

Total No. of Questions : 8]

SEAT No. :

P3145

[Total No. of Pages : 3

[4730] - 1001

M.Sc. (Part - I) (Semester - I)

MICROBIOLOGY

MB - 501 : Microbial Diversity and Taxonomy

(Credit System) (2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt five questions.*
- 2) *Attempt any three questions from Q.No. 1 to Q.No. 4.*
- 3) *Attempt at least two questions from Q.No. 5 to Q.No. 8.*
- 4) *Figures to the right indicate marks.*
- 5) *Draw diagrams wherever necessary.*
- 6) *All questions carry equal marks.*
- 7) *Use of the logarithmic electronic pocket calculator is allowed.*
- 8) *Assume suitable data, if necessary.*

Q1) Attempt any two of the following:

- a) What is a phylogenetic tree? Explain how it is constructed. **[5]**
- b) The two different soil samples were collected, one from farming field and another from industrial field. Design a methodology to determine whether there is a drastic change in the microbial communities present in these soils. **[5]**
- c) Write a note on evolution of species. **[5]**

Q2) Attempt any two of the following:

- a) Explain in brief the great plate count anomaly with suitable example. **[5]**
- b) The bacterial load of a soil sample was found to be 10^{12} cells/gm by fluorescent microscopy. The soil sample was then heated at 90°C for one hour and examined by conventional standard plate count technique which was 10^7 CFU/gm. Describe the methodology by which this difference in count could be nullified. **[5]**
- c) Briefly explain the factors influencing the measurement of microbial diversity. **[5]**

P.T.O.

Q3) Attempt any two of the following:

- a) Describe the taxonomic significance of steps involved in gene transfer. [5]
- b) Discuss in brief 3 domain classification system of bacteria. [5]
- c) Describe the significance of polyphasic approach of bacterial classification. [5]

Q4) Attempt any two of the following:

- a) Differentiate between the species concept of sexual and asexual organisms. [5]
- b) Write a note on estimates of total number of microbial species. [5]
- c) Describe in brief the physiological characters of bacteria used in Systematics. [5]

Q5) Attempt any two of the following:

- a) Differentiate between Basidiomycetes and Ascomycetes classes of fungi. [5]
- b) Justify-Why morphological characterization is adequate for fungal classification upto class level? [5]
- c) Give salient features of Deuteromycetes. [5]

Q6) Attempt any two of the following:

- a) Write note on applications of FISH in bacterial taxonomy. [5]
- b) Explain any one molecular technique used in identification of microbes. [5]
- c) Explain the strategies used for culturing unculturable bacteria. [5]

Q7) Attempt any two of the following:

- a) Explain speciation in sexual and asexual organisms. [5]
- b) Explain the evolution of secondary metabolites diversity. [5]
- c) Explain neutral evolution. [5]

Q8) Attempt any two of the following:

- a) Justify- 'Primer selection for PCR is crucial in gene sequencing'. [5]
- b) Write a note on whole genome shotgun sequencing. [5]
- c) What is PHYLIP? [5]



Total No. of Questions : 8]

SEAT No. :

P3146

[Total No. of Pages : 4

[4730]-1002

M.Sc. (Part - I) (Semester - I)

MICROBIOLOGY

MB-502: Quantitative Biology

(2013 Pattern) (Credit System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any THREE questions from 1 to 4 (Core credits)*
- 2) *Attempt any TWO questions from 5 to 8 (Non-core credits)*
- 3) *All questions carry equal marks.*
- 4) *Draw neat diagrams wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic tables/scientific calculator/statistical table Graph paper is allowed.*
- 7) *Assume suitable data if necessary.*

Q1) Attempt *any two* of the following :

[10]

- a) The 69 sterile Nutrient agar plates were exposed to air and data was recorded on red pigmented colonies per plate. Calculate standard deviation.

Pigmented colonies/plate	2	4	6	8	5	3	1
Frequency	8	10	12	15	11	9	4

- b) Find the regression of X on Y from the following data

$$\sum X=24, \sum Y=44, \sum XY=306, \sum X^2=164, \sum Y^2=574. N = 4$$

Find the value of X when Y = 6

- c) Find the geometric mean for the data related to the internode length(cms) for rice variety.

Internode length(cms)	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	10	16	22	32	26	20

P.T.O.

Q2) Attempt *any two* of the following : **[10]**

- a) Data obtained on two sets of results with regard to number of flowers per plant. Analyse the data using t test and give your inference on the mean difference on number of flowers.

	Set 1	Set 2
N	30	32
Mean	15.65	10.15
Variance	6.2	7.8

- b) Describe type I and type II errors in hypothesis testing.
- c) In a random sample of 110 persons, the blood sugar level was reported as 85%. The standard deviation of blood sugar level in a population is 7 mg%. If the population mean is unknown, within what limits is it likely to lie for 95% confidence limit?

Q3) Attempt *any two* of the following : **[10]**

- a) Test whether the prevalence of carriers of filarial is associated with sex.

Sex	No. of carriers	No. of non carriers	Total
Male	78	412	490
Female	57	553	610

- b) The data on heights of male and female students is given to you. Test with the help of "Mann-Whitney" test whether heights of male and female students is same (Critical $U_{0.05(2),7.5} = 30$)

Height of Males (cm)	193	188	186	183	179	177	171
Height of females (cm)	176	174	168	165	163		

- c) The table given below shows the data obtained during the epidemics of cholera.

	Attacked	Not attacked
Inoculated	24	32
Not Inoculated	50	14

Test the effectiveness of inoculation in preventing the attack of cholera.

Q4) Attempt *any two* of the following : [10]

- a) Calculate the mean median and the mode for the following data series:
19, 20, 17, 11, 19, 19, 15, 8, 15, 20, 17, 18 and 11
Comment on data distribution (skewness).
- b) Following data relate to the heights of two varieties of plant H1 and H2.
Determine whether the two means are significantly different (table z value
at % LS is 1.96)

	H1	H2
N	32	35
Mean	34	38
Variance	9.62	14.23

- c) Nephropathy was observed in 100 cases of each class of diabetes divided into 5 classes as per severity of the disease.

Diabetes Class	I	II	III	IV	V
Frequency	8	15	14	7	6

Test whether severity of diabetes and the incidence of nephropathy are independent.

Q5) Attempt *any two* of the following : [10]

- a) Describe the sampling errors.
- b) To examine the relationship between obesity and age represent following data with appropriate tool.

	Age group			
Obesity level	Under 50	50-59	60-69	70 & over
Normal	11	22	26	19
Overweight	11	23	30	21
Obese	8	7	10	12

- c) Represent the following data by a pie diagram:

Country	Birth Rate
China	40
India	33
New Zealand	30
United Kingdom	20
Germany	16
Sweden	15

Q6) Attempt *any two* of the following : **[10]**

- a) If two parents, both heterozygous carriers of the autosomal recessive gene causing cystic fibrosis, have five children. What is the probability that three will be normal? (Given probability of having normal child is $\frac{3}{4}$)
- b) A person is known to hit target in 4 out of 5 shots. Whereas another person is known to hit the target in 3 out of 4 shots. Find the probability of the target being hit at all when they both try.
- c) Alpha particles are emitted by radioactive source at the rate of 5 per every minute on the average. The number of particles is distributed according to the Poisson distribution. Calculate the probability of getting exactly 7 emissions in one minute.

Q7) Attempt *any two* of the following : **[10]**

- a) Explain study designs in epidemiology.
- b) Two samples are drawn from two normal populations. From the following data test whether the samples have same variances at 5% level of significance using F test or Variance ratio test.

Sample 1	45	50	56	59	61	67	70	72		
Sample 2	49	51	52	70	63	73	71	70	48	76

- c) Write a note on Factorial design.

Q8) Attempt *any two* of the following : **[10]**

- a) Explain exponential growth model.
- b) The distribution of MN blood types in a population of 2000 individuals is as follows:

Blood type	Genotype	No. of individuals
M	MM	980
MN	MN	840
N	NN	180

Find out the genotypic and allele frequency.

- c) Explain concept and different types of models.



Total No. of Questions : 8]

SEAT No. :

P3147

[Total No. of Pages : 2

[4730] - 1003

M.Sc. (Part - I) (Semester - I)

MICROBIOLOGY

MB - 503 : Cell Organization and Biochemistry

(2013 Pattern) (Credit System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Q.1 to Q. 3 is compulsory.*
- 2) *Attempt at least two from Q. 4 to Q. 8.*
- 3) *All questions carry equal marks.*
- 4) *Draw neat - labelled diagrams wherever necessary.*
- 5) *Use of logarithmic tables and scientific calculators is allowed.*
- 6) *Assume suitable data, if necessary.*
- 7) *Figures to the right indicate full marks.*

Q1) Attempt any two of the following : **[10]**

- a) Write a note on quaternary structures of proteins.
- b) Give a comparative account of A, B and Z forms of DNA.
- c) Describe the preparation of 100ml of 0.1M buffer of pH 5.0 using sodium acetate and Acetic acid. (pka of Acetic acid = 4.76).
(Given - MW - Sodium acetate = 82.03, Acetic acid = 60.05).

Q2) Attempt any two of the following : **[10]**

- a) Explain the targeting of proteins of ER by cotranslational pathway.
- b) Diagrammatically illustrate the working of electron microscope and comment on its applications.
- c) Describe events in eukaryotic cell cycle.

Q3) Attempt any two of the following : **[10]**

- a) Write a note on differentiation in embryo development.
- b) Diagrammatically explain antero-posterior body axis formation in Xenopus.
- c) Describe the process of gastrulation in Drosophila.

P.T.O.

Q4) Attempt any two of the following **[10]**

- a) Explain the life cycle of myxobacteria.
- b) Explain formation of biofilm in pathogenic bacteria.
- c) Explain the phenomenon of quorum sensing and its role in microbial communities.

Q5) Attempt any two of the following : **[10]**

- a) Write a note on concept of buffer.
- b) Explain biochemical significance of resonance.
- c) Explain the mechanism of oxidation - reduction reactions giving suitable examples.

Q6) Attempt any two of the following : **[10]**

- a) Elaborate on structure and functions of triglycerides.
- b) What are epimers? Give examples of any two epimers of sugars with structure.
- c) Diagrammatically illustrate the L-series of aldoses.

Q7) Attempt any two of the following : **[10]**

- a) Draw the structure of Vitamin K and explain its biological role.
- b) Explain the function of cobalt as a cofactor.
- c) Explain any two enzyme catalysed reactions where CoA is involved.

Q8) Attempt any two of the following : **[10]**

- a) Explain chemical structure and functions of pituitary gland hormones.
- b) Give major types and functions of adrenal cortical hormones.
- c) Write a note on sex hormones.



Total No. of Questions : 5]

SEAT No. :

P3133

[Total No. of Pages : 2

[4730] - 101
M.Sc. (Semester - I)
MICROBIOLOGY
MB - 501 : Microbial Diversity & Taxonomy
(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicates marks.*
- 3) *Draw diagrams wherever necessary.*
- 4) *All questions carry equal marks.*
- 5) *Use of the logarithmic electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

Q1) Attempt any two of the following:

[16]

- a) Justify : Classification of molds is chiefly based on their morphological characters.
- b) Describe the various measures and indices of diversity.
- c) Explain the characteristics of bacteria in VBNC state. How does this state influence taxonomy.

Q2) Attempt any two of the following:

[16]

- a) Explain the various culture independent molecular methods used in bacterial taxonomy.
- b) Describe the role of sequence alignment in the field of molecular evolution.
- c) What are the universal primers? Explain how these are applied in microbial taxonomy and diversity.

P.T.O.

Q3) Attempt any two of the following: **[16]**

- a) Outline the strategy for identification of pure culture with suitable flow sheet diagram.
- b) Describe the analysis of 'Dayhoff model of protein evolution' as used in PAM matrices.
- c) Explain concept of 'Metagenomic Library' with the help of suitable example.

Q4) Write short note on any four the following: **[16]**

- a) FAME profiles in taxonomy.
- b) Use of DGGE in taxonomy.
- c) Phylochip.
- d) BLAST.
- e) Isoprenoid Quinones as a tool in taxonomy.

Q5) There is outbreak of diarrhea in your city. The patients respond to antibiotic but the causative agent cannot be isolated from stool samples. How would you establish the identity of causative agent in such cases? **[16]**



Total No. of Questions : 5]

SEAT No. :

P3134

[Total No. of Pages : 3

[4730]-102

M.Sc. (Semester - I)

MICROBIOLOGY

MB-502: Quantitative Biology

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) All questions carry equal marks.
- 3) Draw neat labeled diagrams wherever necessary.
- 4) Figures to the right side indicate full marks.
- 5) Use of logarithmic tables and scientific calculator is allowed.
- 6) Assume suitable data if necessary.

Q1) Attempt **any two** of the following : [16]

- a) Calculate the variance, the standard deviation and coefficient of variation from the data recorded on the respiration rate per minute of 10 persons.
Respiration /minute = 22, 22, 20, 24, 16, 17, 18, 19, 21, 21.
- b) Draw a histogram, frequency polygon representing following data:

Number of pods	10-20	20-40	40-50	50-70	70-80	80-100	100-130	130-150
Number of plants	13	48	24	20	5	8	6	2

- c) Describe the models in population genetics.

Q2) Attempt **any two** of the following : [16]

- a) Calculate mean and mode of the following data:

Class Interval	0-5	5-10	10-15	15-20	20-25	25-30
Frequency	2	4	8	5	4	1

P.T.O.

- b) Calculate the probability of following :
- A bag contains 10 balls in the proportion of 7 red and 3 white.
- If two balls are drawn at random replacing one after other. What is the probability that one is red and other is white?
 - if two balls are drawn at random one after the other without replacement. What will be the probability that both the balls drawn are red?
- c) Water samples were taken from the wells of two localities, one from industrial area (1) and the other from non-industrial area (2). The samples were analyzed for lead content and the following data were obtained.

Locality 1	Locality 2
Sample size ₁ =25	Sample size ₂ =25
Mean ₁ = 390 ppb	Mean ₂ = 10 ppb
Stand. Dev ₁ . = 277.5 ppb	Stand. Dev ₂ . =5 ppb

Test the hypothesis that the average lead concentration in the ground water of industrial area exceeds that of the non-industrial area using t test

Q3) Attempt any two of the following : [16]

- a) A new drug candidate was administered to 450 persons out of a total 800 persons in a locality where epidemic was prevalent to test its efficacy against malaria. The results are given below in the table.

Find out effectiveness of drug against disease using Chi square test.

	Infection	No infection
Drug	200	300
No Drug	250	50

- b) Explain the concept of epidemiological model.
- c) In certain population an average of new cases of esophageal cancer are diagnosed each year. If the annual incidence of the esophageal cancer follows a Poisson distribution, find the probability that in a given year the number of newly diagnosed cases of esophageal cancer will be:
- Exactly 10
 - Less than 10

Q4) Write short notes on *any four* of the following :

[16]

- a) Sample & Population.
- b) Normal Distribution Curve.
- c) One tailed and two tailed test.
- d) Simulation of bacterial growth.
- e) Genome database.

Q5) Attempt *any one* of the following :

[16]

- a) Calculate the correlation coefficient and regression coefficient between two measurements of water quality of a lake.

Salinity (%)	2	4	6	8	10	12	14
Dissolved Oxygen (mg/l)	4	2	5	10	4	11	12

- b) To study the performance of three detergents and three different water temperatures; following whiteness readings were obtained with specially designed equipment. Apply two way ANOVA and interpret results.

Water Temperature	Detergents		
	A	B	C
Cold water	57	55	67
Warm Water	49	52	68
Hot water	54	46	58



Total No. of Questions : 5]

SEAT No. :

P3135

[Total No. of Pages : 2

[4730] - 103

M.Sc. (Semester - I)

MICROBIOLOGY

MB - 503 : Cell Organization and Biochemistry

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat-labeled diagrams wherever necessary.*
- 4) *Use of logarithmic tables and scientific calculators is allowed.*
- 5) *Assume suitable data if necessary.*
- 6) *Figures to the right indicate full marks.*

Q1) Attempt any two of the following : **[16]**

- a) Explain Mutarotation in aldehyde and ketones with an example each.
- b) What are biofilm? Explain their applications.
- c) With suitable example explain reaction occurring in organic molecules.

Q2) Attempt any two of the following : **[16]**

- a) Derive Henderson and Hasselbach equation. Explain its significance in buffer formulation.
- b) Explain the classification and functions of phospholipids.
- c) Explain the principle and working of confocal microscope.

Q3) Attempt any two of the following : **[16]**

- a) Diagrammatically explain the droso-ventral polarity in Drosophila.
- b) Explain the process of gastrulation in Xenopus.
- c) Explain the structure and functions of microtubules.

P.T.O.

Q4) Write short notes on any four of the following :

[16]

- a) Tautomerism.
- b) Z form of DNA.
- c) Phases of cell cycle.
- d) Hox code.
- e) Quorum sensing in Gram negative bacteria.

Q5) a) An organism of unknown origin produces a potent inhibitor of nerve conduction that you wish to sequence **[10]**

Composition of peptide : Ala₅, Lys, Phe

Reaction with FDNB : FDNB-Ala

Trypsin cleavage gives : Ala₃, Phe and Lys, Ala₂

Chymotrypsin treatment : Hexapeptide and free Ala

What is the inhibitor sequence?

b) At Na⁺ concentration >5M, the T_m value of DNA decreases with increasing Na⁺ concentration. Explain this behavior? **[6]**



Total No. of Questions : 8]

SEAT No. :

P3148

[Total No. of Pages :3

[4730] - 2001

M.Sc. I (Semester - II)

MICROBIOLOGY

MB - 601: Instrumentation and Molecular Biophysics

(2013 Pattern) (Credit system)

Time :3. Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Attempt any 3 questions from 1 to 4 (core credits)*
- 2) *Attempt any 2 questions from 5 to 8 (Non - Core Credits)*
- 3) *All questions carry equal marks.*
- 4) *Draw neat - diagrams wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic tables / scientific calculator is allowed.*
- 7) *Assume suitable data if necessary.*

Q1) Attempt any two of the following: **[10]**

- a) Explain the steps involved in ion-exchange chromatography comment on the exchangers used in ion exchange chromatography.
- b) Protein A and B having a MW of 16500 and 35400 move 1.3 cm and 4.6 cm respectively, when electro phoresed through a gel. what is molecular weight of protein C which moves 2.8 cm in the same gel.
- c) Daigrammatically represent analytical ultracentrifuge and explain its working.

Q2) Attempt any two of the following: **[10]**

- a) Describe the components of fuorescence spectrometer.
- b) An aliquot of a solution containing a light absorbing substance at a conc of 5g dm^{-3} , was placed in a 2 cm light path cuvette. The cuvette was placed in a spectrophotometer and a beam of light of wavelength λ was passed through the cuvette containing the solution. A transmission value of 80% was recorded.
 - i) What is absorbance of the solution.
 - ii) What is molar extinction coefficient of the solution.
- c) Explain the working of FTIR with the help of a diagram.

P.T.O.

- Q3)** Attempt any two of the following: **[10]**
- a) Explain the basic principle of X - ray diffraction.
 - b) With a suitable example explain how structure determination can be done using 2D NMR.
 - c) Explain Direct lattice and Reciprocal lattice.
- Q4)** Attempt any two of the following: **[10]**
- a) Explain any Two methods of fragmentation of molecule in mass spectroscopy.
 - b) Explain the principle of affinity chromatography.
 - c) Write a short note on chemical shift.
- Q5)** Attempt any two of the following: **[10]**
- a) Describe the physical and chemical properties of aliphatic amino acid.
 - b) Describe the quaternary structure of protein.
 - c) Justify :- β sheets are fully extended structure.
- Q6)** Attempt any two of the following: **[10]**
- a) Explain the steps involved in Homology modelling to predict 3D structure of protein.
 - b) Comment on : OMIM database.
 - c) Explain global alignment method.
- Q7)** Attempt any two of the following: **[10]**
- a) With a suitable example explain biogenic synthesis of nano particles.
 - b) Describe EDAX analysis method for characterization of nano particles.
 - c) What are magnetosomes? which are the bacteria that produce it.

Q8) Attempt any two of the following:

[10]

- a) Write short note on motifs and Domain's in protein.
- b) Describe PDB database.
- c) Explain how characterization of nano particles can be done using AFM.



Total No. of Questions : 8]

SEAT No. :

P3149

[Total No. of Pages : 3

[4730] - 2002

M.Sc. (Part - I) (Semester - II)

MICROBIOLOGY

MB - 602 : Virology

(2013 Pattern) (Credit System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any **THREE** questions from 1 to 4 (core credits).*
- 2) *Attempt any **TWO** questions from 5 to 8 (Non-core credits).*
- 3) *All questions carry equal marks.*
- 4) *Draw neat, labelled diagrams wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of log tables/scientific calculator is allowed.*
- 7) *Assume suitable data, if necessary.*

Q1) Attempt any TWO of the following -

[10]

- a) Explain the role of various proteins in determining structure of a virus.
- b) Describe various steps involved in assembling & release of viruses from infected cells.
- c) Justify - virus genome exists in different forms.

Q2) Attempt any TWO of the following -

[10]

- a) Diagrammatically illustrate various sites for cultivation of viruses in embryonated chicken egg.
- b) Explain the process of sample preparation of viruses for electron microscopy.
- c) In an egg infectivity assay, virus to be assayed was diluted serially. 0.1 ml dilution was inoculated in a set of 8 eggs each. The eggs were incubated and checked for formation of pocks. Calculate EID_{50} value using following data-

P.T.O

Dilution of virus used	No. of eggs showing pocks.
10^{-1}	8
10^{-2}	8
10^{-3}	6
10^{-4}	2
10^{-5}	0
10^{-6}	0

Q3) Attempt any TWO of the following - **[10]**

- a) Give Baltimore system of classification of animal viruses.
- b) Give classification of viruses based on types of transmission vectors.
- c) Elaborate on working of ICTV.

Q4) Attempt any TWO of the following - **[10]**

- a) Comment on Viroids.
- b) Describe half leaf assay for plant viruses.
- c) Justify the use of N.A. probes in detection of viruses.

Q5) Attempt any TWO of the following - **[10]**

- a) Give genome organization and Life cycle of $\Phi \times 174$ phage.
- b) Give morphological details of T_4 phage.
- c) Comment on - bacteriophage therapy for bacterial diseases in poultry.

Q6) Attempt any TWO of the following - **[10]**

- a) Elaborate on edible vaccines.
- b) Justify - Ribozymes can be used as therapeutic agent-
- c) What are adjuvants ? Give their examples with property and use in formulations.

Q7) Attempt any two of the following - **[10]**

- a) Comment on Strategies used in eradication of viral diseases giving suitable examples.
- b) Describe epidemiology of prion induced diseases in animals.
- c) Justify - Retroviruses are oncogenic.

Q8) Attempt any TWO of the following - **[10]**

- a) Comment on - Cellular sites for replication and assembly of plant viruses.
- b) What are the different methods for obtaining virus free plant material.
- c) Explain how fungi contribute to transmission of viruses.



Total No. of Questions : 8]

SEAT No. :

P3150

[Total No. of Pages : 2

[4730] - 2003

M.Sc. (Part - I) (Semester - II)

MICROBIOLOGY

MB - 603 : Microbial Metabolism

(Credit System) (2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Q. 1 to Q. 3 are compulsory.*
- 2) *Attempt at least two from Q.4 to Q.8.*
- 3) *All questions carry equal marks.*
- 4) *Draw neat-labelled diagrams wherever necessary.*
- 5) *Use of logarithmic tables and scientific calculators are allowed.*
- 6) *Assume suitable data if necessary.*
- 7) *Figures to the right indicate full marks.*

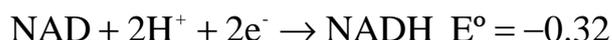
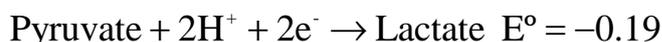
Q1) Attempt any two of the following : **[10]**

- a) Derive the equation for two - substrate enzyme catalysed reaction with double displacement mechanism.
- b) How are allosteric enzymes regulated? What is their significance?
- c) Derive MM equation for competitive inhibition.

Q2) Attempt any two of the following : **[10]**

- a) What are coupled reactions? Discuss their significance.
- b) Comment on Gibb's free energy.
- c) Calculate ΔG° taking place in pyruvate reduction by lactate dehydrogenase using the following data.

Given



Q3) Attempt any two of the following : **[10]**

- a) Describe the energy generation pathway in sulphate reducing bacteria.
- b) Explain the process of generation and maintenance of proton motive force in mitochondria.
- c) Draw neat labelled diagram of mitochondrial ATPase.

P.T.O.

Q4) Attempt any two of the following : **[10]**

- a) Describe process of ion mediated transport across membranes.
- b) Explain the concept of passive diffusion across membranes with suitable examples.
- c) Diagrammatically illustrate $\text{Na}^+ - \text{K}^+$ AT Pase

Q5) Attempt any two of the following : **[10]**

- a) Schematically represent biosynthesis of serine - glycine family amino - acids.
- b) Describe structure of nitrogenase enzyme complex.
- c) Explain regulation of glutamate dehydrogenase.

Q6) Attempt any two of the following : **[10]**

- a) Compare plant and bacterial photosynthesis.
- b) Diagrammatically illustrate ETC of photosynthetic bacteria.
- c) Explain Hatch - slack pathway of CO_2 assimilation.

Q7) Attempt any two of the following : **[10]**

- a) Write note on RUBISCO
- b) Describe the steps involved in synthesis of sucrose.
- c) Write a note on photorespiration.

Q8) Attempt any two of the following : **[10]**

- a) Describe the steps involved in synthesis of saturated fatty acids.
- b) Give the role of eicosanoids as signal molecules.
- c) Explain synthesis of sphingolipids with a suitable example.



Total No. of Questions : 5]

SEAT No. :

P3136

[Total No. of Pages :2

[4730]-201

M.Sc. (Semester - II)

MICROBIOLOGY

MB 601 : Instrumentation and Molecular Biophysics

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*
- 6) *All questions carry equal marks.*

Q1) Attempt any two of the following.

[16]

- a) Explain the principle and applications of Gel filtration chromatography.
- b) Explain the principle of protein gel electrophoresis. Differentiate between Native and SDS PAGE.
- c) Explain the principle and applications of Ultracentrifugation.

Q2) Attempt any two of the following:

[16]

- a) Give the principle and schematic diagrammatical representation of UV-visible spectrophotometer.
- b) Explain the principle of pulse chase experiment with an example of protein movement tracking in an eukaryotic cell.
- c) Explain the instrumentation of Mass spectroscopy.

P.T.O.

Q3) Attempt any two of the following: [16]

- a) What are protein motifs? How do they help in Protein structure classification. Discuss.
- b) Explain instrumentation required for X-ray crystallography. Explain with diagram Miller indices of (1,0,0) in a simple cuboid.
- c) Explain the principle of Mass spectroscopy. How does ionization take place in the Mass spectroscopy.

Q4) Write *short notes* on any four of the following: [16]

- a) Infrared spectroscopy
- b) Affinity Chromatography
- c) Spin-spin coupling in NMR
- d) Chemical Shift
- e) Super Secondary Structure of Proteins.

Q5) Attempt the following: [16]

- a) Explain the secondary structure prediction by chou-fasman method.
- b) If solution containing ATP is found to have absorbance of 0.17 in 1cm cuvette and the molar extinction coefficient is $1.54 \times 10^4 (\text{mol dm}^{-3})^{-1} \text{cm}^{-1}$, what is the concentration and the transmission of ATP solution?



Total No. of Questions : 5]

SEAT No. :

P3137

[Total No. of Pages : 2

[4730] - 202

M.Sc. (Semester - II)

MICROBIOLOGY

**MB - 602 : Evolution, Ecology and Environmental Microbiology
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat labeled diagrams wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

Q1) Attempt any one of the following:

[16]

- a) Explain how a malfunctioning settler-clarifier can adversely affect the efficiency of an activated sludge process. Give relevant equations for mass balance in explaining the feature.
- b) Discuss the evolutionary stability of cooperation among microorganisms. Explain with suitable examples how the cooperative and competitive interactions influence this stability.

Q2) Attempt any two of the following:

[16]

- a) Describe the advantages and disadvantages of various granular medium filters used for wastewater treatment.
- b) Discuss the bacterial growth in the marine ecosystem and its regulation by environmental conditions.
- c) Discuss mycorrhizal associations with special reference to host-fungus specificity and interactions with non-host plants.

P.T.O

Q3) Attempt any two of the following: [16]

- a) Discuss the diversity of secondary metabolites in the evolutionary context.
- b) Elaborate on the mode of action of various plant products as antimicrobial agents.
- c) Describe the reaction mechanisms of chemical precipitation, as a unit process in the treatment of wastewaters.

Q4) Write short notes on any four of the following: [16]

- a) Working principle of an UASB digester.
- b) Reuse of treated solid wastes.
- c) Industrial ETP layout for dairy waste.
- d) Neo-Darwinism.
- e) Significance of DOM in marine ecosystem.

Q5) A wastewater has the following characteristics: [16]

Flow rate: 10200m³/d

BOD₅: 290mg/L

The process by which it is to be treated is the activated sludge process with recycle. The MPCB has imposed a discharge limit of BOD₅=10 mg/L. Assuming MLSS in the aeration basin = 3750 mg/L, MLSS in clarifier sludge = 13500 mg/L, MCRT = 8 days, kinetic coefficients, $k_d = 0.06d^{-1}$ and $Y = 0.6$,

Determine the following:

- a) The hydraulic retention time.
- b) The mass of sludge wasted daily.
- c) The F/M ratio.



Total No. of Questions : 5]

SEAT No. :

P3138

[Total No. of Pages : 2

[4730] - 203
M.Sc. (Semester - II)
MICROBIOLOGY
MB - 603 : Microbial Metabolism
(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt any two of the following: **[16]**

- a) Compare passive & active transport.
- b) Derive the Adair equation for cooperativity & state its significance in relation to allosteric enzymes.
- c) Describe biosynthesis of aspartate family of amino acids.

Q2) Attempt any two of the following : **[16]**

- a) Explain in brief process of nitrate respiration.
- b) State laws of thermodynamics. Discuss their role in biochemistry.
- c) Describe structure & function of nitrogenase enzyme. Elaborate on the energy & reducing power requirement per mole of nitrogen fixed.

Q3) Attempt any two of the following : **[16]**

- a) Justify, C₄ plants have better photosynthetic ability than C₃ plants?
- b) Write a note on Atkinson's energy charge.
- c) Describe the regulation of enzyme glutamine synthetase in E. coli.

Q4) Write short notes on any four of the following : **[16]**

- a) Phosphorylation potential & its significance.
- b) Types of mechanisms in two substrate enzyme catalysed reaction.
- c) Concept of free energy.
- d) Rubisco.
- e) Mitochondrial ATPase.

P.T.O.

- Q5) a) An enzyme catalysed reaction was investigated in the presence of an inhibitor, giving the following data. [8]

S_0 (m moles/lit)	V_0 (u moles/lit/min) (Inhibitor absent)	V_0 (u moles/lit/min) (Inhibitor pre.)
3.0	10.4	4.1
5.0	14.5	6.4
10.0	22.5	11.3
30.0	33.8	22.6
90.0	40.5	33.8

Determine the type of inhibition & calculate K'_m & V'_{max} .

- b) Dichlorophenyl dimethylurea (DCMU), a herbicide, interferes with photophosphorylation & oxygen evolution. However, it does not block oxygen evolution in the presence of an artificial electron acceptor such as ferricyanide. Propose a site for the inhibitory action of DCMU. [8]



Total No. of Questions : 8]

SEAT No. :

P3151

[Total No. of Pages : 2

[4730] - 3001
M.Sc. (Semester - III)
MICROBIOLOGY
MB - 701 : Immunology
(Credit and Semester System) (2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt any three questions from Q.No. 1 to Q.No. 4 (Core Credits).*
- 2) Attempt any two questions from Q.No. 5 to Q.No. 8 (Non-Core Credits).*
- 3) All questions carry equal marks.*
- 4) Draw neat-labeled diagrams wherever necessary.*
- 5) Use of logarithmic tables and scientific calculators is allowed.*
- 6) Figures to the right indicate full marks.*

Q1) Attempt any two of the following: [10]

- a) Explain the role of Toll-like receptors (TLRs) in innate immune mechanisms.
- b) Explain the structure of TCR-CD₃ complex.
- c) Describe in brief the characters of cytokine receptor families.

Q2) Attempt any two of the following: [10]

- a) Diagrammatically represent regulation of alternative complement pathway.
- b) Justify, "The mechanism of central tolerance induction is clonal deletion".
- c) Comment on role of T cells in immune regulation.

Q3) Attempt any two of the following: [10]

- a) Describe the ELISPOT assay, giving its applications.
- b) Describe use of animal models for study of AIDS.
- c) Explain culturing of anchorage-dependent cells *in vitro*.

P.T.O.

- Q4)** Attempt **any two** of the following: [10]
- With the help of diagrams, explain role of adhesion molecules in immune activation.
 - Describe cytokine mediated regulation of immune responses, giving suitable examples.
 - Explain assay methods to evaluate phagocytic cell function.
- Q5)** Attempt **any two** of the following: [10]
- How tumors escape host defense mechanisms?
 - What are tumor vaccines? Explain giving examples.
 - Discuss use of immune adjuvants in prevention and treatment of tumors.
- Q6)** Attempt **any two** of the following: [10]
- How host immune system responds to extracellular bacterial pathogens?
 - Explain the pathophysiology in cutaneous leishmaniasis.
 - Describe immuno-prophylaxis of tuberculosis.
- Q7)** Attempt **any two** of the following: [10]
- Explain the mechanism of symptoms development in systemic lupus erythomatosus.
 - How T cell deficiency disorders are diagnosed?
 - Discuss the immuno-therapeutic approaches for rheumatoid arthritis.
- Q8)** Attempt **any two** of the following: [10]
- Discuss evolution of cellular defenses in lower invertebrate species.
 - Justify, “To defend against life threats in terrestrial environment, functional and inducible specific humoral factors appeared during course of evolution of immune system among vertebrate species”.
 - Discuss the complexity of immune system among different species of vertebrates.



Total No. of Questions : 8]

SEAT No. :

P3152

[Total No. of Pages : 2

[4730] - 3002

M.Sc. (Semester - III)

MICROBIOLOGY

**MB - 702 : Molecular Biology - I
(2013 Pattern) (Credit System)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any three questions from 1 to 4 (Core credit)*
- 2) *Attempt any two questions from 5 to 8 (Non-core credit)*
- 3) *All questions carry equal marks.*
- 4) *Draw neat diagrams wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of log tables/graph papers/scientific calculator is allowed.*
- 7) *Assume suitable data if necessary.*

Q1) Attempt any two of the following : **[10]**

- a) Explain the principle of filter binding assay. Give its applications.
- b) Explain the preparation and use of knock out mice as a tool in molecular biology research.
- c) Elaborate on uses of DNA finger printing. technique.

Q2) Attempt any two of the following : **[10]**

- a) Explain the regulation of *lac* operon in the presence of lactose.
- b) Explain the role of *ara C* gene in the regulation of *ara* operon.
- c) Explain the molecular significance of sigma factor switching in phages.

Q3) Attempt any two of the following : **[10]**

- a) Diagrammatically represent mechanism of mRNA splicing in eukaryotes.
- b) Comment on the role of micro RNA in gene silencing.
- c) Give the reaction involved in capping of eukaryotic mRNA.

P.T.O.

Q4) Comment on any two of the following : **[10]**

- a) Epitope tagging as a tool in molecular biology
- b) Riboswitches
- c) t RNA processing

Q5) Attempt any two of the following : **[10]**

- a) Diagrammatically illustrate an IS element. State the role of IS in bacterial transposition.
- b) How is transposition of Tn10 controlled?
- c) Explain features of SINES.

Q6) Attempt any two of the following : **[10]**

- a) Describe the procedure of two dimensional gel electrophoresis technique.
- b) Elaborate on MALDI and its applications.
- c) Write note on metabolomics and its significance.

Q7) Attempt any two of the following : **[10]**

- a) Diagrammatically illustrate cyclic events occurring during PCR.
- b) Justify-fluorochromes are used in quantification of DNA in PCR.
- c) How is cancer detected using molecular markers?

Q8) Attempt any two of the following : **[10]**

- a) Diagrammatically show replicative transposition of a Tn.
- b) Justify-Structure of a protein can be deduced using computer programmes and software.
- c) Elaborate on DNA microarray technique.



Total No. of Questions : 8]

SEAT No. :

P3153

[Total No. of Pages : 2

[4730] - 3003

M.Sc. (Semester - III)

MICROBIOLOGY

MB - 703 : Industrial Waste Water Treatment

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any three from Q.1 to Q.4.*
- 2) *Attempt any two from Q.5 to Q.8.*
- 3) *All questions carry equal marks.*
- 4) *Draw neat labelled diagrams wherever necessary.*
- 5) *Use of logarithmic tables and scientific calculators are allowed.*
- 6) *Assume suitable data if necessary.*
- 7) *Figures to right indicate full marks.*

Q1) Attempt *any two* of the following : **[10]**

- a) Explain the methods for estimating parameters used for determining waste water treatment efficacy.
- b) Explain the use of indicator organism in waste water treatment. Enlist different indicators.
- c) Schematically represent the layout of typical waste water treatment plant.

Q2) Attempt *any two* of the following : **[10]**

- a) Explain the different screening devices used for removal of fine suspended particles.
- b) Describe the various flotation techniques.
- c) Describe the different type of filters used in granular medium filtration.

Q3) Attempt *any two* of the following : **[10]**

- a) Enlist the various anaerobic biological processes used in waste water treatment. Describe UASB reactor in detail.
- b) Describe various type of adsorption techniques used in waste water treatment.
- c) The BOD/COD ratio and the TS of an industrial effluent were found to be 0.8 and 350 mg/dm³. Suggest the suitable biological treatment to be given along with justification.

P.T.O.

Q4) Attempt *any two* of the following : **[10]**

- a) Describe the parameters for measuring pollution load of waste water.
- b) Explain the significance of flow equalization.
- c) A industrial wastewater having a BOD of 350 mg/L is to be treated by a two stage trickling filter. The discharge limit is 20 mg/L of BOD. The depth of the trickling filter is 6 feet and the recirculation ratio is 2:1. The influent flow rate is 4 Mgal/d. The efficiency of BOD removal at both stages of the filter is the same.
Determine the diameter of both the filters.

Q5) Attempt *any two* of the following : **[10]**

- a) Schematically represent a typical effluent treatment for dairy industry and briefly explain each step.
- b) How is colour removed from effluent of paper industry.
- c) Describe the physico - chemical treatment processes for dye-house effluents.

Q6) Attempt *any two* of the following : **[10]**

- a) What is EIA? Explain its significance.
- b) Explain briefly the strategy for determining the most significant impacts.
- c) Write short note on phases of EIA study.

Q7) Attempt *any two* of the following : **[10]**

- a) Explain the principle and working of MBRs.
- b) Describe the advantages of MBBRs.
- c) Draw a schematic diagram of typical RBC and explain its functioning.

Q8) Attempt *any two* of the following : **[10]**

- a) Delineate the characteristics of paper industry effluent.
- b) What is significant impact ? How is it determined in EIA.
- c) Differentiate between RBC and trickling filter.



Total No. of Questions : 5]

SEAT No. :

P3139

[Total No. of Pages : 3

[4730]-301

M. Sc. (Semester - III)

MICROBIOLOGY

MB 701 : Immunology

(2008 Pattern)

[Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*

- 3) *Draw neat-labeled diagrams wherever necessary.*
- 4) *Use of logarithmic tables and scientific calculators is allowed.*
- 5) *Assume suitable data if necessary.*
- 6) *Figures to the right indicate full marks.*

Q1) Attempt **any two** of the following:

[16]

- a) Describe in vitro quantification of cytokine function.
- b) Explain the chemical nature of super-antigen and its role in generation of Septic Shock Syndrome.
- c) Giving examples, describe general properties of chemokines

Q2) Attempt **any two** of the following:

[16]

- a) Justify, "Clonal deletion is one of the mechanisms for development of central tolerance".
- b) Explain evolution of cellular immune components in different invertebrate species?
- c) How the self cells are protected from complement mediated lysis?

P.T.O.

Q3) Attempt **any two** of the following: [16]

- a) Explain diagnosis of phagocytic deficiency disorders
- b) Discuss possible use of cytokines in tumor immunotherapy.
- c) Describe the symptoms and treatment of B-cell deficiencies

Q4) Write short notes on **any four** of the following: [16]

- a) Biochemical tumor markers
- b) SCID-Hu mouse model in study of diseases
- c) Pathophysiology of Systemic Lupus Erythomatosus
- d) Diagnosis of HIV-AIDS
- e) Host immune response to tumor

Q5) Connective tissue growth factor (CTGF) has been shown to be implicated in tumor development and progression. However, the role of CTGF in gastric cancer was not clear.

To establish an association between CTGF expression and clinic-pathologic characteristics of patients with gastric cancer (n = 110) were recorded as:

	CTGF Expression		P value
	Negative	Positive	
Gender			
Male	33	34	0.779
Female	20	23	-
Age (years)			
≤ 65	35	40	0.642
> 65	18	17	-
Tumor size (cm)			
< 5	26	25	0.585
≥ 5	27	32	-

Tumor location			
Lower	42	37	0.413
Middle	5	8	-
Upper	3	6	-
Entire	3	6	-
Histologic grade			
Differentiated	26	17	0.039*
Undifferentiated	27	40	-
Lauren grade			
Intestinal	28	21	0.108
Diffuse	25	36	-
Lymph node metastasis			
Negative	23	12	0.012*
Positive	30	45	-
TNM stage			
I	11	8	0.080
II	15	9	-
III	20	22	-
IV	7	18	-
Hepatic metastasis			
Negative	50	55	0.588
Positive	3	2	-
Peritoneal dissemination			
Negative	50	44	0.011*
Positive	3	13	-

*P < 0.05; CTGF, connective tissue growth factor.

TNM Classification of Malignant Tumors (TNM) = T describe size of primary tumor, N describes involvement of nearby lymph nodes, M describes metastasis.

- a) Based on the given data, discuss the possible association of CTGF and gastric cancer? [8]
- b) List the criteria on the basis of which tumors are classified. Describe any one in detail. [8]



Total No. of Questions : 5]

SEAT No. :

P3140

[Total No. of Pages : 2

[4730]-302

M.Sc. (Semester - III)

MICROBIOLOGY

MB-702: Molecular Biology - I

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat and labeled diagrams wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of logarithmic tables and scientific calculator is allowed.*
- 6) *Assume suitable data if necessary.*

Q1) Attempt **any two** of the following : **[16]**

- a) Explain in brief site specific recombination with example.
- b) Explain the role of DNA polymerase III in synthesis of leading and lagging strand.
- c) Explain in brief replication features of single stranded phages.

Q2) Attempt **any two** of the following : **[16]**

- a) Explain the role of RB proteins in cancer.
- b) Describe Cot $\frac{1}{2}$ curve and its application.
- c) Comment on the controlling of Tn A transposition.

Q3) Attempt **any two** of the following : **[16]**

- a) Elaborate the role of ARC complex in eukaryotes.
- b) Describe the mechanism of regulation of SOS operon.
- c) Explain Acetylation and its effect on structure and function of chromatin.

P.T.O.

Q4) Write short note on **any four** :

[16]

- a) Base excision repair.
- b) Apoptosis.
- c) Gene conversion.
- d) Ty elements.
- e) DNA methylation.

Q5) a) Comment on SINES and LINES.

[8]

- b) Predict the base composition of the total DNA synthesized by DNA polymerase on templates provided by equimolar mixture of two complementary strands of bacteriophage DNA. The base composition of one of the strand is A, 24.7%; G, 24.1%; C, 18.5% and T, 32.7%. Justify your prediction.

[8]



Total No. of Questions : 5]

SEAT No. :

P3141

[Total No. of Pages : 2

[4730] - 303
M.Sc. (Semester - III)
MICROBIOLOGY
MB - 703 : Virology
(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat, labeled diagrams wherever necessary.*
- 4) *Use of log tables and electronic pocket calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) Attempt any two of the following : **[16]**

- a) Describe adjuvant to increase immunogenicity of viruses.
- b) Explain infectivity assay of plant viruses.
- c) Explain patho-physiological changes caused by SV40 infection.

Q2) Answer any two of the following : **[16]**

- a) Justify : embryonated hen's egg has various sites for cultivation of viruses.
- b) Comment on replication strategies of negative sense RNA genomes.
- c) Describe various stages in the life cycle of Cauliflower mosaic virus.

Q3) Attempt any two of the following : **[16]**

- a) Explain sample preparation for electron microscopy.
- b) Elaborate lysogenic cycle of bacteriophage lambda
- c) Enlist methods of detection of plant viruses, explain any one.

P.T.O.

Q4) Write short notes on any four of the following :

[16]

- a) Virus mediated oncogenesis.
- b) Conventional vaccines
- c) Rinderpest disease.
- d) Viroids
- e) Complement fixation.

Q5) Answer the following :

- a) A Bacterial culture was mixed with live T₇ phages. What will be the multiplicity of infection required for infecting 95% of the bacterial cells of the population? **[6]**
- b) A viral suspension was serially diluted. 0.1 ml of each dilution was injected into each mouse of a set of 6 mice separately. **[10]**

The following table shows results of the experiment.

Determine the LD₅₀ value.

Virus dilution	Number of mice died
10 ⁻¹	8
10 ⁻²	6
10 ⁻³	2
10 ⁻⁴	1
10 ⁻⁵	0



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages :3

P3154

[4730] - 4001

M.Sc. (Semester - IV)

MICROBIOLOGY

MB - 801: Pharmaceutical & Medical Microbiology

(2013 Pattern) (Credit and Semester system)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) Attempt any three questions from 1 to 4 (Core Credits)*
- 2) Attempt any two questions from 5 to 8 (Non - Core Credits)*
- 3) All questions carry equal marks.*
- 4) Draw neat-labeled diagrams wherever necessary.*
- 5) Use of logarithmic tables and scientific calculators is allowed.*
- 6) Figures to the right indicate full marks.*

Q1) Attempt any two of the following:

[10]

- a) Which of the Paul Ehrlich's postulate is relevant to the rational drug design strategies? Explain giving suitable examples.
- b) What are the advantages and disadvantages of conventional drug discovery?
- c) Describe the objectives and outcome of phase I clinical trial.

Q2) Attempt any two of the following:

[10]

- a) Discuss the factors affecting susceptibility testing in solid media.
- b) Describe E-test for the susceptibility testing of a clinical isolate.
- c) Describe the susceptibility testing methods used for pathogenic fungal isolates.

P.T.O.

Q3) Attempt any two of the following: **[10]**

- a) How pathogenic bacteria evade non-specific cellular defenses of host?
- b) What are spreading factors liberated of pathogens?
- c) Explain in vitro assay systems for the endotoxin of Gram negative bacteria.

Q4) Attempt any two of the following: **[10]**

- a) Explain the principles of extraction and purification used in bio-prospecting.
- b) Explain the role of CLSI with respect to the working of clinical laboratories.
- c) Describe pathogenicity islands.

Q5) Attempt any two of the following: **[10]**

- a) How the interactions among anti-infectives are studied in the laboratory?
- b) Justify, "Microcalorimetric technique can be used to understand mode of action of an anti-infective?"
- c) List the drugs targeting protein biosynthesis in bacteria. Diagrammatically illustrate the mechanism of action for any one.

Q6) Attempt any two of the following: **[10]**

- a) Describe principle of Ames test for a candidate drug, giving its significance.
- b) Explain interaction of drugs in vivo.
- c) Explain the role of quality assurance section in pharmaceutical industry.

Q7) Attempt any two of the following: **[10]**

- a) Explain role of carriers in drug formulations, giving suitable examples.
- b) What is the significance of ADME studies?
- c) Give the principles involved in the use of yeasts as production systems for biopharmaceuticals.

Q8) Attempt any two of the following: **[10]**

- a) What are the mechanisms of drug resistance development by bacterial pathogens? Explain giving examples of VRE.
- b) Discuss use of microorganism as weapons of biological warfare.
- c) What are investigational approaches in study of swine influenza?



Total No. of Questions : 8]

SEAT No. :

P3155

[Total No. of Pages : 3

[4730] - 4002

M.Sc. (Semester - IV)

MICROBIOLOGY

MB - 802 : Molecular Biology -II

(2013 Pattern) (Credit System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any three questions from 1 to 4 (core credit).*
- 2) *Attempt any two questions from 5 to 8 (Non-core credit).*
- 3) *All questions carry equal marks.*
- 4) *Draw neat diagrams wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of log tables/graph papers/scientific calculator is allowed.*
- 7) *Assume suitable data if necessary.*

Q1) Attempt any two of the following :

[10]

- a) Explain the working of an automated gene sequencer.
- b) Explain the relationship between genome tradeoffs and longevity.
- c) What are conserved genes ? Explain with suitable examples.

Q2) Attempt any two of the following:

[10]

- a) Explain site directed mutagenesis and state its importance.
- b) What is cDNA library ? From what cellular material it is derived ?
How is cDNA synthesized ? How do the steps used to clone cDNA differ from the steps used to clone genomic DNA ?
- c) What are BAC ? How are they used in manipulating clones of large fragments of DNA ?

P.T.O

Q3) Attempt any two of the following: **[10]**

- a) Give a protocol for synthesis of an amino acid using recombinant DNA.
- b) What are biopolymers ? Explain the synthesis of a biopolymer where recombinant DNA is constructed and used.
- c) What are high quality protein drugs ? What genetic modification is required to produce such drugs ?

Q4) Attempt any two of the following: **[10]**

- a) Explain the significance of SNPs in medical therapies.
- b) Give a protocol for screening genome libraries for identification of a new gene.
- c) Comment on the role of RDT in the production of a secondary metabolite.

Q5) Attempt any two of the following: **[10]**

- a) What are the advantages and disadvantages of using GM plants ?
- b) Give examples of transgenic animals. For what purpose they are produced ?
- c) Illustrate mechanisms by which GM plants resist infections by pathogens.

Q6) Attempt any two of the following: **[10]**

- a) What are xenobiotics ? Elaborate on mechanisms of microbial degradation of such compounds.
- b) Give a protocol for in vitro manipulation of cellulase genes from fungal mRNA to be cloned in prokaryotes.
- c) What is meant by silage ? How is a recombinant alpha amylase prepared for silage fermentation ?

Q7) Attempt any two of the following:

[10]

- a) Justify : 'Hereditary diseases can be diagnosed using data from human genome project'
- b) What are the salient features of mouse genome project.
- c) Give a step wise procedure used to sequence human genome ?

Q8) Attempt any two of the following:

[10]

- a) Justify-Edible vaccines can be prepared using GM plants.
- b) Comment on -Genetically manipulated bacteria have advantages over wild type bacteria in xenobiotics.
- c) Describe a stepwise procedure for gene annotation.



Total No. of Questions : 8]

SEAT No. :

P3156

[Total No. of Pages : 3

[4730] - 4003
M.Sc. (Semester - IV)
MICROBIOLOGY
MB - 803 : Microbial Technology
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt any three questions from 1 to 4 (Core credits)*
- 2) Attempt any two questions from 5 to 8 (Non-core credits)*
- 3) All questions carry equal marks.*
- 4) Draw neat diagrams wherever necessary.*
- 5) Figures to the right indicate full marks.*
- 6) Use of logarithmic tables /scientific calculator is allowed.*
- 7) Assume suitable data if necessary.*

Q1) Attempt any two of the following: **[10]**

- a) With the help of a diagram, describe the construction and typical dimensional ratios of CSTR.
- b) Elaborate “In batch culture growth rate decreases due to depletion of essential nutrients”.
- c) Describe construction of Air lift bioreactor, state situations in which air lift bioreactor is used.

Q2) Attempt any two of the following: **[10]**

- a) What is KLa? Explain its significance in determining aeration rate and how it is measured.
- b) Explain the Reynolds number and how it is significant in fermentation process.
- c) Explain the principle, construction and operation of a DCO₂ sensor.

Q3) Attempt any two of the following: **[10]**

- a) Describe the process of pullulan production.
- b) The microbial consortia was immobilized on suitable carrier by appropriate mode of immobilization using same amount of bacterial cells, for the production of proteases using different leguminous seed extracts as nitrogen sources.

P.T.O.

Suitable method and carrier were selected on the basis of specific productivity and effectiveness factor as key parameters. Results obtained are as shown in figure,

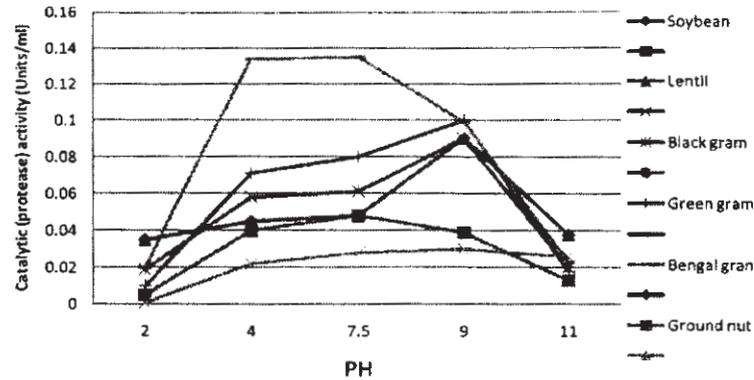


Figure 1. Effect of pH on catalytic activity of protease at 37°C.

Interpret the results and answer :

- 1) Which leguminous seed is responsible for which type of protease?
- 2) Which leguminous seed is the best nitrogen source for protease activity?
- c) Describe the forms of IPR.

Q4) Attempt any two of the following: **[10]**

- a) Explain the construction of and flow patterns created by a Rushton turbine.
- b) What is “OTR” and ‘OUR’ in context with a fermentation process.
- c) Graphically represent the relationship between DO ,Biomass and Rifamycin produced during typical batch fermentation and give the justification.

Q5) Attempt any two of the following : **[10]**

- a) Explain primary and secondary metabolites and their control.
- b) How mycellial pellet form of growth affects the growth of fermentation process.
- c) Explain growth rate and yield coefficient.

Q6) Attempt any two of the following: **[10]**

- a) Describe the environmental applications of fungi.
- b) Explain membranes and cytoskeleton of fungal cell.
- c) Explain biofertilizers and biological control.

Q7) Attempt any two of the following: **[10]**

- a) Explain the production of insulin using animal cell culture.
- b) Explain production of recombinant protein HIV vaccine.
- c) Explain Gene therapy using nucleic acid products.

Q8) Attempt any two of the following: **[10]**

- a) Explain principles of process validation.
- b) Explain concept of ISO certification.
- c) Give the validation protocol for quality control.



Total No. of Questions : 5]

SEAT No. :

P3142

[Total No. of Pages :3

[4730]-401

M.Sc. (Semester - IV)

MICROBIOLOGY

MB - 801 : Pharmaceutical and Medical Microbiology

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat-labeled diagrams wherever necessary.*
- 4) *Use of logarithmic tables and scientific calculators is allowed.*
- 5) *Assume suitable data if necessary.*
- 6) *Figures to the right indicate full marks.*

Q1) Attempt *any two* of the following. **[16]**

- a) Why drugs are used in combinations? How drug interactions can be studied *in vitro*?
- b) Explain optimization of lead compound and selection of a candidate drug.
- c) Explain acute and chronic toxicity tests for a candidate drug.

Q2) Attempt *any two* of the following: **[16]**

- a) What is role of CLSI in development of antimicrobial agents?
- b) How antimycobacterial agents are tested for its activity *in vitro*?
- c) Explain the principles of pharmacokinetic studies.

Q3) Attempt *any two* of the following: **[16]**

- a) Describe adhesion mechanisms of bacterial pathogens, giving suitable examples.
- b) Explain the mode of action and assay of diphtheria toxin.
- c) How bacterial pathogens overcome host humoral defense mechanisms?

P.T.O.

Q4) Write *short notes* on *any four* of the following:

[16]

- Carcinogenicity studies.
- Good Laboratory Practices (GLP).
- Targeted drug delivery systems.
- Coagulase as virulence mechanism.
- Acute toxicity tests.

Q5) To investigate sub-chronic oral toxicities of aqueous extract from the bark of *ficus benghalensis* (AFB); male and female rats were treated with p.o. doses 500 and 1000 mg/kg/day for 28 days. Results of the biochemical tests for liver function are given below:

Table 1	Parameters	Control	500mg/kg	1000mg/kg
Male rats				
	ALT (U/L)	32.23 ± 2.32	31.53 ± 4.21	30.45 ± 3.43
	AST (U/L)	124 ± 4.21	123 ± 4.08	121 ± 4.10
	ALP (U/L)	157 ± 3.24	153 ± 3.27	152 ± 3.25
	T. Protein (g/dl)	5.24 ± 0.12	5.42 ± 0.19	6.08 ± 0.14*
	Albumin (g/dl)	3.62 ± 0.05	3.74 ± 0.07	3.82 ± 0.08
	B. direct (mg/dl)	0.08 ± 0.02	0.09 ± 0.03	0.13 ± 0.04*
	B. total (mg/dl)	0.21 ± 0.03	0.35 ± 0.04*	0.39 ± 0.11*

Table 2	Parameters	Control	500mg/kg	1000mg/kg
Femal rats				
	ALT (U/L)	28.32 ± 2.23	28.21 ± 3.19	28.19 ± 2.53
	AST (U/L)	116 ± 2.34	113 ± 4.08	109 ± 3.23
	ALP (U/L)	130 ± 3.22	126 ± 3.21	125 ± 4.24
	T. Protein (g/dl)	5.42 ± 0.16	5.58 ± 0.42	6.91 ± 0.21
	Albumin (g/dl)	2.65 ± 0.04	2.79 ± 0.06	2.84 ± 0.05*
	B. direct (mg/dl)	0.06 ± 0.05	0.18 ± 0.06	0.28 ± 0.29*
	B. total (mg/dl)	0.18 ± 0.03	0.31 ± 0.19*	0.39 ± 0.28*

All values are expressed as mean \pm S.E.M., n=5, "*" indicates $p < 0.05$ when the values in the groups are compared against the control value.

Based on the given data, answer the following:

- a) Comment on the sub-acute toxicities of AFB bark extracts on liver function. [8]
- b) What will be the nature of chemical compounds present in these extracts? [2]
- c) Give the principles of solvent extraction of bioactive compounds from plants. [4]
- d) Give the names of plants and their uses that have been developed as anti-infectives. [2]



Total No. of Questions : 5]

SEAT No. :

P3143

[Total No. of Pages : 2

[4730] - 402

M.Sc. (Semester IV)

MICROBIOLOGY

MB - 802 : Molecular Biology II
(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat labeled diagrams wherever necessary.*
- 4) *All questions carry equal marks.*
- 5) *Use of log tables, electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

Q1) Attempt any four of the following with respect to transcription process. **[16]**

- a) Initiation.
- b) Elongation.
- c) Rho dependent termination.
- d) Structure of bacterial RNA Polymerase.
- e) TATA Box Binding proteins
- f) Types of sigma factor.

Q2) Explain the principle and give applications of any two of the following techniques. **[16]**

- a) Southern blotting.
- b) Real time PCR.
- c) Agarose gel electrophoresis.

P.T.O

Q3) Attempt any two of the following: [16]

- a) State the principle of Maxam and Gilbert method of DNA sequencing and give its applications.
- b) Comment on : plasmid as a vector in genetic engineering.
- c) State and explain characteristics of genetic code.

Q4) Draw Diagrams of any two of the following: [16]

- a) Structure of t RNA.
- b) YAC.
- c) Flowchart of PCR.

Q5) a) Explain nomenclature, properties and uses of Tupe II R.E. [8]

- b) Construct a restriction map of a 10 kb DNA fragment using following data: [8]

<u>Enzyme (s) Used</u>		<u>Sizes of fragments (kb)</u>
Eco RI	→	1,4,7
Bam HI	→	4,6
Hind III	→	0.8,1.5,7.7
Eco RI+Bam HI	→	1,2,3,4
Eco RI+Hind III	→	0.5,0.8,1,3.2,4.5
Bam HI+Hind III	→	0.8,1.5,2.5,5.2
All the 3 enzymes		
Eco RI+Bam HI+Hind III	→	0.5,0.8,1,2,2.5,3.2



Total No. of Questions : 5]

SEAT No. :

P3144

[Total No. of Pages : 2

[4730] - 403
M.Sc. (Semester - IV)
MICROBIOLOGY
MB - 803 : Microbial Technology
(2008 Pattern)

Time : 3 Hours]

[Maximum Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Draw a neat labeled diagrams wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

Q1) Attempt any two of the following : **[16]**

- a) With the help of a diagram, describe the construction and typical dimension ratios of CSTR.
- b) Describe the production of glucose oxidase. Delineate the critical operating parameters for glucose oxidase production.
- c) Justify “Rheogram of - Newtonian fluids deviate from that of non Newtonian Fluids” with examples.

Q2) Attempt any two of the following : **[16]**

- a) With help of a suitable example, explain the batch mode of operation of fermentation process.
- b) Explain bio - control with the help of a suitable example.
- c) Explain the principle, construction and operation of pH sensor.

Q3) Attempt any two of the following : **[16]**

- a) Explain the use of fungi in promoting plant growth with appropriate examples.
- b) What is ISO certification? Comment on preparation of SOP.
- c) Explain the construction of and flow patterns created by a Rushton turbine.

P.T.O.

Q4) Write short notes on any four of the following :

[16]

- Np
- IPR Types
- KLa
- Growth associated and growth non - associated metabolites.
- OTR

Q5) The graph below shows the time - course of Rifamycin production.

[16]

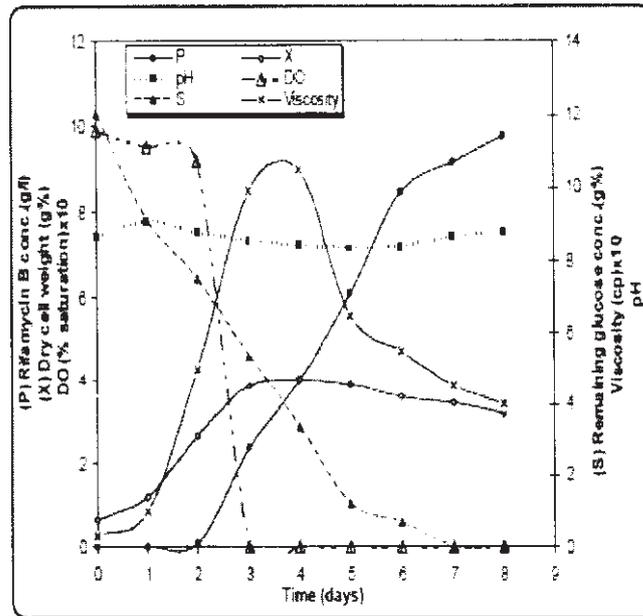


Figure : 1 Time course of rifamycin B production in F2ml medium by variant NCH in the fermentor. Conditions : 1 vvm, 500 rpm and 28°C.

P : Product (Rifamycin)

pH : pH

S : Substrate

X : Biomass

DO : Dissolved oxygen

Interpret the time - course and answer the following questions, giving reasons:

- What is the effect pH on this rifamycin?
- State why viscosity increases during the fermentation?
- State effect of DO on product yeild?



Total No. of Questions : 8]

SEAT No. :

P2649

[4731] - 1001

[Total No. of Pages : 2

M.A./M.Sc. (Semester - I)

GEOGRAPHY

Gg - 101 : Principles of Geomorphology

(Credit System) (2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Attempt any Three questions from Q.1 to Q.6.*
- 2) *Questions 7 and 8 are compulsory.*
- 3) *Draw figures/maps wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of map stencils and calculator is allowed.*

Q1) a) Define process geomorphology. [2]

b) Explain the terms Uniformitarianism and catastrophism. [4]

c) Write a note on Spatial scale in geomorphology. [4]

Q2) a) What do you mean by gravity anomaly? [2]

b) Explain any two evidences given in Wegener's Continental drift theory. [4]

c) What is folding? Discuss various landforms associated with folding. [4]

Q3) a) What is erosion? [2]

b) Describe the theory of isostasy. [4]

c) Give an account of palaeomagnetism. [4]

P.T.O.

- Q4)** a) What are natural levees? [2]
b) Write a note on Davisian cycle of erosion. [4]
c) Explain the mechanism of movements of plates. [4]
- Q5)** a) What do you mean by eskers? [2]
b) Explain the types of plate boundaries in plate tectonics. [4]
c) Describe mechanical weathering. [4]
- Q6)** a) Discuss the mechanism of deposition by the wind in deserts. [5]
b) Explain any two types of erosional landforms produced by rivers. [5]
- Q7)** a) Give an account of the mechanism of deposition by glaciers. [5]
b) Describe any two types of erosional landforms by sea waves. [5]
- Q8)** a) Discuss various segments of slope profile. [5]
b) Give an account of slope replacement model. [5]



Total No. of Questions : 8]

SEAT No. :

P2650

[Total No. of Pages : 2

[4731] - 1002

M.A./M.Sc. (Semester - I)

GEOGRAPHY

**Gg. : 102 - Principles of Climatology
(Credit System) (2013 Pattern)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any three questions from Q. 1 to Q. 6.*
- 2) *Questions 6 and 8 are compulsory.*
- 3) *Draw figures/Maps wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of map stencils and calculator is allowed.*

- Q1)** a) Give the meaning of weather. [2]
b) Explain the scope of climatology. [4]
c) Describe the chemical composition of the atmosphere. [4]
- Q2)** a) What do you mean by structure of the atmosphere? [2]
b) Describe the various layers of the atmosphere. [4]
c) Explain the effects of atmosphere on insolation. [4]
- Q3)** a) What is green house effect? [2]
b) Explain the heat budget of the atmosphere. [4]
c) Explain the various types of temperature inversion. [4]
- Q4)** a) What do you mean by atmospheric pressure? [2]
b) Describe the observed distribution of atmospheric pressure at the earth's surface. [4]
c) Explain the geostrophic winds. [4]

- Q5)** a) What is humidity of the atmosphere? [2]
b) Explain the various states of water. [4]
c) Explain the concept of conditional instability of the atmosphere. [4]
- Q6)** a) What are the jet streams? [2]
b) Explain the concept of scales of atmospheric motion. [4]
c) Explain the tri-cellular model of atmospheric circulation. [4]
- Q7)** a) Explain the dry and wet adiabatic lapse rate. [5]
b) Explain the source regions of air masses. [5]
- Q8)** a) Describe the characteristics and types of fronts. [5]
b) Explain the numerical method of weather forecasting. [5]



Total No. of Questions : 8]

SEAT No. :

P2651

[Total No. of Pages : 2

[4731] - 1003

M. A./ M. Sc. (Semester - I)

GEOGRAPHY

**Gg-103 : Principles of Economic Geography
(2013 Pattern) (Credit System)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any three questions from Q. 1 to Q. 6.*
- 2) *Questions 6 and 8 are compulsory.*
- 3) *Draw figures/maps wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of map stencils and calculator is allowed.*

- Q1)** a) What are the branches of economic geography? [2]
b) Describe scope of economic geography. [4]
c) Give the recent trends in economic geography. [4]
- Q2)** a) What is hypothesis? [2]
b) Explain the formation of hypothesis. [4]
c) How are the hypotheses tested in economic geography? [4]
- Q3)** a) What is economic landscape? [2]
b) Give the significance of natural resources in economic development. [4]
c) Describe the importance of land in different economic activities. [4]
- Q4)** a) Define economic activity. [2]
b) Explain the importance of labour and capital in different economic activities. [4]
c) Discuss the external economies of scale. [4]

P.T.O

- Q5)** a) What is economic development? [2]
b) Describe the various measures of economic development. [4]
c) Classify the countries on the basis of economic development. [4]
- Q6)** a) What do you mean by regional disparity in development? [2]
b) Describe the role of cultural factors in economic development of India. [4]
c) Explain the impact of Privatization and Globalization on economic development in India. [4]
- Q7)** a) Explain the evolution of modern economic landscape. [5]
b) Explain the Weber's model of location of economic activity. [5]
- Q8)** a) Describe the cultural factors influencing international trade. [5]
b) Describe Ricardo's Classical Theory of international trade. [5]



Total No. of Questions : 8]

SEAT No. :

P2652

[Total No. of Pages : 2

[4731] - 1004

M.A./M.Sc. (Semester - I)

GEOGRAPHY

Gg - 104 : Principles of Population and Settlement Geography
(Credit System) (2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any three questions from Q.1 to Q.6.*
- 2) *Questions 7 and 8 are compulsory.*
- 3) *Draw figures/Maps wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of map stencils and Calculator is allowed.*

- Q1)** a) Explain the concept of distribution of settlements. [2]
b) Describe social factors influencing distribution of settlements. [4]
c) Describe physical factors influencing distribution of settlements. [4]
- Q2)** a) What is nucleation? [2]
b) Discuss the various factors influencing dispersion of settlements. [4]
c) Describe socio-economic factors influencing the nucleation of settlements. [4]
- Q3)** a) Explain the terminology of 'central place'. [2]
b) Describe the levels of central places in Christaller's model. [4]
c) What do you mean by fixed-K hierarchies? [4]
- Q4)** a) What do you mean by levels of urbanization? [2]
b) Describe the factors of urban growth. [4]
c) Describe how improvement in communication is responsible for urbanization. [4]

P.T.O.

- Q5)** a) Explain the relationship of location and population distribution. [2]
b) Describe political factors influencing the distribution of population.[4]
c) Describe the socio-cultural factors influencing distribution of population. [4]
- Q6)** a) Give the applications of demographic transition model. [2]
b) Explain the concept of Ricardo's theory. [4]
c) Discuss the relevance of Ricardo's theory. [4]
- Q7)** a) Explain qualitative aspects of population resource. [5]
b) Explain quantitative aspects of population resource. [5]
- Q8)** a) Explain the concept of nearest neighbor. [5]
b) Describe evolution of population geography. [5]



Total No. of Questions : 7]

SEAT No. :

P2610

[4731] - 101

[Total No. of Pages : 2

M.A./M.Sc. (Semester - I)

GEOGRAPHY

Gg - 101 : Principles of Geomorphology

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates :

- 1) Attempt any four questions.*
- 2) All questions carry equal marks.*
- 3) Use of map stencils is allowed.*

Q1) Discuss the 'Process Geomorphology.'

Q2) What is sea floor spreading? Discuss the mechanism of sea floor spreading.

Q3) Describe different types of faults and landforms produced by them.

Q4) Describe the erosional landforms produced by rivers.

Q5) Explain the depositional landforms of glaciers.

Q6) Discuss different models of slope evolution.

P. T. O.

Q7) Write notes on **any two** :

- a) Uniformitarianism.
- b) Epirogenic and orogenic movements.
- c) Types of weathering.



Total No. of Questions : 7]

SEAT No. :

P2611

[4731] - 102

[Total No. of Pages : 1

M.A./M.Sc. (Semester - I)

GEOGRAPHY

**Gg - 102 : Principles of Climatology
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) Write an account on the development of modern Climatology.

Q2) What is an electromagnetic spectrum? Describe terrestrial Heat Balance.

Q3) What is an Air Mass? Explain the major types of Air Masses.

Q4) What is dry adiabatic temperature change? Explain Absolute Stability and Absolute Instability.

Q5) Define Wind and explain the factors generating wind.

Q6) Describe various approaches of weather forecasting.

Q7) Write notes on **any two** :

- a) Inversion of Temperature.
- b) Sub divisions of Climatology.
- c) Absorption and Reflection of Solar radiation.



Total No. of Questions : 7]

SEAT No. :

P2612

[4731] - 103

[Total No. of Pages : 1

M.A./M.Sc. (Semester - I)

GEOGRAPHY

**Gg - 103 : Principles of Economic Geography
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Attempt any four questions.*
- 2) All questions carry equal marks.*
- 3) Use of map stencils is allowed.*

Q1) Discuss the nature and scope of economic geography.

Q2) Describe historical evolution of economic landscape.

Q3) Explain the role of natural resources in economic development.

Q4) Discuss significance of land, labour and capital in different economic activities.

Q5) Elaborate the different measures of economic development.

Q6) Write an essay on 'Green Revolution in India'.

Q7) Write notes on any two:

- a) Problems and prospects of international trade.
- b) Natural factors affecting regional disparity in India.
- c) Classification of countries according to economic development.



Total No. of Questions : 7]

SEAT No. :

P2613

[Total No. of Pages : 1

[4731] - 104

M.A./M.Sc. (Semester - I)

GEOGRAPHY

**Gg - 104 : Principles of Settlement and Population Geography
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Attempt any four questions.*
- 2) All questions carry equal marks.*
- 3) Use of map stencils is allowed.*

Q1) Discuss man-environment relationship with respect to settlement.

Q2) Describe various patterns of settlements.

Q3) Discuss various concepts related to study of settlements.

Q4) Critically examine the Ricardo's theory of population growth.

Q5) Write an essay on population as a resource.

Q6) Discuss the level of urbanization and changes in industrial production.

Q7) Write notes on any two.

- a) Factors influencing the dispersion of settlement.
- b) System approach.
- c) Losch's model of settlement.



Total No. of Questions : 6]

SEAT No. :

P2653

[Total No. of Pages : 2

[4731] - 2001

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg. - 201 : Quantitative Techniques in Geography
(Credit System) (2013 Pattern)**

Time : 2.30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from Question No. 1 to Q. 4.*
- 2) *Question No. 5 and 6 are compulsory.*
- 3) *Draw figures/maps wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of map stencil and calculator is allowed.*

Q1) a) Write a note on meaning and description of mean. **[2]**

b) Calculate skewness of the following data of floods on the Mutha River at Khadakwasala Dam from 1941-1954 (Data in 000 m³/s). **[4]**

1.17	1.73	1.77	2.29	1.27	1.32	1.35
1.22	1.22	1.02	1.73	0.93	1.76	1.16

c) Calculate Kurtosis for the data provided in Question No. 1b). **[4]**

Q2) a) Describe Binomial Probability Distribution. **[2]**

b) In an area, exceptionally heavy showers were experienced 5 times in a span of 20 years. In 10 years selected at random, what is the probability of

i) Heavy showers for 2 times? **[4]**

c) A survey conducted in a Market Yard revealed that the mean weight of wheat bags was 101 kg and standard deviation was 2 kg. Assuming that the distribution is normal, what is probability of the a bag containing. **[4]**

i) Less than 100 kg of wheat

ii) More than 102 kg of wheat

Q3) a) What is discrete and continuous data? **[2]**

- b) An analysis of 3 sediment samples resulted following amount silt clay component. Apply the F test and find out the result. [4]

Sample 1	Sample 2	Sample 3
5.4	10.1	15.2
6.3	11.2	16.6
7.2	12.3	17.8

- c) Test the hypothesis at 0.05 level of significance for the example given in Question No. 3 b) that the samples are representative of population. [4]

- Q4)** a) Write a note on ordinal scale of measurement. [2]

- b) Apply the Chi-square test for the following data of components from a factory. [4]

Outcome	Machine	
	A	B
Defective	8	6
Non-defective	54	62

- c) From the Chi-square result of Question No. 4 b), find out whether there is significant difference between machines in manufacturing of parts. Test the hypothesis at 0.05 level of significance. [4]

- Q5)** a) What is cyclicity and persistent increase and decrease of time series? [4]

- b) Apply the least-squares method for the data provided in the following table. Estimate the temperature at 4 km from the surface of the Earth. [5]

Altitude in km (X)	0	1	2	3
Temp. in °C (Y)	16	10	5	-7

- Q6)** a) Explain the concept of Bivariate Correlation. [4]

- b) The following table shows the data of discharge in (000) m³/s (X) and corresponding depth in m (Y) for annual maximum floods of the Tapi River at Savkheda. Derive the power regression equation. [5]

X	5.3	6.9	4.7	24.2	20.8	6.6	1.5
Y	6.86	7.10	6.67	11.34	10.32	8.19	3.73



Total No. of Questions : 6]

SEAT No. :

P2654

[Total No. of Pages : 2

[4731] - 2002

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg - 210 : Coastal Geomorphology
(2013 Pattern) (Credit System)**

Time : 2.30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from Q. 1 to Q.4.*
- 2) *Question 5 and 6 are compulsory.*
- 3) *Draw Figures/Maps wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of map stencils and Calculator is allowed.*

- Q1)** a) What are different components of coastal system? [2]
b) Define wave and explain wave length and wave period. [4]
c) What are storm waves and standing waves? [4]
- Q2)** a) Define spilling and plunging breakers. [2]
b) What is wave refraction? [4]
c) Write a note on rip currents and beach drift. [4]
- Q3)** a) What is Neap tide? [2]
b) Write a note on relative and eustatic sea level change. [4]
c) Explain in short the indicators of former sea level change. [4]
- Q4)** a) What are biogenic sediments? [2]
b) Explain in short the grain size characteristics of coastal sediments. [4]
c) Write a note on barrier islands. [4]

P.T.O.

- Q5)** a) Explain the formation and types of shore platforms. [4]
b) Write a note on mangrove swamps and salt marshes. [5]
- Q6)** a) Write a short note on “tides and coastal landforms”. [4]
b) Discuss the problem of coastal erosion. [5]



Total No. of Questions : 6]

SEAT No. :

P2655

[Total No. of Pages : 2

[4731] - 2003

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg - 211 : Synoptic Climatology
(2013 Pattern) (Credit System)**

Time : 2.30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from Q. 1 to Q.4.*
- 2) *Question 5 and 6 are compulsory.*
- 3) *Draw Figures/Maps wherever necessary.*
- 4) *Figures to the right side indicate full marks..*
- 5) *Use of map stencils and Calculator is allowed.*

- Q1)** a) Define synoptic climatology. [2]
b) Write a note on scope of synoptic climatology. [4]
c) Explain the weather data collecting system by IMD. [4]
- Q2)** a) Explain any two characteristics of easterly waves. [2]
b) Describe the formation of easterly waves. [4]
c) What is the life cycle of tropical cyclone? [4]
- Q3)** a) Mention the origin of thunderstorm. [2]
b) Explain the structure of thunderstorm. [4]
c) Describe the stages of development of thunderstorm. [4]
- Q4)** a) How are clouds classified? [2]
b) Write a brief account of theories of rain formation. [4]
c) Explain the process of formation of fog. [4]

P.T.O.

- Q5)** a) Describe principal zones of frontogenesis and frontolyses. [4]
b) Give an account of extra tropical cyclone. [5]
- Q6)** a) Explain the importance of satellites in weather forecasting. [4]
b) Explain the methods of weather forecasting. [5]



Total No. of Questions : 6]

SEAT No. :

P2656

[Total No. of Pages : 2

[4731] - 2004

M.A./M.Sc. (Semester - II)

GEOGRAPHY

Gg - 212 : Agricultural Geography

(2013 Pattern) (Credit System)

Time : 2.30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from Q.1 to Q.4.*
- 2) *Question 5 and 6 are compulsory.*
- 3) *Draw figures/Maps wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of map stencils and Calculator is allowed.*

- Q1)** a) What is the systematic approach? [2]
b) Describe the nature of agricultural geography. [4]
c) Describe the scope of agricultural geography. [4]
- Q2)** a) What is irrigation? [2]
b) Discuss the influence of mechanization on agricultural pattern. [4]
c) Discuss the importance of agriculture in Indian economy. [4]
- Q3)** a) What is biochemical input? [2]
b) Explain the characteristic of shifting agriculture. [4]
c) Discuss the mixed farming. [4]
- Q4)** a) Give the definition of semi-arid region. [2]
b) Describe the characteristic of arid regions. [4]
c) Discuss the agricultural problems of semi-arid region. [4]

P.T.O.

- Q5)** a) Discuss the views of Baker on agricultural regionalization. [4]
b) Explain the weaver's crop combination method. [5]
- Q6)** a) Describe the agricultural regions in India. [4]
b) Discuss the land classification in Great Britain. [5]



Total No. of Questions : 6]

SEAT No. :

P2657

[Total No. of Pages : 2

[4731] - 2005

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg - 213 : Population Geography
(2013 Pattern) (Credit System)**

Time : 2½ Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) Attempt any two questions from Q.1 to Q.4.*
- 2) Question 5 and 6 are compulsory.*
- 3) Draw figures/Maps wherever necessary.*
- 4) Figures to the right side indicate full marks.*
- 5) Use of map stencils and Calculator is allowed.*

- Q1)* a) Define migration. [2]
b) Describe the approaches to the study of population geography. [4]
c) Discuss the economical factors affecting distribution of world population. [4]
- Q2)* a) What is population projection? [2]
b) Explain the relation of population geography with other disciplines. [4]
c) Discuss the physical factors affecting world population distribution. [4]
- Q3)* a) What is foetal mortality? [2]
b) Describe the Lee's theory of migration. [4]
c) Describe the fertility differentials with reference to economic status. [4]
- Q4)* a) Give the areas of low fertility levels in the world. [2]
b) Discuss the urban and rural composition of population. [4]
c) Explain the mortality levels in developing countries. [4]

P.T.O.

- Q5)** a) Discuss the causes of migration. [4]
b) Critically examine the Malthus theory of population growth. [5]
- Q6)** a) Explain the importance of population projection in agricultural development. [4]
b) Discuss the population policies after Second World War. [5]



Total No. of Questions : 6]

SEAT No. :

P2658

[4731] - 2006

[Total No. of Pages : 1

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg - 220 : Fluvial Geomorphology
(2013 Pattern) (Credit System)**

Time : 2½ Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from Q.1 to Q.4*
- 2) *Question 5 and 6 are compulsory*
- 3) *Draw figures/Maps wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of map stencils and Calculator is allowed.*

- Q1)** a) State Horton's law of stream number. [2]
b) Distinguish between surface and sub surface wash. [4]
c) What do you understand by downstream hydraulic geometry of a channel? [4]
- Q2)** a) Distinguish between suspended and bed load. [2]
b) Write a note on channel patterns [4]
c) State the chezy's and manning's equation. [4]
- Q3)** a) What do you understand by tractive force? [2]
b) Explain the Reynolds Number [4]
c) How potholes are formed? [4]
- Q4)** a) What is head-ward erosion of the channel? [2]
b) What do you understand by 'belt of no erosion'? [4]
c) Write a note on 'Cross section morphology of a river' [4]
- Q5)** a) Explain various types of fluvial erosion, [4]
b) Write a note on 'Quaternary fluvial system' [5]
- Q6)** a) Describe various features associated with flood plain. [4]
b) Describe the stages of drainage development in Glock's model. [5]



Total No. of Questions : 6]

SEAT No. :

P2659

[4731] - 2007

[Total No. of Pages : 1

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg - 221 : Monsoon Climatology
(2013 Pattern) (Credit System)**

Time : 2.30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from Q.1 to Q.4.*
- 2) *Question 5 and 6 are compulsory.*
- 3) *Draw figures/Maps wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of map stencils and Calculator is allowed.*

- Q1)** a) Define Monsoon Climatology. [2]
b) Explain in brief thermal concept in the origin of Monsoon. [4]
c) Discuss the characteristics of winter Monsoon. [4]
- Q2)** a) Name any two models of Monsoon. [2]
b) Describe in brief annual cycle of summer monsoon. [4]
c) Discuss the temperature condition at the surface in summer Monsoon. [4]
- Q3)** a) What are monsoon depressions? [2]
b) Describe the off-shore trough along west coast of India. [4]
c) Write a note on NINO regions. [4]
- Q4)** a) Give definition of Walker circulation. [2]
b) Write note on Eurasian snow cover. [4]
c) Discuss sea level pressure patterns in summer monsoon. [4]
- Q5)** a) Write note on feature of the predictors in forecasting. [4]
b) Discuss the role of regional conditions in forecasting. [5]
- Q6)** a) Explain ENSO Indicators. [4]
b) Discuss parametric model in forecasting. [5]



Total No. of Questions : 6]

SEAT No. :

P2660

[4731] - 2008

[Total No. of Pages : 1

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg - 222 : Industrial Geography
(2013 Pattern) (Credit System)**

Time : 2½ Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from Q.1 to Q.4*
- 2) *Question 5 and 6 are compulsory.*
- 3) *Draw figures/Maps wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of map stencils and Calculator is allowed.*

- Q1)** a) Define industrial Geography? [2]
b) Describe the cotton textile industrial region in India. [4]
c) Explain the impact of socio – cultural factors on industrial location. [4]
- Q2)** a) What do you mean by secondary activity? [2]
b) Discuss the favorable conditions for iron and Steel industries in Japan. [4]
c) Explain the assumptions of Waber’ s model. [4]
- Q3)** a) State any two names of cotton industrial region in India. [2]
b) Explain the scope of industrial geography. [4]
c) Describe the merits and demerits of Green huts model. [4]
- Q4)** a) What is K3 model? [2]
b) Discuss the problems of Automobile industry. [4]
c) What are the characteristics of decentralization? [4]
- Q5)** a) What do you mean by industrial linkage? Explain its significance. [4]
b) Describe the industrial regions in India. [5]
- Q6)** a) Discuss the role of software industries in India. [4]
b) Write an essay on “Anglo American” industrial region. [5]



Total No. of Questions : 6]

SEAT No. :

P2661

[4731] - 2009

[Total No. of Pages : 1

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg - 223 : Geography of Rural Settlement
(2013 Pattern) (Credit System)**

Time : 2:30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from Q.1 to Q.4*
- 2) *Question 5 and 6 are compulsory*
- 3) *Draw figures/Maps wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of map stencils and Calculator is allowed.*

- Q1)** a) Define site of a settlement. [2]
b) Describe cultural aspects reflected in place names. [4]
c) Describe factors affecting growth of settlements. [4]
- Q2)** a) Explain absolute and relative location of settlements. [2]
b) Describe the system of land division in rural areas. [4]
c) Describe the land tenancy system in rural areas. [4]
- Q3)** a) Define hierarchy of settlement. [2]
b) Describe morphogenesis of rural settlements. [4]
c) Discuss economic organization within village. [4]
- Q4)** a) What is population composition? [2]
b) Explain age-sex composition of rural areas. [4]
c) Explain occupational composition of rural areas. [4]
- Q5)** a) Describe primitive and vernacular house types in rural areas. [4]
b) Describe building material used for rural houses. [5]
- Q6)** a) Discuss the importance of environmental planning the rural areas. [4]
b) Discuss the need of water resource planning in rural areas. [5]



Total No. of Questions : 7]

SEAT No. :

P2614

[Total No. of Pages : 2

[4731] - 201

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg. - 201 : Quantitative Techniques in Geography
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *Use of calculator and statistical table are allowed.*
- 3) *Figures to the right indicate full marks.*

Q1) a) Write a note on grouped and ungrouped data. **[6]**

- b) The following table represents grouped data of monthly precipitation in mm of a station. Calculate kurtosis and comment. **[14]**

Class	8-10	10-12	12-14	14-16	16-18
Frequency	2	4	6	5	2

Q2) a) What is descriptive statistics? **[6]**

- b) Calculate standard deviation for farm size rounded to nearest hectare. **[14]**

Class	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80
F	1	4	6	11	13	9	6	4

Q3) a) Write a note on concept of probability? **[6]**

- b) Mean annual rainfall of Sydney (Australia) is 120 cm with the standard deviation of 15 cm. Assumed that the rainfall of Sydney is normally distributed, What is the probability of **[14]**

- i) Less than 100 cm of rainfall
- ii) More than 140 cm of rainfall
- iii) Between 110 and 130 cm of rainfall
- iv) More than 170 cm of rainfall

P.T.O.

Q4) a) What is trend and periodicity in time series? [6]

b) Using population figures for North America between 1920-1960, apply the least squares method to estimate population for 1970 and interpret. [14]

Year (X)	1920	1930	1940	1950	1960
Population in Millions (Y)	117	134	144	166	199

Q5) a) What is regression? [6]

b) Calculate the Pearson product moment correlation coefficient (r) between water surface distance from right bank in meter and velocity of water in m/s. Interpret the results. [14]

Distance	2	4	6	8	10	12	14	16
Velocity	1.2	1.31	1.50	1.69	1.82	1.90	1.99	2.0

Q6) Apply the Student 't' test for average depth of wells in meter from two different areas. Test the hypothesis at 0.05 level of significance to know whether the samples are taken from a common population. [20]

Area A	9.1	10.2	8.7	9.5	11.1	10.1	8.8	9.2	7.8	8.4
Area B	11.2	9.6	12.3	10.8	12.1	8.6	11.5	11.2	10.2	8.9

Q7) Write short notes on any two : [20]

- a) Unbaised random sample
- b) Scales of measurement
- c) Parametric and Non-parametric tests



Total No. of Questions : 6]

SEAT No. :

P2662

[Total No. of Pages : 1

[4731] - 2010

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg - 204 : Geography of Tourism
(2013 Pattern) (Credit System)**

Time : 2.30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from Q. 1 to Q. 4.*
- 2) *Question No. 5 and 6 are compulsory.*
- 3) *Draw figures/Maps wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of map stencils and calculator is allowed.*

- Q1)** a) What do you mean by I.T.D.C. [2]
b) What is adventure tourism? [4]
c) Explain the basic elements of tourism. [4]
- Q2)** a) What do you mean by leisure? [2]
b) Explain the impact of Geographical factors on tourism. [4]
c) Discuss the origin and development of tourism in India. [4]
- Q3)** a) State two names of pilgrim centers in India. [2]
b) Explain the international tourism. [4]
c) 'Mahabaleshwar is a tourist attraction place.' Discuss. [4]
- Q4)** a) Distinguish between hotel and motel? [2]
b) Write a note on 'coastal tourism'. [4]
c) Discuss the planning and process for promotion of tourism. [4]
- Q5)** a) Explain the role of hotel industry in tourism. [4]
b) Describe the impact of economic factors on tourism. [5]
- Q6)** a) Write short note on 'Adventure tourism'. [4]
b) Write an essay on 'Ajanta and Ellora as places of tourist attraction'. [5]



Total No. of Questions : 6]

SEAT No. :

P2663

[Total No. of Pages : 2

[4731] - 2011

M.A/M.Sc. (Semester - II)

GEOGRAPHY

Gg - 205 : Geography of Disaster Management

(Credit System) (2013 Pattern)

Time : 2½ Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any Two questions from Q. 1 to Q.4.*
- 2) *Questions 5 and 6 are Compulsory.*
- 3) *Draw figures/maps wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of map stencils and calculator is allowed.*

- Q1)** a) Define risk. [2]
b) Discuss the natural and manmade causes of floods. [4]
c) Discuss the role of IT in disaster preparedness. [4]
- Q2)** a) Differentiate resilience and vulnerability. [2]
b) Discuss the measures through which manmade disasters can be averted. [4]
c) Discuss the environmental impacts of earthquakes and volcanoes. [4]
- Q3)** a) What are the economic impacts of droughts? [2]
b) Discuss the differential impact of disaster on people of different castes in India. [4]
c) Discuss the role of civilians and NGOs in the management of manmade calamities. [4]
- Q4)** a) What is disaster management? [2]
b) Discuss the political and psychological impacts of terrorism on the population of an affected region. [4]
c) Give examples of the application of modern technology for emergency communication in the event of a natural disaster. [4]

P.T.O.

- Q5)** a) Explain the nature and impact of urban disasters at the global level. [4]
b) Identify the role of Remote sensing, GIS and GPS in preparedness of disaster management. [5]
- Q6)** a) Make a list of the manmade and natural disasters that happened in independent India. [4]
b) Identify the landslide hazard prone areas in India and account for the causes of landslides. [5]



Total No. of Questions : 7]

SEAT No. :

P2615

[Total No. of Pages : 2

[4731] - 202

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg - 210 : Tropical Geomorphology
(2008 Pattern)**

Time :3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Attempt any four questions.*
- 2) All questions carry equal marks.*
- 3) Use of map stencils is allowed.*

Q1) Define tropics and explain morphogenetic regions.

Q2) Describe the nature and development of deep weathering profiles in the tropical environment.

Q3) Define laterite and discuss various theories of origin of iron in laterite.

Q4) Discuss various types of mass movement processes in the tropics.

Q5) Discuss tropical terrain with respect to domed and boulder inselbergs.

Q6) Define planation surface and discuss the concept of double surface of planation.

P.T.O.

Q7) Write notes on any two:

- a) Solubility and mobility of minerals in tropics.
- b) Process of soil formation
- c) Distribution of laterite in India.



Total No. of Questions : 7]

SEAT No. :

P2616

[Total No. of Pages : 2

[4731] - 203

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg - 211 : Synoptic Climatology
(2008 Pattern)**

Time :3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Attempt any four questions.*
- 2) All questions carry equal marks.*
- 3) Use of map stencils is allowed.*

Q1) Explain the prediction, development and occurrence of tornados.

Q2) Differentiate between frontogenesis and frontolyses and explain air masses of North America.

Q3) Explain in detail the Rossby waves and western disturbances.

Q4) Give classification of clouds and explain any two theories of rain formation.

Q5) Explain in detail the synoptic and numerical methods of weather forecasting.

Q6) What are the benefits of weather forecasting in marine activities, disaster prevention and preparedness?

P.T.O.

Q7) Write note on any two:

- a) Scope of synoptic Climatology.
- b) Meteorological code and data exchange.
- c) Formation of Tropical cyclone.



Total No. of Questions : 7]

SEAT No. :

P2617

[Total No. of Pages : 2

[4731] - 204

M.A./M.Sc. (Semester - I)

GEOGRAPHY

**Gg - 212 : Agricultural Geography
(2008 Pattern)**

Time :3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Attempt any four questions.*
- 2) All questions carry equal marks.*
- 3) Use of map stencils is allowed.*

Q1) Describe the significance of agriculture in world regions.

Q2) Explain the influence of technological factors on agricultural patterns.

Q3) Give the types of agriculture. Describe with examples plantation agriculture.

Q4) Explain the role of irrigation in drought prone area.

Q5) Critically examine Bhatia's method of measuring agricultural efficiency.

Q6) Describe land classification in India with appropriate examples.

P.T.O.

Q7) Write note on any two:

- a) Commodity approach.
- b) Mixed farming.
- c) Mechanization of agriculture.



Total No. of Questions : 7]

SEAT No. :

P2618

[Total No. of Pages : 2

[4731] - 205

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg - 213 : Population Geography
(2008 Pattern)**

Time :3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Attempt any four questions.*
- 2) All questions carry equal marks.*
- 3) Use of map stencils is allowed.*

Q1) Describe the approaches to the study of population geography.

Q2) Critically examine the population theory of Malthus.

Q3) Give an account of distribution of world population.

Q4) Explain the various factors affecting mortality levels.

Q5) Define migration and explain the types of migration.

Q6) Explain the levels and trends of fertility in developing countries.

P.T.O.

Q7) Write note on any two:

- a) Use of population projection in housing.
- b) Occupational composition.
- c) Infant Mortality.



Total No. of Questions : 7]

SEAT No. :

P2619

[Total No. of Pages : 2

[4731] - 206

M.A./M.Sc. (Semester - II)

GEOGRAPHY (Paper - I)

Gg - 214 : Geoinformatics

(2008 Pattern)

Time :3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Attempt any four questions.*
- 2) All questions carry equal marks.*
- 3) Use of map stencils is allowed.*

Q1) Describe the various potentials of GIS with suitable examples.

Q2) What is non-spatial database? Explain the types of non-spatial relations in geographical data.

Q3) Write descriptive account of spatial data models.

Q4) What is topology? Explain the methods of spatial data digitization with topologic applications.

Q5) Give an account of SQL operations in GIS to ask attribute query.

Q6) Give detailed account on implementational data models in GIS.

P.T.O.

Q7) Write note on any two:

- a) Data management
- b) Network model
- c) Map algebra



Total No. of Questions : 7]

SEAT No. :

P2620

[Total No. of Pages : 2

[4731] - 207

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg - 220 : Fluvial Geomorphology
(2008 Pattern)**

Time :3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) 'Drainage basin as a geomorphic unit' — Discuss.

Q2) Distinguish between laminar flow and turbulent flow.

Q3) 'Width, depth, velocity of a river channel are the resultant factors of discharge'.
Elaborate.

Q4) Explain the factors affecting capacity and competence of a river channel.

Q5) Write an account of various channel patterns with suitable diagram.

Q6) Describe various depositional landforms and associated features created by a river with suitable diagrams.

P.T.O.

Q7) Write note on any two:

- a) Horton's laws of drainage composition.
- b) Concept of grade
- c) River terraces



Total No. of Questions : 7]

SEAT No. :

P2621

[Total No. of Pages : 2

[4731] - 208

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg - 221 : Monsoon Climatology
(2008 Pattern)**

Time :3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) Give an account of monsoon of east Asia and south Asia.

Q2) Explain in detail summer and winter Indian monsoon.

Q3) Discuss the driving mechanism of monsoon model with reference to differential heating of land and sea.

Q4) Write an account of onset and withdrawal of Monsoon.

Q5) Explain the impact of eurasian snow cover and role of ocean and upper atmosphere in teleconnection.

Q6) Explain the effect of regional and global conditions in forecasting.

P.T.O.

Q7) Write note on any two:

- a) Aerological concept in Monsoon origin.
- b) Monsoon trough.
- c) Decadal trends in Indian Monsoon.



Total No. of Questions : 7]

SEAT No. :

P2622

[Total No. of Pages : 2

[4731] - 209

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg - 222 : Industrial Geography
(2008 Pattern)**

Time :3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) Assess the significance of manufacturing in the development of regional economies.

Q2) Describe various factors favoring industrial location.

Q3) Describe the development of Losch's general theory of industrial location with demand as the major spatial variable.

Q4) Give a brief account of changing pattern of cotton textile industry.

Q5) Write an essay on industrial regions of Japan.

Q6) Explain the role of economic factors in the location of industry.

P.T.O.

Q7) Write notes on any two:

- a) Advantages of decentralization of industry.
- b) Industrial Linkages.
- c) Problems and prospects of software industry in India.



Total No. of Questions : 7]

SEAT No. :

P2623

[Total No. of Pages : 2

[4731] - 210

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg - 223 : Geography of Rural Settlements
(2008 Pattern)**

Time :3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) Describe sequence of occupancy from Neolithic to modern period.

Q2) What is dispersion? Describe the factors influencing dispersion of rural settlements with suitable examples.

Q3) Critically examine Central Place Theory.

Q4) Explain functional growth and economic transformation in rural areas.

Q5) Describe age-sex, education and occupational composition of rural population.

Q6) "Population and amenities are the significant aspects of rural development planning." Discuss.

P.T.O.

Q7) Write notes (any two) :

- a) Place names associated with geographical aspects.
- b) House types in Maharashtra.
- c) Causes of rural migration.



Total No. of Questions : 7]

SEAT No. :

P2624

[4731] - 211

[Total No. of Pages : 1

M.A./M.Sc. (Semester - II)

GEOGRAPHY

**Gg - 224 : Geoinformatics (Paper - II)
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) Describe the historical perspective of remote sensing with respect to national and international scenario.

Q2) Describe the concept of blackbody radiation and spectral signatures giving suitable examples.

Q3) State major components of an aerial camera and describe various optical aspects of it.

Q4) Write an essay on 'types of sensors used in remote sensing'.

Q5) Give a comparative account of IRS data products and Landsat images.

Q6) Explain space segment as a fundamental concept of GPS.

Q7) Write notes on any two

- a) EMR
- b) FCC
- c) Sun-synchronous satellites



Total No. of Questions : 6]

SEAT No. :

P2667

[4731] - 3001

[Total No. of Pages : 2

M.A./M.Sc. (Semester - III)

GEOGRAPHY

**Gg - 301 : Geography of India with Special Reference to Maharashtra
(Credit System) (2013 Pattern)**

Time : 2.30 Hours]

[Max. Marks : 38

Instructions to the candidates :

- 1) *Attempt any two questions from question number 1 to 4.*
- 2) *Question No. 5 and 6 are compulsory.*
- 3) *Figures to the right indicate marks.*
- 4) *Use of map stencils and calculator is allowed.*

- Q1)** a) What do you understand by relative location? [2]
b) Explain the relative location of India. [4]
c) Describe the geological structure of Maharashtra. [4]
- Q2)** a) Write the main physiographic divisions of India. [2]
b) Discuss the physiography of peninsular plateau. [4]
c) Describe the drainage system of river Ganga. [4]
- Q3)** a) What is climate? [2]
b) Explain the mechanism of south-west Monsoon. [4]
c) Describe any two soil types in India. [4]

P.T.O.

- Q4)** a) Mention various type of soils in India. [2]
b) Explain any two types of soil and their distribution in India. [4]
c) Describe the Monsoon forest's in India. [4]
- Q5)** a) Describe the distribution of iron ore in India. [4]
b) Describe utilization of petroleum in India. [5]
- Q6)** a) Describe the distribution and production of rice in India. [4]
b) Discuss the problems related to industrial development in India. [5]



Total No. of Questions : 6]

SEAT No. :

P2668

[4731] - 3002

[Total No. of Pages : 1

M.A./M.Sc. (Semester - III)

GEOGRAPHY

**Gg - 310 : Tropical Geomorphology
(2013 Pattern) (Credit System)**

Time : 2.30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from questions numbers 1 to 4.*
- 2) *Question No. 5 and 6 are compulsory.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of map stencils and calculator is allowed.*

- Q1)** a) Define tropical environment. [2]
b) What do you understand by mechanical denudation? [4]
c) Discuss stream erosion and deposition with respect to tropical rivers. [4]
- Q2)** a) What are inselbergs? [2]
b) Outline and discuss the factors influencing the weathering in the tropics. [4]
c) Describe various clay minerals found in the tropics. [4]
- Q3)** a) Mention various theories of origin of iron in laterites. [2]
b) Describe the process of soil formation in the tropics. [4]
c) Write a note on landform development on laterites. [4]
- Q4)** a) Mention various types of mass movements in the tropics. [2]
b) What do you understand by indurated laterites? Describe. [4]
c) Give a world distribution of indurated laterites. [4]
- Q5)** a) Write an account of tropical coasts. [4]
b) Discuss the morphology of planation surfaces. [5]
- Q6)** a) Write a note on double surfaces of planation. [4]
b) Give a complete account of various divisions of laterite profile. [5]



Total No. of Questions : 6]

SEAT No. :

P2669

[Total No. of Pages : 1

[4731] - 3003

M.A./M.Sc. (Semester - III)

GEOGRAPHY

**Gg. : 311 - Applied Climatology
(Credit System) (2013 Pattern)**

Time : 2:30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from questions No. 1 to 4.*
- 2) *Question No. 5 and 6 are compulsory.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of map stencil and calculator is allowed.*

- Q1)** a) Define 'Applied Climatology'. [2]
b) Explain the nature of applied climatology. [4]
c) Discuss the 'climate impact assessment'. [4]
- Q2)** a) What is radiation? [2]
b) Give the distribution of precipitation. [4]
c) Discuss the soil-plant relationship. [4]
- Q3)** a) Define agroclimatology. [2]
b) Discuss the climate and soil management. [4]
c) Discuss the artificial control of plant environment. [4]
- Q4)** a) What is human biometeorology? [2]
b) Discuss the influence of climate on health. [4]
c) Explain the urban heat island. [4]
- Q5)** a) Describe the various climatic variables affecting industrial activity. [4]
b) Discuss the heating degree days. [5]
- Q6)** a) Explain the effects of climate on land transport. [4]
b) Discuss the role of remote sensing in agriculture. [5]



Total No. of Questions : 6]

SEAT No. :

P2670

[4731] - 3004

[Total No. of Pages : 1

M.A./M.Sc. (Semester - III)

GEOGRAPHY

**Gg. : 312 - Trade and Transport Geography
(Credit System) (2013 Pattern)**

Time : 2:30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from question No. 1 to 4.*
- 2) *Question No. 5 and 6 are compulsory.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of map stencils and calculator is allowed.*

- Q1)** a) Define transport. [2]
b) Explain the significance of transportation in world economy. [4]
c) Discuss the characteristic of railways. [4]
- Q2)** a) What is transport network? [2]
b) Explain the gravity model. [4]
c) Explain the physical factors associated with location and growth of airports. [4]
- Q3)** a) What do you mean by accessibility? [2]
b) Discuss the political factors associated with locations and growth of sea ports. [4]
c) Discuss the alternative transport systems in mega cities in India. [4]
- Q4)** a) What are economic blocks? [2]
b) Discuss the various types of trade. [4]
c) Discuss the measurement of accessibility. [4]
- Q5)** a) Explain the types of theories of trade. [4]
b) Discuss the modern theory of trade. [5]
- Q6)** a) Describe the various approaches to the study of trade and transport geography. [4]
b) What are problems of international trade? [5]



Total No. of Questions : 6]

SEAT No. :

P2671

[Total No. of Pages : 1

[4731] - 3005

M.A./M.Sc. (Semester - III)

GEOGRAPHY

**Gg. : 313 - Urban Geography
(2013 Pattern) (Credit System)**

Time : 2:30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from questions No. 1 to 4.*
- 2) *Question number 5 and 6 are compulsory.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of map stencils and calculator is allowed.*

- Q1)** a) What is urbanisation? [2]
b) Discuss the relationship of urban geography with other disciplines. [4]
c) Explain the contemporary factors of urbanisation. [4]
- Q2)** a) What do you mean by CBD? [2]
b) Describe the characteristics of CBD. [4]
c) Explain the criteria used to classify the towns and cities. [4]
- Q3)** a) What is urban demography? [2]
b) Explain age-sex structure of urban populations. [4]
c) Explain the terms 'conurbation' and 'megalopolis'. [4]
- Q4)** a) What is urban planning? [2]
b) Explain the need of city planning. [4]
c) Discuss the urban environmental pollution in brief. [4]
- Q5)** a) Describe the characteristics of rural-urban fringe. [4]
b) Explain the criteria used to demarcate the city region. [5]
- Q6)** a) Describe the urban functions in brief. [4]
b) Discuss the scarcity of housing and growth of slums in cities. [5]



Total No. of Questions : 6]

SEAT No. :

P2672

[Total No. of Pages : 3

[4731]-3006

M.A./M.Sc. (Semester - III)

GEOGRAPHY

Gg - 320: Multivariate Statistics
(2013 Pattern) (Credit System)

Time : 2.30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) Attempt any two questions from Q.1 to Q.4.
- 2) Question numbers 5 and 6 are compulsory.
- 3) Draw figures/maps wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of map stencils and calculator is allowed.

- Q1) a) Define the terms Null Matrix and Order of a Matrix. [2]
- b) Prove the theorem of association for multiplication. [4]
- c) Find $A * B$ [4]

$$A = \begin{pmatrix} 68 & 33 & 90 \\ 35 & 45 & 65 \\ 13 & 24 & 42 \end{pmatrix} \quad B = \begin{pmatrix} 328 & 331 & 128 \\ 231 & 421 & 112 \\ 166 & 611 & 764 \end{pmatrix}$$

- Q2) a) What do you understand by bivariate curvilinear relationship? [2]
- b) Following table depicts the means, variances and covariances obtained from a bivariate data. Obtain an appropriate bivariate equation and interpret the results. [4]

	X^1	X^2	Y	n
Mean	10	132.5	30.825	12
Variance	32.5	15420.25	9.095208	
	X^1Y	X^2Y	X^1X^2	
Covariances	12.80833	212.9792	685	

P.T.O.

- c) Find the values of unknowns from the set of simultaneous equations using Crammers rule II. [4]

$$3x + 3y + 2z = 35$$

$$12x - 6y + 4z = 22$$

$$x + 12y - 6z = 20$$

- Q3) a)** Write the given data in a proper variance covariance matrix format. [2]

Means : $\bar{Y} = 69.2727$; $\bar{X}_1 = 2.4364$; $\bar{X}_2 = 1.5636$; $X_3 = 0.9$ $n = 11$

Variances : $\sigma^2 Y = 1396.926$; $\sigma^2 X_1 = 5.1587$; $\sigma^2 X_2 = 2.4423$; $\sigma^2 X_3 = 0.7236$

Covariances: $\text{Cov} Y X_1 = -76.8918$; $\text{Cov} Y X_2 = -52.1809$; $\text{Cov} Y X_3 = -25.1182$

$\text{Cov} X_1 X_2 = 3.3677$; $\text{Cov} X_1 X_3 = 1.8236$; $\text{Cov} X_2 X_3 = 1.1600$

- b) Using the data given in Q3 a find the A_0, A_1, A_2 and A_3 determinants. [4]
- c) Using the determinants obtained above compute a multiple regression equation, explained variance and interpret the results. [4]

- Q4) a)** Define the terms Communalities and component scores. [2]

- b) Using the following matrix obtain the first factor loadings matrix. [4]

	X_1	X_2	X_3	X_4	X_5	X_6
X_1	1	0.76	0.98	0.55	0.25	0.93
X_2		1	0.12	-0.25	0.83	0.54
X_3			1	0.7	0.91	0.56
X_4				1	0.69	0.73
X_5					1	-0.5
X_6						1

- c) Compute Eigen vector and the variance explained by the factor loadings from the above given data and interpret the results. [4]

- Q5) a)** Following data records the depth of water in wells in meters at different locations in a region. Fit a suitable trend surface equation. **[4]**

X	10	10	30	30	30	30	50	50	50	60	70
Y	30	50	20	40	20	70	10	50	70	30	30
Z	4	8	12	10	14	17	18	15	18	21	20

- b) Obtain the explained variance, at 0.05 level of significance and interpret the results. Use data of Q. 5a **[5]**

- Q6) a)** Using the correlation matrix given in Q. 4 b Compute the first Principal component loadings. **[4]**

- b) From the Principal loadings obtained in the Q. 6 a find Eigen value, explained variance and interpret the results. **[5]**



Total No. of Questions : 6]

SEAT No. :

P2673

[Total No. of Pages : 2

[4731]-3007

M.A./M.Sc. (Semester - III)

GEOGRAPHY

Gg-321: Political Geography

(2013 Pattern) (Credit System)

Time : 2½ Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) Attempt any two questions from question number 1 to 4.
- 2) Question number 5 and 6 are compulsory.
- 3) Figures to the right indicate marks.
- 4) Use of map stencils and calculator is allowed.

- Q1)** a) Give various definitions of political geography. [2]
b) Discuss the history and development of political geography. [4]
c) Geography and politics are the two sides of the same coin". Discuss. [4]
- Q2)** a) What do you mean by territoriality? [2]
b) Discuss the term nation building. [4]
c) Explain the process of state formation. [4]
- Q3)** a) Define the frontiers and boundaries. [2]
b) How are the frontiers different than boundaries? [4]
c) Describe the types of genetic boundaries. [4]
- Q4)** a) What is 'SAARC'? [2]
b) Discuss the geopolitics in India Ocean border states. [4]
c) Discuss the stability and instability in state politics in India. [4]

P.T.O.

- Q5)** a) Discuss the interstate water disputes in India. [4]
b) Explain the external functions. [5]
- Q6)** a) Discuss the geopolitical views of spykman. [4]
b) Explain the classification of resources. [5]



Total No. of Questions : 6]

SEAT No. :

P2674

[Total No. of Pages : 2

[4731]-3008

M.A./M.Sc. (Semester - III)

GEOGRAPHY

Gg-322: Geography of Soils

(2013 Pattern) (Credit System)

Time : 2.30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from Q.No.1 to 4.*
- 2) *Q.No.5 and 6 are compulsory.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw figures/maps wherever necessary.*
- 5) *Use of Map stencils and calculator is allowed.*

- Q1)** a) What do you mean by soil texture? [2]
- b) Bring out the relationship between Human Geography, agriculture and forestry with soil geography. [4]
- c) Explain the importance of land suitability classification. [4]
- Q2)** a) Explain the importance of the study of soils. [2]
- b) Write an account of humus content and soil biomass. [4]
- c) What do you mean by Ion exchange process? [4]
- Q3)** a) What is soil Permeability? [2]
- b) Explain the process of salinization and acidification in the soil degradation. [4]
- c) What do you mean by Porosity of soils? State its importance. [4]

P.T.O.

- Q4)** a) What are the incorrect methods of farming? [2]
b) Write an account of clay minerals and their distribution in the soil profile. [4]
c) Difference between soil texture and soil structure. [4]
- Q5)** a) Explain the concept of the Genetic structure of Soils. [4]
b) What is the Redox Potential and Cation-Anion exchange capacity of soils? [5]
- Q6)** a) Describe the United States soil classification system. [4]
b) Discuss the effects of soil degradation. [5]



Total No. of Questions : 6]

SEAT No. :

P2675

[Total No. of Pages : 2

[4731] - 3009

M.A./M.Sc. (Semester - III)

GEOGRAPHY

**Gg - 303 : Research Methods In Geography
(Credit System) (2013 Pattern)**

Time : 2.30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from question numbers 1 to 4.*
- 2) *Question No. 5 and 6 are compulsory.*
- 3) *Figures to the right indicate marks.*
- 4) *Use of map stencils and calculator is allowed.*

- Q1)** a) Explain significance of UTM projection. [2]
b) Describe various methods of survey. [4]
c) Discuss the importance of survey. [4]
- Q2)** a) What is terrain cross profile? [2]
b) Explain indexing system of SOI toposheet. [4]
c) Explain the significance and use of SOI toposheet. [4]
- Q3)** a) What is fiducial mark? [2]
b) Explain measurement of relative height. [4]
c) Describe tentative scheme of interpretation of aerial photographs. [4]
- Q4)** a) What is non parametric test? [2]
b) Explain bivariate correlation analysis. [4]
c) Explain multivariate correlation analysis. [4]

P.T.O.

- Q5)** a) Discuss the use of GIS in modeling. [4]
b) “Interviews is a major component of field work”Discuss. [5]
- Q6)** a) Discuss the significance of analysis in report writing. [4]
b) Discuss the significance of conclusions in report writing. [5]



Total No. of Questions : 7]

SEAT No. :

P2625

[4731] - 301

[Total No. of Pages : 2

M.A./M.Sc. (Semester - III)

GEOGRAPHY

Gg - 301 : Theoretical and Applied Geography

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates :

- 1) Attempt any four questions.*
- 2) All questions carry equal marks.*
- 3) Use of map stencils is allowed.*

Q1) Discuss the contribution of Alexander Von Humboldt in the development of geographical thought.

Q2) Give a brief account of American and British Schools of thought to the development of geographical thought.

Q3) Critically examine the concept of dualism with special reference to Systematic versus Regional Geography.

Q4) Discuss the changing paradigms in geography.

Q5) Bring out the salient features of quantitative revolution in geography.

Q6) Explain the application of geographical concepts and techniques in land use and regional planning.

P. T. O.

Q7) Write notes on **any two** :

- a) Roman school of thought.
- b) Use of models in Geography.
- c) Application of Remote Sensing in geography.



Total No. of Questions : 6]

SEAT No. :

P2676

[Total No. of Pages : 2

[4731]-3010

M.A./M.Sc. (Semester - III)

GEOGRAPHY

Gg-304 : Social and Cultural Geography
(2013 Pattern) (Credit System)

[Time : 2.30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from Qu. No. 1 to 4.*
- 2) *Question No. 5 and 6 are compulsory.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of map stencils and calculator is allowed.*

- Q1)** a) Define social geography. [2]
b) Explain the nature of social geography. [4]
c) Explain the Scope of social geography. [4]
- Q2)** a) Explain the concept of Materialism. [2]
b) Explain the base and concept of existentialism. [4]
c) Explain the base and concept of Structuralism. [4]
- Q3)** a) What is individual space? [2]
b) Describe structure of social pattern. [4]
c) Explain theoretical space. [4]

P.T.O.

- Q4)** a) What is cultural diversity? [2]
b) Explain the role of race and religion information of cultural region. [4]
c) Explain the role of caste and ethnicity information of cultural region. [4]
- Q5)** a) Describe the components and indicators of social well being. [4]
b) Explain the methods of measuring well- being of society. [5]
- Q6)** a) Describe the impact of technology on human settlement. [4]
b) Describe the social areas in urban settlements. [5]



Total No. of Questions : 6]

SEAT No. :

P2677

[Total No. of Pages : 1

[4731] - 3011
M.A./M.Sc. (Semester - III)
GEOGRAPHY
Gg, 306 : Geoinformatics - III
(2013 Pattern) (Credit System)

Time : 2.30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from question number 1 to 4.*
- 2) *Question Numbers 5 and 6 are compulsory.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of Map stencils and calculator is allowed.*

- Q1)** a) What do you understand by simple grid operations? [2]
b) Discuss various applications of DEM. [4]
c) Explain single layer operation in GIS. [4]
- Q2)** a) What do you understand by spectral rationing? [2]
b) What is image rectification? [4]
c) State the importance of GCP tools in georeferencing the image. [4]
- Q3)** a) What do you understand by MXL classifier in Digital Image Processing (DIP)? [2]
b) What is resampling in Digital Image Processing? [4]
c) How do you distinguish between training and classification stage in DIP?[4]
- Q4)** a) What is confusion matrix? [2]
b) Explain density slicing as a process of image enhancement. [4]
c) What do you understand by topological overlay in spatial analysis? [4]
- Q5)** a) Discuss output stage in Digital Image Processing (DIP) [4]
b) Give a brief account of classification accuracy in Digital Image Processing (DIP) [5]
- Q6)** a) Explain contrast stretching and spatial filtering as a processes of image enhancement. [4]
b) Distinguish between supervised and unsupervised classification in DIP.[5]



Total No. of Questions : 7]

SEAT No. :

P2626

[4731] - 302

[Total No. of Pages : 1

M.A./M.Sc. (Semester - III)

GEOGRAPHY

**Gg - 310 : Coastal Geomorphology
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Draw figures/maps wherever necessary.*
- 4) *Use of map stencils is allowed.*

Q1) Define wave and describe various parameters of waves.

Q2) What are tides? Explain semidiurnal, diurnal, spring and neap tides.

Q3) Give a brief review of Pleistocene sea levels and staircase theory of glacial eustasy.

Q4) Describe various sources of sediments and pathways of sediment transport.

Q5) Explain morphodynamics of deltas and describe its morphology in detail.

Q6) Explain the formation and morphology of sea cliffs and caves.

Q7) Write notes on **any two** :

- a) Genetic coastal classification.
- b) Mangrove swamps and salt marshes.
- c) Sea level rise : a current coastal issue.



Total No. of Questions : 7]

SEAT No. :

P2627

[4731] - 303

[Total No. of Pages : 1

M.A./M.Sc. (Semester - III)

GEOGRAPHY

**Gg-311 : Applied Climatology
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Attempt any four questions.*
- 2) All questions carry equal marks.*
- 3) Use of map stencils is allowed.*

Q1) Describe different forms of precipitation and write note on instruments to measure radiation.

Q2) Explain relationship of climate and crops. Discuss the artificial control of plant environment.

Q3) Describe heating degree days and cooling towers with examples.

Q4) Discuss the influence of climate on land and air transport.

Q5) Give an account of importance of remote sensing in meteorological study monitoring.

Q6) Discuss the impact of plate tectonics and volcanic activity in reconstruction of past Climate.

Q7) Write notes on any two :

- a) Scope of Applied Climatology.
- b) Urban Heat Island.
- c) Climate and Industrial activities.



Total No. of Questions : 7]

SEAT No. :

P2628

[Total No. of Pages : 1

[4731] - 304

M.A./M.Sc. (Semester - III)

GEOGRAPHY

**Gg. - 312 : Trade and Transport Geography
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) Explain with examples 'Fundamental approach'.

Q2) Describe significance of water ways in economic development.

Q3) Economic factors are directly impact on transportation network Elaborate in brief.

Q4) Explain the concept of trade and the role of trade in the development of a region.

Q5) Critically examine the theory of comparative advantage.

Q6) Describe in detail history and development of international trade.

Q7) Write notes on **any two** :

- a) Traffic flow.
- b) Transportation and environmental degradation.
- c) Significance of trade.



Total No. of Questions : 7]

SEAT No. :

P2629

[Total No. of Pages : 1

[4731] - 305

M.A./M.Sc. (Semester - III)

GEOGRAPHY

**Gg. : 313 - Urban Geography
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) Explain the scope of Urban Geography and its relationship with other disciplines.

Q2) What do you mean by urbanization? Describe the criteria used to distinguish urban settlements.

Q3) Explain the approaches to the classification of towns and cities.

Q4) Critically examine the Park and Burgess Model of urban morphology.

Q5) Discuss the Christaller's Central Place Theory with reference to hierarchy of urban settlements.

Q6) 'Rural urban migration and problems of civic amenities are the two sides of the same coin'. Discuss.

Q7) Write notes on **any two** :

- a) Methods of demarcation of rural-urban fringe.
- b) Criteria to delimit the city region.
- c) Master plan of towns.



Total No. of Questions : 7]

SEAT No. :

P2630

[Total No. of Pages : 1

[4731] - 306

M.A./M.Sc. (Semester - III)

GEOGRAPHY

Gg - 314 : Geoinformatics - III

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) Explain the difference between network analysis and geocoding.

Q2) Give an account on Digital Terrain Models and their applications.

Q3) Describe various sources of distortions in digital image processing.

Q4) Give an account of topographical analysis.

Q5) What is image enhancement? Describe various steps involved in image enhancement.

Q6) Write an explanatory note on 'supervised' and 'unsupervised' classification in digital image processing.

Q7) Write notes on any two :

- a) Layer operations.
- b) Density slicing.
- c) Surface analysis.



Total No. of Questions : 7]

SEAT No. :

P2631

[4731] - 307

[Total No. of Pages : 2

M.A./M.Sc. (Semester - III)

GEOGRAPHY

**Gg - 320 : Multivariate Statistics
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of calculators, statistical tables etc. is allowed.*

- Q1)** a) Differentiate between bivariate and multivariate analysis. **[6]**
b) Find the determinant and the adjoint of the following matrix. **[6]**

$$A = \begin{pmatrix} 2 & 1 & 5 \\ 10 & 3 & 6 \\ 7 & 9 & 2 \end{pmatrix}$$

- c) Find the unknowns in the following simultaneous equations using the matrix solution **[8]**
- $$a - b + 4c = 30$$
- $$6a + 2b - c = 28$$
- $$4a + b + c = 30$$

- Q2)** The values of price levels as observed over a period of one year are recorded in the following table. Using suitable bivariate model express the trend of the data and find the amount of variance explained. **[20]**

Months	1	2	3	4	5	6	7	8	9	10	11	12
Price levels	12.3	15.6	17.2	18.1	20.3	25.2	21.3	18.5	16.2	14.1	11.9	10.3

- Q3)** Obtain a multiple regression equation and explained variance for the given data and comment on the results **[20]**

N = 6	Y	X1	X2	X3
Mean	1.88	68	43.6	18.43
Variance	0.18	629.33	546.61	4.51

P.T.O.

Covariance	X1Y	X2Y	X3Y	X1X2	X1X3	X2X3
	8.47	-9.071	-0.89	-538.42	-45.57	48.21

Q4) The information regarding the location of a few retail markets in terms of northings (000 m) and eastings (000 m) along with the price of vegetables is given below. Compute a suitable equation to generate a surface of the price levels observed in the area. **[20]**

Markets	1	2	3	4	5	6	7	8	9	10
Northings	2.7	4.2	6.3	8.9	9.1	10.4	11.0	12.3	15.6	17.2
Eastings	-6.3	-4.8	-2.1	-0.3	1.6	2.8	5.9	7.8	12.3	14.2
Price in Rs./kg	6.2	6.1	8.9	5.3	6.8	4.9	3.2	2.1	12.5	7.2

Q5) Using the following matrix find the first principal component and the variance explained by the component. **[20]**

	X1	X2	X3	X4	X5	X6
X1	1	0.6	0.9	0.35	0.55	0.98
X2		1	0.06	-0.4	0.8	0.54
X3			1	0.7	0.9	0.66
X4				1	0.6	0.7
X5					1	-0.5
X6						1

Q6) Find first factor from the matrix of correlations given in the Q.5 above and find the explained variance. **[20]**

Q7) Write note on **any two** : **[20]**

- a) Nature of non-linear bivariate functions
- b) Concept of regionalization
- c) Use of PCA in Geomorphology.



Total No. of Questions : 7]

SEAT No. :

P2632

[4731] - 308

[Total No. of Pages : 1

M.A./M.Sc. (Semester - III)

GEOGRAPHY

**Gg - 321 : Political Geography
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Attempt any four questions.*
- 2) All questions carry equal marks.*
- 3) Use of map stencils is allowed.*

Q1) Define political geography and explain its historical development.

Q2) Describe 'Whittlesey's law' & landscape approach and bring out its limitations.

Q3) Differentiate between State & Nation and explain the process of state formation.

Q4) Explain Spykman's Rimland Theory and global geostrategic views.

Q5) Describe the political geography of SAARC region.

Q6) Explain geopolitical significance of Indian Ocean.

Q7) Write notes on any two:

- a) Scope of political geography
- b) Morphological classification of boundaries
- c) Interstate language disputes in India



Total No. of Questions : 7]

SEAT No. :

P2633

[4731] - 309

[Total No. of Pages : 1

M.A./M.Sc. (Semester - III)

GEOGRAPHY

Gg - 322 : Soil Geography

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Attempt any four questions.*
- 2) All questions carry equal marks.*
- 3) Use of map stencils is allowed.*

Q1) Write an account of 'productivity of the soil'.

Q2) Discuss the relationship between hydrology and soils.

Q3) 'Parent material, Climate and vegetation are the major soil forming factors'. Discuss.

Q4) Give an account of 'Biochemical properties of soil'.

Q5) Write an explanatory note on 'Importance of organic matter and humus in the soil'.

Q6) Discuss various weathering processes responsible for the formation of soil.

Q7) Write notes on any two

- a) Soil degradation
- b) Soil classification
- c) Incorrect methods of farming



Total No. of Questions : 6]

SEAT No. :

P2678

[4731] - 4001

[Total No. of Pages : 1

M.A./M.Sc. (Credit System)

GEOGRAPHY

**Gg. - 401 : Theoretical and Applied Geography
(2013 Pattern)**

Time : 2:30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from question No. 1 to 4.*
- 2) *Question number 5 and 6 are compulsory.*
- 3) *Draw Figures/maps whenever necessary.*
- 4) *Use of map stencils and calculator is allowed.*
- 5) *Figures to the right side indicate full marks.*

- Q1)** a) What is dark age? [2]
b) Give brief account of German's contribution to Geography. [4]
c) Discuss the contribution of Humboldt to Geography. [4]
- Q2)** a) What is dualism? [2]
b) Explain the concept of physical geography. [4]
c) Explain the concept of human geography. [4]
- Q3)** a) Define model. [2]
b) Explain the significance of models in geography. [4]
c) Describe the system approach in geography. [4]
- Q4)** a) Define GIS. [2]
b) Discuss the significance of computer based cartography. [4]
c) Describe scientific methods used in geography. [4]
- Q5)** a) Describe the applications of remote sensing in geography. [4]
b) Explain the significance of resource management. [5]
- Q6)** a) Explain the significance of land-use planning. [4]
b) Explain the need of scenic evaluation. [5]



Total No. of Questions : 6]

SEAT No. :

P2679

[Total No. of Pages : 2

[4731] - 4002

M.A./M.Sc. (Semester - IV)

GEOGRAPH

**Gg - 402 : Principles of Remote Sensing and GIS
(2013 Pattern) (Credit System)**

Time : 2.30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from Question no.1 to 4.*
- 2) *Question no. 5 and 6 are compulsory.*
- 3) *Draw figures/maps wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of map stencils and Calculator is allowed.*

- Q1)** a) What is visible spectrum? [2]
b) Write a brief account of development of Remote Sensing in India. [4]
c) State the laws of radiation. [4]
- Q2)** a) State useful regions of EMR. [2]
b) Describe the characteristics of sun synchronous satellite. [4]
c) What are the special characteristics of LANDSAT? [4]
- Q3)** a) What is across track (whiskbroom) scanning? [2]
b) Explain and state uses of TM as a optical mechanical scanner. [4]
c) Explain radiometric resolution. [4]
- Q4)** a) Mention the types of Earth resource satellites. [2]
b) What is WiFS? Describe its characteristics. [4]
c) Explain the concept of Temporal resolution. [4]

P.T.O.

- Q5)** a) What is INSAT? Describe its characteristics. [4]
b) Discuss the uses of Microwave remote sensing. [5]
- Q6)** a) Discuss the application of IKONOS satellites. [4]
b) Give an account of Earth resource satellites. [5]



Total No. of Questions : 6]

SEAT No. :

P2680

[4731] - 4003

[Total No. of Pages : 1

M.A./M.Sc. (Semester - IV)

GEOGRAPHY

Gg - 411 : Geostatistics

(2013 Pattern) (Credit System)

Time : 2.30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from Q.1 to Q.4.*
- 2) *Question No. 5 and 6 are compulsory.*
- 3) *Draw figures/Maps wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of map stencils and Calculator is allowed.*

- Q1)** a) Give the definition of Geostatistics. [2]
b) Write a brief note on the history of Geostatistics. [4]
c) List various terms in spatial analysis and define any two. [4]
- Q2)** a) Define the term Exploratory Data Analysis (EDA). [2]
b) Explain the concept of data distribution in space. [4]
c) With proper illustration elaborate the importance of usage of Descriptive statistics in Exploratory Spatial Data Analysis (ESDA). [4]
- Q3)** a) Define Spatial Correlation. [2]
b) What is correlogram? Explain its types in brief. [4]
c) With a proper diagram explain various components of Variogram. [4]
- Q4)** a) What is heterogeneity? [2]
b) Explain the concept of Markov chain analysis. [4]
c) Give the applications of Markov chain analysis in Earth sciences. [4]
- Q5)** a) Explain the elements and types of spatial interpolation techniques. [4]
b) Give the characteristics of kriging. [5]
- Q6)** a) List the types of cluster analysis and explain any one in brief. [4]
b) Write a note on merits and demerits of cluster analysis. [5]



Total No. of Questions : 6]

SEAT No. :

P2681

[Total No. of Pages : 2

[4731] - 4004

M.A./M.Sc. (Semester - IV)

GEOGRAPHY

**Gg - 420 : Regional Planning and Development
(2013 Pattern) (Credit System)**

Time : 2:30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from question No. 1 to Q. 4.*
- 2) *Question 5 and 6 are compulsory.*
- 3) *Draw Figures/maps whenever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of map stencils and calculator is allowed.*

- Q1)** a) Define region. [2]
- b) Explain the types of planning. [4]
- c) Differentiate between micro and meso level planning. [4]
- Q2)** a) What do you mean by regional planning? [2]
- b) Explain the major indicators of regional development. [4]
- c) Discuss the methodology of regional planning. [4]
- Q3)** a) What is regionalisation? [2]
- b) Explain major policies suggested for district level planning. [4]
- c) Discuss the methods of regionalisation. [4]

P.T.O.

- Q4)** a) Define national capital region. [2]
b) Explain the role of Geography in regional planning. [4]
c) Write a note on systematic approach in regional planning. [4]
- Q5)** a) Discuss the hierarchy of planning. [4]
b) Explain the new trends in regional planning. [5]
- Q6)** a) Discuss the measurement of regional development? [4]
b) Explain the appropriate stages of planning of metropolitan region. [5]



Total No. of Questions : 6]

SEAT No. :

P2682

[Total No. of Pages : 2

[4731] - 4005

M.A./M.Sc. (Semester - IV)

GEOGRAPHY

**Gg - 421 : Geography of water Resources
(2013 Pattern) (Credit System)**

Time : 2:30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from question No. 1 to 4.*
- 2) *Question number 5 and 6 are compulsory.*
- 3) *Draw Figures/maps whenever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of map stencils and calculator is allowed.*

- Q1)** a) What do you mean by percolation and run off? [2]
- b) Give the distribution of worlds ground water resources. [4]
- c) Explain how the water resources get renewed through hydrologic cycle.[4]
- Q2)** a) What do you mean by agriculatural cropping pattern? [2]
- b) Discuss the methods of estimation for industrial use of water. [4]
- c) Describe the methods of distribution of water to farms. [4]
- Q3)** a) What is pollution of water? [2]
- b) Explain the Utilisation of water by different types of industries. [4]
- c) Discuss the imbalance between municipal demand and use of water. [4]

P.T.O.

- Q4)** a) What do you mean by conservation of water? [2]
b) Discuss the international water disputes with examples. [4]
c) Discuss the Ganga caveri proposed Garland project. [4]
- Q5)** a) Explain the channel improvement and river embankments as measures of water management. [4]
b) Discuss the krishna water dispute. [5]
- Q6)** a) Explain the processes of evaporation and evapotranspiration. [4]
b) Discuss 'water balance and droughts'. [5]



Total No. of Questions : 6]

SEAT No. :

P2683

[4731] - 4006

[Total No. of Pages : 1

M.A./M.Sc. (Semester - IV)

GEOGRAPHY

**Gg. - 422 : Biogeography
(2013 Pattern) (Credit System)**

Time : 2:30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from question No. 1 to 4.*
- 2) *Question number 5 and 6 are compulsory.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw Figures/maps whenever necessary.*
- 5) *Use of map stencils and calculator is allowed.*

- Q1)** a) What is the meaning of distribution patterns of rarity? [2]
b) Describe the nature, scope and relevance of Biogeography. [4]
c) Write an essay on "environmental limitation of life". [4]
- Q2)** a) What do you mean by Gondwanaland and Laurasia? [2]
b) Explain the distribution patterns of habitats and micro-habitats. [4]
c) Discuss the variety of island habitats. [4]
- Q3)** a) What is ecological succession? [2]
b) Describe the biomass of desert. [4]
c) Explain the ancient patterns in distribution of plants and animals. [4]
- Q4)** a) Describe the zoogeographical provinces. [2]
b) Explain the factors of physical limitation of life. [4]
c) Describe temperate broad leaf forest biomes with respect to regional climate and species richness. [4]
- Q5)** a) Write a note on the idea of continental drift and discuss the role of changing pattern of continents. [4]
b) Describe the biomass of tropical Savanna and desert. [5]
- Q6)** a) Explain the concept of evolution and adaptation as a basic processes in biogeography. [4]
b) Discuss how biome and life forms are physical limitation of life. [5]



Total No. of Questions : 6]

SEAT No. :

P2684

[Total No. of Pages : 1

[4731] - 4007

M.A./M.Sc. (Semester - IV)

GEOGRAPHY

**Gg. - 423 : Oceanography
(2013 Pattern) (Credit System)**

Time : 2:30 Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from question No. 1 to 4.*
- 2) *Question number 5 and 6 are compulsory.*
- 3) *Draw Figures/maps whenever necessary.*
- 4) *Use of map stencils and calculator is allowed.*

- Q1)** a) What is post-war oceanography? [2]
b) Explain the foundation of modern oceanography. [4]
c) Discuss various modern trends in oceanography. [4]
- Q2)** a) Define oceanic trenches. [2]
b) Explain the process of formation of coral reefs. [4]
c) Elaborate various types of continental margins. [4]
- Q3)** a) What do you mean by sea waves? [2]
b) Explain various types of oceanic waves. [4]
c) Discuss various types of wave breaking. [4]
- Q4)** a) Define tidal bores. [2]
b) Give an account of various tide generating forces. [4]
c) Explain the various types of tides. [4]
- Q5)** a) Elaborate the effects of thermohaline circulation on Ocean currents. [4]
b) Describe the ocean currents produced in Indian Ocean. [5]
- Q6)** a) Discuss the nature and distribution of hydrogenous sediments. [4]
b) Explain the nature and distribution of various marine sediments deposits. [5]



Total No. of Questions : 6]

SEAT No. :

P2685

[4731] - 4008

[Total No. of Pages : 1

M.A./M.Sc. (Semester - IV)

GEOGRAPHY

**Gg. - 424 : Natural and Manmade Hazards
(2013 Pattern) (Credit System)**

Time : 2½ Hours]

[Max. Marks : 38

Instructions to the candidates:

- 1) *Attempt any two questions from question No. 1 to 4.*
- 2) *Question number 5 and 6 are compulsory.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw figures/maps wherever necessary.*
- 5) *Use of map stencils and calculator is allowed.*

- Q1)** a) What are the types of man induced hazards? [2]
b) Explain risk and vulnerability assessment of disaster. [4]
c) Describe the causes and effects of global warming. [4]
- Q2)** a) Name the effects of droughts. [2]
b) Give an account of causes and effects of climatic hazards. [4]
c) Explain the effects of release of toxic elements in the air and water. [4]
- Q3)** a) What is disaster rehabilitation? [2]
b) Discuss the causes and effects of landslides. [4]
c) Discuss the causes and effects of 2013 Kedarnath flood. [4]
- Q4)** a) What do you mean by chemical hazards? [2]
b) Discuss the causes and effects of erosion and deposition on land instability. [4]
c) Explain the effects of ozone depletion. [4]
- Q5)** a) Discuss the effects of population growth and its impact on biodiversity. [4]
b) Discuss the causes and effects of tsunami. [5]
- Q6)** a) Describe the effects of over exploitation of resources on environment. [4]
b) Explain the impact of large river project on environment with reference to Sardar Sarovar. [5]



Total No. of Questions : 5]

SEAT No. :

P2686

[4731] - 4009

[Total No. of Pages : 1

M.A./M.Sc. (Semester - IV)

GEOGRAPHY

**Gg - 441 : Principles of Regional Planning & Project Work
(Credit System) (2013 Pattern)**

Time : 1½. Hours]

[Max. Marks : 25

Instructions to the candidates:

- 1) *Attempt any two questions from Question No. 1 to 3.*
- 2) *Attempt any one question from Question No.4 to 5.*
- 3) *Draw figures/maps wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of map stencils and calculator is allowed.*

- Q1)** a) Define 'Regional Geography'. [2]
b) Explain the Growth Pole Theory. [4]
c) Describe the effects of regional disparities. [4]
- Q2)** a) What is meant by regionalization? [2]
b) Describe the K3 and K4 principles. [4]
c) Discuss the application of Myrdal's theory in regional planning. [4]
- Q3)** a) Define the term 'Threshold'. [2]
b) Explain the types of regional planning. [4]
c) Explain the reasons for disparities in regional development. [4]
- Q4)** a) Write the assumptions of the Central place Theory. [2]
b) Discuss the application of the Growth Pole Theory in India. [3]
- Q5)** a) What is the need for regional planning? [2]
b) Discuss the application of the administrative principle by Christaller. [3]



Total No. of Questions : 7]

SEAT No. :

P2634

[Total No. of Pages : 1

[4731] - 401

M.A./M.Sc. (Semester - IV)

GEOGRAPHY

**Gg. - 401 : Resource Management
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) Explain the concept of resource management. Describe various approaches of resource management.

Q2) Discuss the methods of conservation and management of soil resources.

Q3) Write in detail about the significance of integrated surveys for natural resources.

Q4) Write an account of applications of remote sensing technique in resource appraisal and management.

Q5) Write an essay on water resources of India.

Q6) Describe the distribution and policies of development related to industrial resources of India.

Q7) Write notes on **any two** :

- a) Cultural resources.
- b) Population as a resource.
- c) Resource development policies of India.



Total No. of Questions : 7]

SEAT No. :

P2635

[Total No. of Pages : 1

[4731] - 402

M.A./M.Sc. (Semester - IV)

GEOGRAPHY

**Gg. - 420 : Regional Planning and Development
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) 'Geography plays a vital role in regional planning' Examine the statement.

Q2) Techno-economic surveys are very important for regional planning.

Q3) What is multi-level planning? Bring out the salient features of district level planning.

Q4) Describe the characteristics of tribal and hilly regions.

Q5) Explain the concept of 'concentration versus dispersal' in regional development.

Q6) Write in detail the problems and prospects of regional planning and development in India.

Q7) Write notes on **any two** :

- a) Scope of regional planning.
- b) Command areas as a planning unit.
- c) Methodology for regional planning.



Total No. of Questions : 7]

SEAT No. :

P2636

[Total No. of Pages : 1

[4731] - 403

M.A./M.Sc. (Semester - IV)

GEOGRAPHY

**Gg. - 421 : Geography of Water Resources
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) Define hydrological cycle. Give an account of surface and subsurface water resources of the earth in detail.

Q2) Write in detail different methods of irrigation.

Q3) Discuss industrial demand for water and industrial water pollution.

Q4) Discuss the problems associated with abundance and scarcity of water resources.

Q5) Describe various measure of planning, conservation and development of water resources.

Q6) Write an account of international and inter-state water disputes with reference to India.

Q7) Write notes on **any two** :

- a) Runoff and percolation
- b) Soil-Water-Crop Relationship
- c) Drought



Total No. of Questions : 7]

SEAT No. :

P2637

[Total No. of Pages : 1

[4731] - 404

M.A./M.Sc. (Semester - IV)

GEOGRAPHY

Gg. - 422 : Biogeography

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) Discuss the nature and scope of bio geography.

Q2) Describe ecogeographic trend as a basic pattern of biogeography.

Q3) Describe the biogeographical processes of dispersal and colonization.

Q4) Explain ecological succession giving suitable examples.

Q5) Show how the changing patterns of continents affected the ancient pattern of distribution of animals and plants.

Q6) Describe the tropical broadleaf evergreen forests.

Q7) Write notes on **any two** :

- a) Endemics
- b) Microclimates
- c) Island as an area of isolation



Total No. of Questions : 7]

SEAT No. :

P2638

[Total No. of Pages : 1

[4731] - 405

M.A./M.Sc. (Semester - IV)

GEOGRAPHY

**Gg - 423 : Geography and Ecosystem
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) Describe the characteristics of the general systems theory.

Q2) Elaborate the concepts of 'ecological habitat' and 'ecological niche'.

Q3) Describe in detail the biogeochemical cycle of nitrogen.

Q4) Describe the chief characteristics of the desert ecosystem.

Q5) Discuss the impact of population growth on environment.

Q6) Critically discuss the relation between resource use and ecological imbalance.

Q7) Write notes on **any two** :

- a) National parks and their role in conservation of environment.
- b) The laws and acts of the Earth Summit.
- c) Food chain and food-web.



Total No. of Questions : 7]

SEAT No. :

P2639

[4731] - 406

[Total No. of Pages : 1

M.A/M.Sc. (Semester - IV)

GEOGRAPHY

**Gg - 430 : Social and Cultural Geography
(2008 Pattern)**

Time : 3.00 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) Explain the development and recent trends in social and cultural geography.

Q2) Critically examine the relevance of humanism and radicalism in cultural geography.

Q3) Explain different types of 'Space'.

Q4) Describe cultural diversities among different cultural regions of the world.

Q5) 'Social well being is not the same everywhere in the world'. Explain.

Q6) Explain the impact of technology on human settlements.

Q7) Write notes on any two:

- a) Concept of equality and welfare.
- b) Cultural regions of India.
- c) Diffusion of culture.



Total No. of Questions : 7]

SEAT No. :

P2640

[4731] - 407

[Total No. of Pages : 1

M.A/M.S.c. (Semester - IV)

GEOGRAPHY

**Gg - 431 : Computer Geography
(2008 Pattern)**

Time : 3.00 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) Explain the working of any four input-output devices.

Q2) Explain the procedure of accessing files and folders.

Q3) Discuss creating maps, editing and color fill.

Q4) State the enhancement technique in Coral Draw.

Q5) Define GIS? Explain the importance of GIS in Geography.

Q6) Discuss the uses and types of charts and graphs in MS-EXCEL.

Q7) Write notes on any two:

- a) Internet
- b) Image Cropping
- c) Digitization.



Total No. of Questions : 7]

SEAT No. :

P2641

[4731] - 408

[Total No. of Pages : 1

M.A/M.S.c. (Semester - IV)

GEOGRAPHY

**Gg - 432 : Oceanography
(2008 Pattern)**

Time : 3.00 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) Define oceanography and describe the modern trends in oceanography.

Q2) Explain plate tectonics with reference to the formation of ocean basins in detail.

Q3) Discuss the inter-relation between ocean water temperature, density and salinity.

Q4) Discuss the movement of ocean waves near shore and various types of breaking of waves.

Q5) Describe various tide generating forces with the help of Dynamical Theory of Tides.

Q6) Discuss the formation of ocean currents in the Atlantic ocean.

Q7) Write notes on any two:

- a) Post-war oceanography.
- b) Formation and distribution of coral reefs.
- c) Types of marine sediments.



Total No. of Questions : 7]

SEAT No. :

P2642

[Total No. of Pages : 1

[4731] - 409

M.A/M.S.c. (Semester - IV)

GEOGRAPHY

Gg - 433 : Natural and Manmade Hazards

(2008 Pattern)

Time : 3.00 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Use of map stencils is allowed.*

Q1) Define hazard and explain the various types of hazards.

Q2) Describe the causes, effects and areas affected by soil erosion.

Q3) Describe the factors contributing to man-made hazards.

Q4) Discuss the causes and effects of desertification.

Q5) Explain the impact of large river projects.

Q6) Discuss the pollution of Indian rivers due to religious activities.

Q7) Write notes on any two:

- a) Causes and effects of tsunami.
- b) Impact of excessive irrigation.
- c) Prevention of disaster.



Total No. of Questions : 8]

SEAT No. :

P2853

[4732] - 1001

[Total No. of Pages :2

M.Sc. -I

BOTANY

**BO-1.1: Cryptogamic Botany - I
(2013 Pattern) (Semester - I) (Credit System)**

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat labelled diagrams must be drawn wherever necessary.*

- Q1)** a) Draw and describe external and internal characters of gametophyte of Targionia. [4]
- b) Sketch and label T.S. of Equisetum stem. [3]
- c) Give economic importance of pteridophytes. [3]
- Q2)** a) Describe sporophyte of Isoetes. [4]
- b) Give an account of economic 'importance of Bryophyta'. [3]
- c) Draw and describe mature antheridia in Riccia. [3]
- Q3)** a) Describe vegetative reproduction in Bryophyta. [4]
- b) Comment on Calamites. [3]
- c) Draw and describe internal structure of leaf of polytrichum. [3]
- Q4)** a) Draw and describe L.S. of sporophyte of Anthocerotales. [5]
- b) Give an account of stelar evolution in Pteridophyta. [5]

P.T.O.

- Q5)** a) Give an outline classification of pteridophyta proposed by sporne system. [4]
b) Draw and describe internal structure of Hepaticopsida. [4]
c) Enlist types of sporophyte of pteridophytes. [2]
- Q6)** a) Comment on Metzerales. [4]
b) Write on Rhynia. [4]
c) Differentiate between sterile and fertile branches of Equisetum. [2]
- Q7)** a) Comment on Lepidocarpon. [4]
b) Write on Takkakiales. [4]
c) What is comma? Explain. [2]
- Q8)** a) Explain any one theory of evolution of sporophyte of Bryophyta. [5]
b) Give an account of morphology and anatomy of gametophyte of order marsileales. [5]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages :2

P2854

[4732] - 1002

M.Sc.

BOTANY

**BO - 1.2 : Plant Physiology & Biochemistry
(Credit System) (Semester - I) (New) (2013 Pattern)**

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any Five questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat labelled diagrams must be drawn wherever necessary.*

Q1) a) Discuss about enzyme kinetics. [4]

b) How active transport occur in plants? [3]

c) Write the types of nucleotides. Give the difference between RNA & DNA. [3]

Q2) a) Give an account on lipid biosynthesis. [4]

b) Write a note on dissociation & association constant. [3]

c) What is temperature stress & How it affects the plants? [3]

Q3) a) What is meant by diffusion? Write a note on channels & their role in transport process. [4]

b) Explain structural hierarchy in proteins. [3]

c) Write a note on phytochromes. Discuss their structure & function. [3]

Q4) a) Write a note on metabolic pathways of phenolics. [5]

b) Discuss regulation of Calvin cycle. [5]

P.T.O.

- Q5)** a) What type of metabolic changes occur during flower initiation. [4]
b) Write principles & working of capacitance meter. [4]
c) What are the types of carbohydrates. [2]
- Q6)** a) What is a NOD factor? Explain its role in nitrogen fixation. [4]
b) Write the Factors affecting enzyme activity. [4]
c) How ATPs are synthesized? [2]
- Q7)** a) Discuss signal transduction process in guardcells. [4]
b) What are brassinosteroids? Give any two effects of them on plants. [4]
c) Comment on activation energy. [2]
- Q8)** a) Write a note on mitochondrial ETS. [5]
b) What are the types of amino acids & proteins? [5]



Total No. of Questions : 8]

SEAT No. :

P2855

[4732] - 1003

[Total No. of Pages : 2

M.Sc. (Botany)

BO-1.3: GENETICS & PLANT BREEDING

(2013 Pattern) (Credit System) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat labelled diagram wherever necessary.*

- Q1)** a) Explain Hardy-Weinberg law of gene & gene Frequencies. [4]
b) Write importance of Genetic Markers. [3]
c) Explain the mechanism of point mutagenesis. [3]
- Q2)** a) Explain the mechanism of transformation in Bacteria. [4]
b) Write the concept of Karyotype. [3]
c) Give classification of polyploids. [3]
- Q3)** a) Describe lytic & Lysogenic cycles in phages. [4]
b) Explain the phenomenon of Robert sonian. [3]
c) Explain the characters of multiple allele. [3]
- Q4)** a) Describe conjugation method of genetic transfer in bacteria. [5]
b) Explain the inheritance of mitochondrial gene in petite yeast. [5]

P.T.O.

- Q5)** a) Explain homologous & non-homologous recombination. [4]
b) Describe inheritance of quantitative traits in *Zea mays*. [4]
c) Describe role of Hybridization in plant breeding. [2]
- Q6)** a) Explain pre and post Mendelian development in plant breeding. [4]
b) Comment on phage mutants. [4]
c) Give the role of polyploidy in plant breeding. [2]
- Q7)** a) Give importance of genetic diversity in crop improvement. [4]
b) Describe the Role of chemical mutagens in mutation breeding. [4]
c) Write an account on Asexual reproduction. [2]
- Q8)** a) Explain the mechanism of tetrad analysis in ordered tetrad. [5]
b) Enlist types of chromosome banding with their importance. [5]



Total No. of Questions : 8]

SEAT No. :

P2856

[4732] - 1004

[Total No. of Pages : 2

M.Sc.

BOTANY

BO - 1.4 : Botanical Techniques

(2013 Pattern) (Credit System) (Semester - I)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat labelled diagram wherever necessary.*

- Q1)** a) Explain the principle and working of oxygen electrode. [4]
b) Explain molar extinction coefficient. [3]
c) Application of Gel Filtration chromatography. [3]
- Q2)** a) Comment on safety handling of radio isotopes. [4]
b) Write note on Antigen - antibody interaction. [3]
c) Explain Camera lucida technique. [3]
- Q3)** a) Explain working of fluorescence microscopy. [4]
b) State working principle of flow cytometry. [3]
c) Enlist properties of light. [3]
- Q4)** a) What is PCR? Explain various steps involved in PCR. [5]
b) State principle and working of IR spectroscopy. [5]
- Q5)** a) Explain Gel Filtration chromatography technique. [4]
b) Explain 2-Dimensional gel electrophoresis Technique. [4]
c) Define partition coefficient. [2]

P.T.O.

- Q6)** a) Explain X-ray crystallography technique. [4]
b) State principle of NMR Spectroscopy. [4]
c) Define Magnification. [2]
- Q7)** a) Describe HPLC technique in detail. [4]
b) State working principle of Fluorescence microscopy. [4]
c) Comment on multiple staining technique. [2]
- Q8)** a) Describe DNA microarray technique. [5]
b) State principle and working of Atomic absorption Spectroscopy. [5]



Total No. of Questions : 8]

SEAT No. :

P2829

[4732] - 101

[Total No. of Pages :2

M.Sc. (Botany)

**BO-1.1: SYSTEMATICS OF NONVASCULAR PLANTS
(2008 Pattern) (Semester - I) (Old Course)**

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Answer any five questions, selecting at least two questions from each section.*
- 2) Answer to the two sections should be written in separate answer books.*
- 3) All questions carry equal marks.*
- 4) Neat labelled diagram must be drawn wherever necessary.*

SECTION - I

Q1) Discuss the thallus structure different types of fruiting bodies and types of asexual spores produced in Deuteromycotina. **[16]**

- Q2)** a) Explain the inter relationship between chlorophyta and cyanophyta. **[8]**
b) Describe evolutionary trends in algae. **[8]**

Q3) Solve ANY TWO of the following. **[16]**

- a) Comment on sexual reproduction in Ascomycotina.
- b) Explain general characters of Rhodophyta.
- c) Give a brief account of sporophyte of Marchantia and Riccia.

Q4) Write short notes on any two. **[16]**

- a) External and internal peculiarities of gametophytes in Anthocerotales.
- b) General characters of Take kiales.
- c) Sex hormones in fungi.
- d) Charophyta.

P.T.O.

SECTION - II

Q5) Discuss various life cycles present in phaeophyta with suitable examples. [16]

Q6) a) Explain various types of spore producing structures in myxomycotina. [8]

b) Describe the classification of fungi proposed by Ains worth etal., [8]

Q7) Solve ANY TWO of the following. [16]

a) Comment on gametophyte of poly trichales.

b) Explain sporophyte of sphagnales.

c) Give a brief account of marchantiales.

Q8) Write short notes on (Any two). [16]

a) Sex organs in Bryophyta.

b) Ecological significance of Bryophyta.

c) Saprotrophs and Necrotrophs.

d) Principles and procedure of plant systematics.



Total No. of Questions : 8]

SEAT No. :

P2830

[4732] - 102

[Total No. of Pages :2

M.Sc. - I

BOTANY

**BO - 1.2 : Plant Physiology and Biochemistry
(Old Pattern 2008) (Semester - I)**

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *Attempt minimum two questions from each section.*
- 3) *All questions carry equal marks.*
- 4) *Draw diagrams wherever necessary.*

SECTION - I

Q1) Explain C₄ cycle. Add a note on significance.

Q2) a) Explain cyanide resistance pathway.

b) Describe CAM mechanism.

Q3) Solve any two:

a) Explain biosynthesis of Gibberellins.

b) Comment on signal transduction of guard cells.

c) Give a brief account on. Synthesis of starch and sucrose.

Q4) Write notes on (Any two):

a) Apoplastic pathway.

b) Aquaporins.

c) Types of Biotic stress.

d) Physiological effects of ABA on seed dormancy.

P.T.O.

Q5) What are proteins? Explain Primary, Secondary, tertiary and quaternary structure of proteins.

Q6) a) Write principles of thermodynamics.

b) Explain β -oxidation of fatty acids.

Q7) Solve any two:

a) What are Isozymes.

b) Give classification of carbohydrates.

c) Explain shikimic acid pathway.

Q8) Write notes on (Any two)

a) Phospholipids.

b) Synthesis of glycogen.

c) Michaelis-Menton equation.

d) NOD factor.



Total No. of Questions : 8]

SEAT No. :

P2831

[4732] - 103

[Total No. of Pages : 2

M.Sc. - I (Botany)

**BO-1.3: GENETICS & PLANT BREEDING
(2008 Pattern) (Semester - I) (Old Course)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answer any five questions, selecting at least two question from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *All questions carry equal marks.*
- 4) *Draw neat labelled diagram wherever necessary.*

SECTION - I

Q1) Give detailed account of structural and Numerical aberrations of chromosomes. **[16]**

Q2) a) Discuss factors affecting Hardy Weinberg equilibrium. **[8]**

b) Explain three point test crosses with suitable example. **[8]**

Q3) Write Any two. **[16]**

a) Describe cytoplasmic inheritance.

b) Discuss Role of polyploidy in crop improvement.

c) Comment on Post Mendelian genetics.

Q4) Write short note (Any two). **[16]**

a) C-Value paradox.

b) Allopolyploidy.

c) Cytoplasmic male sterility.

d) Linkage.

P.T.O.

SECTION - II

Q5) Enlist various physical and chemical mutagens and explain their mechanism of action. Add note on molecular basis of gene mutation. **[16]**

Q6) a) Justify “Genetic diversity is necessary for crop improvement”. **[8]**

b) Discuss hybrid breeding in self and cross pollinated crops. **[8]**

Q7) Write Any two. **[16]**

a) Comment on “Plant breeding in India”.

b) Explain Intervarietal and wide crosses.

c) Discuss sexual Incompatibility.

Q8) Write short note (Any two). **[16]**

a) Heterosis.

b) Biodiversity conservation.

c) Applications of plant breeding

d) Hybridization.



Total No. of Questions : 8]

SEAT No. :

P2857

[4732] - 2001

[Total No. of Pages : 2

M.Sc.

BO-2.1:BOTANY

Cryptogamic Botany - II

(2013 Course) (Semester - II) (Credit System) (New)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat labelled diagrams must be drawn wherever necessary.*

Q1) a) Comment on life cycle pattern of Rhodophyta. **[4]**

b) Write note on sex hormones in fungi: **[3]**

c) What are mycorrhizae? Briefly write on its significance. **[3]**

Q2) a) Give distinguishing characters of Deuteromycotina. **[4]**

b) Write note on anatomy of lichen thallus. **[3]**

c) Briefly comment on contribution of any two mycologists from India. **[3]**

Q3) a) Give distinguishing characters of Chlorophyta. **[4]**

b) Write thallus organization in chroococcales. **[3]**

c) Mention economic aspects of algae. **[3]**

Q4) a) Give an detail account of photosynthetic pigments and reserve food in algae. **[5]**

b) Write on sources of data for plant systematics. **[5]**

P.T.O.

- Q5)** a) Give distinguishing characters and thallus structure in Euglenophyta. [4]
b) Comment on life cycle pattern in Hemiascomycetes. [4]
c) Write contribution of any one Indian Phycologist. [2]
- Q6)** a) Discuss types and structure of basidia. [4]
b) Comment on habit and habitat of Bacillariophyta. [4]
c) Write on damage caused by smut fungi. [2]
- Q7)** a) Discuss life cycle pattern in chytridiomycetes. [4]
b) Write on sexual reproduction in Zygomycotina. [4]
c) Sketch and lable the typical fungal cell. [2]
- Q8)** a) Give an account of classification of fungi as proposed by Ainsworth et al. (1973). [5]
b) Comment on fungal nutrition. [5]



Total No. of Questions : 8]

SEAT No. :

P2858

[4732]-2002

[Total No. of Pages : 2

M.Sc.

BOTANY

**BO-2.2 : Cell Biology and Evolution
(2013 Pattern) (Semester-II) (Credit System)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat-labelled diagram wherever necessary.*

- Q1)** a) Describe various modes of transport across membranes. [4]
b) Enlist electrical properties of membranes. [3]
c) State cell theory. [3]
- Q2)** a) Comment on “programmed cell death-a molecular aspect”. [4]
b) Write note on cell cycle labelled mitotic curve. [3]
c) Describe evolution of unicellular eukaryotes. [3]
- Q3)** a) Explain ultra structure of lysosomes, membrane integrity and its role. [4]
b) Write note on transport across vacuolar membrane. [3]
c) Comment on “Transport of ions and solutes. [3]
- Q4)** a) What is cell cycle? Explain mechanism of regulation of cell cycle. [5]
b) Explain Hardy-Weinberg law, with suitable example. [5]

P.T.O.

- Q5)** a) Give an account of migration and genetic drift. [4]
b) Comment on “Threonine Kinase”. [4]
c) Explain parapatric speciation. [2]
- Q6)** a) Explain transport across nuclear membrane. [4]
b) Comment on “Mechanism of sorting and regulation of intracellular transport.” [4]
c) Define coevolution. [2]
- Q7)** a) Explain diversity in phosphatase. [4]
b) Write note on Regulation of cell death. [4]
c) Enlist function of mitochondria. [2]
- Q8)** a) Explain the role of cyclins and protein Kinase in cell cycle. [5]
b) What is molecular evolution? Describe molecular tool in phylogeny. [5]



Total No. of Questions : 8]

SEAT No. :

P2859

[4732]-2003

[Total No. of Pages : 2

M.Sc.

BOTANY

**BO-2.3 : Molecular Biology & Genetic Engineering
(2013 Pattern) (Semester-II)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat labelled diagrams must be drawn wherever necessary.*

Q1) a) What is C-value? Explain about C-value paradox. [4]

b) Discuss about DNA replication in prokaryotes. [3]

c) Write on exonucleases & their application in genetic engineering. [3]

Q2) a) Give an account on DNA damage & their types. [4]

b) Explain reverse transcriptase & their role. [3]

c) Comment on hypochromicity & hyperchromicity. [3]

Q3) a) Discuss any two methods of blotting. [4]

b) How C-DNA is prepared? [3]

c) Write a note on selection of recombinants. [3]

Q4) a) What are chaperones? Write their role. [5]

b) How transformants should be handled in subsequent generations? [5]

P.T.O.

- Q5)** a) Write a note on BACs. [4]
b) Give an account on 'rolling circle' & theta model. [4]
c) Explain about 'Exons'. [2]
- Q6)** a) How RNA processing occur in eukaryotes. [4]
b) Write on the 'vectors' used for marker free selection. [4]
c) Explain - topoisomerases. [2]
- Q7)** a) How recombinant DNA molecule is constructed? [4]
b) Write about direct gene transfer methods in plant. [4]
c) What are transcription factors? [2]
- Q8)** a) Discuss the structure & role of promoters & terminators. [5]
b) Give an account on the applications of genetic engineering for abiotic stress tolerance. [5]



Total No. of Questions : 8]

SEAT No. :

P2860

[4732]-2004

[Total No. of Pages : 2

M.Sc.

BOTANY

**BO-2.4 : Plant Ecology and Phytogeography
(2013 Pattern) (Semester-II) (New) (Credit System)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *All questions carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*

- Q1)** a) How plant establishes relationship with light and radiation? [4]
b) Discuss the relationship between plant and soil microbes as edaphic factor. [3]
c) Comment on the impact of soil and noise pollution. [3]
- Q2)** a) Write a note on water pollution and its impact. [4]
b) Discuss centres of origin. [3]
c) Comment on water holding capacity of the soil. [3]
- Q3)** a) Discuss Estuarine ecology. [4]
b) Comment on the components of Biomes. [3]
c) Describe Endemism. [3]
- Q4)** a) Discuss life history with referance to C-S-R triangle. [5]
b) Comment on community structure. [5]

P.T.O.

- Q5)** a) Describe the forest ecosystem with suitable examples. [4]
b) Discuss Autogenic plant succession. [4]
c) What is ecosystem organization? [2]
- Q6)** a) Discuss plant adaptive responses to variation with respect to water availability. [4]
b) Write a note on mechanism and phases of plant succession. [4]
c) What is ecosystem? [2]
- Q7)** a) Discuss the types of plant diversity with reference to ecotone and edge effect. [4]
b) Define extinction. Add a note on extinction events. [4]
c) What is population ecology? [2]
- Q8)** a) Write note on floristic regions of India. [5]
b) Comment on habitat ecology with respect to desert ecology. [5]



Total No. of Questions : 8]

SEAT No. :

P2832

[4732] - 201

[Total No. of Pages :2

M.Sc. - I

BOTANY

BO-2.1: SYSTEMATICS OF VASCULAR PLANTS

(2008 Pattern) (Semester - II) (Old Course)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answer any five questions, selecting at least two questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *All questions carry equal marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

SECTION - I

Q1) Give an account of morphology and anatomy of sporophyte of Lycopodiales.
Add a note on its reproductive structures. **[16]**

Q2) a) Explain external morphology of sporophyte of Ephedrales. **[8]**

b) Describe structure of gametophyte of cycadales. **[8]**

Q3) Solve any two of the following. **[16]**

- a) Comment on evolutionary significance of heterosporous pteridophytes.
- b) Explain apogamy and apospory.
- c) Give brief account of alternation of generation in pteridophytes.

Q4) Write short notes (Any two). **[16]**

- a) Gymnosperms as prospective ancestors of angiosperms.
- b) Reproductive structures of Equisetales.
- c) Male and female cones of Ginkgoales.
- d) Sporophyte of Isoetales.

P.T.O.

SECTION - II

Q5) Explain merits and limitations of Takhtajan's system of classification of angiosperms. **[16]**

Q6) a) Explain the role of palynology in angiosperm systematics with suitable examples. **[8]**

b) Describe Ecads and Ecotypes. **[8]**

Q7) Solve any two of the following. **[16]**

a) Comment on salient features of Magnoliopsida.

b) Explain Darwinian concept of evolution of species w.r.t. angiosperms.

c) Give brief account of Cronquist's system of classification of angiosperms.

Q8) Write short notes. (Any two). **[16]**

a) Conservation and utilization of angiosperm diversity.

b) Cladistics in taxonomy.

c) Taxonomic hierarchy.

d) Population and environment.



Total No. of Questions : 8]

SEAT No. :

P2833

[4732]-202

[Total No. of Pages : 2

M.Sc.-I

BOTANY

**BO-2.2 : Cell Biology and Instrumentation
(2008 Pattern) (Old)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *Attempt minimum two questions from each session.*
- 3) *All questions carry equal marks.*
- 4) *Draw diagrams wherever necessary.*

SECTION-I

Q1) Explain ultrastructure, biogenesis and functions of nucleus.

Q2) a) Give brief account on functions of peroxisomes and glyoxysomes.

b) Describe structure and functions of Ribosomes.

Q3) Solve Any Two:

a) Explain structure of chromosomes.

b) Comment on totipotency and cell differentiation.

c) Explain molecular organization of centromere and telomere.

Q4) Write notes on (Any Two):

a) Types of plastids.

b) Micrometry.

c) Difference between Prokaryotic and Eukaryotic cell.

d) Polytene chromosomes.

P.T.O.

SECTION-II

Q5) Explain mechanism of cell division giving details of Meiosis.

- Q6)** a) Explain plant wound signalling pathway.
b) Describe principle, working and application of chromatography.

Q7) Solve Any Two:

- a) Comment on malignant growth.
b) GM counting.
c) Give an account on principle, working of spectroscopy.

Q8) Write notes on (Any Two):

- a) NMR.
b) Centrifugation.
c) Significance of Mitosis and meiosis.
d) Immuno-electrophoresis.



Total No. of Questions : 8]

SEAT No. :

P2834

[4732]-203

[Total No. of Pages : 2

M.Sc.

BOTANY

**BO-2.3 : Molecular Biology & Genetic Engineering
(2008 Pattern) (Semester-II)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answer any five questions, selecting at least two questions from each section.*
- 2) *Answers to the two sections should be written on separate answer books.*
- 3) *All questions carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*

SECTION-I

Q1) Describe the procedure of RAPD and RFLP. Write note on its applications.

Q2) a) Describe the structure of t-RNA and its role in protein synthesis.

b) Explain the structure of Ti and Ri plasmids.

Q3) Attempt Any Two of the following:

a) Describe rolling circle mechanism of replication.

b) Describe the structure of Eukaryotic promotor.

c) Explain the mechanism of reverse transcription.

Q4) Write note on Any Two:

a) Restriction enzyme.

b) RNA - processing.

c) Replication apparatus.

P.T.O.

SECTION-II

Q5) Explain the mechanism of translation in prokaryotic organism.

Q6) a) Give structural & thermal properties of DNA.

b) Describe types of cloning vectors.

Q7) Attempt Any Two of the following:

a) Describe the procedure for the production for salt tolerance plant.

b) Explain the mechanism of construction of gene libraries.

c) Describe the mechanism of Polymerase Chain Reaction.

Q8) Write note on Any Two:

a) Lac operon.

b) Types of DNA damages.

c) Blue-white screening of recombinants.

d) B and Z forms of DNA.



Total No. of Questions : 8]

SEAT No. :

P2861

[4732] - 3001

[Total No. of Pages :2

M.Sc. -II

BOTANY

**BO-3.1: Spermatophytic Botany
(2013 Pattern) (Semester - III) (Credit System)**

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat labelled diagram must be drawn wherever necessary.*

Q1) a) Give the general characters of cordaitales. **[4]**

b) Comment an gametophyte of Gnetales. **[3]**

c) Give merits and Demerits of Dahlgren system of classification. **[3]**

Q2) a) Write shortly cordaites. **[4]**

b) Give systematic position of family lauraceae. **[3]**

c) Write an phenetic verses phylogenetic systems. **[3]**

Q3) a) Explain general characters of coniferales. **[4]**

b) Write an cycadeoidea. **[3]**

c) Comment an invasions and Introductions. **[3]**

Q4) a) Describe pentoxylates. **[5]**

b) Give any two pre-Darwinian classification systems. **[5]**

P.T.O.

- Q5)** a) Comment an morphology of plant body of Ginkgoales. [4]
b) Comment an Alpha and omega Taxonomy. [4]
c) Enlist importance of systematics. [2]
- Q6)** a) Write a note on APG. [4]
b) Comment an Hotspots. [4]
c) Give any four affinities of Gymnosperms with Angiosperms. [2]
- Q7)** a) Comment an Welwitschia. [4]
b) Comment an provisions for the governance of the ICBN code. [4]
c) Give economic Importance of family Alismataceae. [2]
- Q8)** a) Comment an morphology of sparophytes of cycadales. [5]
b) Discuss morphological variations of the family Hydrocharitaceae. [5]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages :2

P2862

[4732] - 3002
M.Sc. (Part - II)
BOTANY

BO - 3.2 : Developmental and Economic Botany
(2013 Pattern) (Credit System) (Semester - III)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat labelled diagrams must be drawn wherever necessary.*

Q1) a) Write note on polarity and symmetry. **[4]**

b) Comment on microsporogenesis. **[3]**

c) What is totipotency. **[3]**

Q2) a) Describe vegetative to reproductive phase of transition. **[4]**

b) Describe seedling development at molecular level. **[3]**

c) Give source and economic use of barley and finger millet. **[3]**

Q3) a) Describe gene expression during flowering. **[4]**

b) Give source and cultivation method of turmeric and saffron. **[3]**

c) Comment on meristems as a dynamic centers of cell regeneration. **[3]**

Q4) a) Describe categories of apomixis. **[5]**

b) Comment on intrinsic factors for plant development. **[5]**

P.T.O.

- Q5)** a) Write morphological and histochemical changes in transition. [4]
b) Give source and economic use of camphor oil and sarson oil. [4]
c) Comment on cell growth. [2]
- Q6)** a) Describe apomictic polyembryony. [4]
b) Explain anther culture. [4]
c) Write source and any two economic uses of coffee and strawberry. [2]
- Q7)** a) Comment on pollen and protoplast culture. [4]
b) Give source and cultivation method of cauliflower and banana. [4]
c) Define plant development. Comment on its concept. [2]
- Q8)** a) Give an account of seed germination. [5]
b) Describe gametic fusion and significance of double fertilization. [5]



Total No. of Questions : 8]

SEAT No. :

P2863

[4732] - 3003

[Total No. of Pages : 2

M.Sc. - II (Botany)

**BO-3.3: INDUSTRIAL BOTANY - I
(2013 Pattern) (Semester - III) (Credit System)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat labelled diagram wherever necessary.*

Q1) a) Comment on algae as a resource for fuel biofertilizer and neutraceuticals. **[4]**

b) Describe bioethanol production process from cellulose. **[3]**

c) Write note on “Animal fat as source for biodiesel production”. **[3]**

Q2) a) Justify “Biodiesel as alternative for fossil fuel”. **[4]**

b) Explain oil extraction methods. **[3]**

c) Write note on pyrethrins. **[3]**

Q3) a) Write note on economy of lipid biofuel. **[4]**

b) Give an account of economically important algae. **[3]**

c) State properties of lipid biofuel. **[3]**

Q4) a) Explain contineous fermentation process. **[5]**

b) Describe the method of penicillin production. **[5]**

P.T.O.

- Q5)** a) Describe the production process of fungal food. [4]
b) Write note on NABARD. [4]
c) What is accounting. [2]
- Q6)** a) What is entrepreneur? Give the types and function of entrepreneur. [4]
b) Describe the production process of cephalosporins. [4]
c) What is role of Industrial estate. [2]
- Q7)** a) Give an account of human resource management. [4]
b) Write note on commerce and trade. [4]
c) What you mean by aseptic operation. [2]
- Q8)** a) What is algal technology? Add note on commercial utility of algae. [5]
b) Explain isolation, and mass multiplication technique of Trichoderma. [5]



Total No. of Questions : 8]

SEAT No. :

P2864

[4732] - 3004

[Total No. of Pages : 2

M.Sc.

BOTANY

BO - 3.41 : Advanced Mycology and Plant Pathology

(New) (2013 Pattern) (Credit System) (Semester - III)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat labelled diagrams must be drawn wherever necessary.*

- Q1)** a) Give an account of Bessey's system of classification of fungi. [4]
b) How Fungi are ideal organism for genetical studies? [3]
c) Write contribution of Anton de Bary. [3]
- Q2)** a) Explain ecological groups of Fungi. [4]
b) Write affinities of fungi with plants and animals. [3]
c) Describe asexual spores in Fungi. [3]
- Q3)** a) Comment on plasmodiophoromycota. [4]
b) Write on Labyrinthulomycota. [3]
c) What are straminipila? [3]
- Q4)** a) Give characters of Oomycota and add a note on peronosporales. [5]
b) Explain Acrasiomycetes and Protosteliomycetes. [5]
- Q5)** a) What are Zygomycetes? Comment on evolution and conidium in Mucorales. [4]
b) Mention salient characters of Gasteromycetes. Comment on structure of fruit bodies. [4]
c) Write briefly on Archiascomycetes. [2]

P.T.O.

- Q6)** a) What are Loculoascomycetes? Add a note on ascostromatic ascocarp. [4]
b) Comment on different types of rusts with examples. [4]
c) Write on Agaricus. [2]
- Q7)** a) What are anamorphic Fungi? Comment on conidiomata. [4]
b) Write on ruderal and stress tolerant Fungi. [4]
c) Give difference between intermediate and systemic mycosis. [2]
- Q8)** a) What is dermatomycosis? Write on symptoms and clinical aspects. [5]
b) Discuss Fungus - plant association. [5]



Total No. of Questions : 8]

SEAT No. :

P2865

[4732] - 3005

[Total No. of Pages : 2

M.Sc. (Part - II)

BOTANY

**BO - 3.42 : Advanced Angiosperms
(Semester - III) (Credit System) (2013 Pattern)**

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions*
- 2) *All questions carry equal marks.*
- 3) *Neat labelled diagrams must be drawn wherever necessary.*

- Q1)** a) Give systematic position, interrelationships and economic importance of family Asteraceae. [5]
- b) Describe the role of chromosome number, polyploidy and aneuploidy in systematics of Angiosperms. [5]
- Q2)** a) Describe the exine stratification in pollen grain. Add a note on NPC system. [5]
- b) Discuss the various techniques of protein electrophoresis. [5]
- Q3)** a) Explain the role of amino acid sequence and its significance in Angiosperm systematics. [4]
- b) What is RAPD? Write a note on PCR analysis. [3]
- c) Write an account of applications of serological data in systematics. [3]
- Q4)** a) Give systematic position, interrelationships, phylogeny and economic importance of Dioscoriaceae. [4]
- b) Floral architecture in Orchids. [3]
- c) Significance of chromosome banding in angiosperm systematics. [3]

P.T.O.

- Q5)** a) Discuss the evolution of angiosperms with reference to anatomy of wood. [4]
b) Explain the importance of meiotic analysis in plant systematics. [3]
c) Write note on L/O pattern. [3]
- Q6)** a) Give importance of SEM and TEM studied in plant systematics. [4]
b) Describe phytogeographical regions of India in brief. [4]
c) Systematic position of Trapa. [2]
- Q7)** a) Discuss - "Centrospermae as a natural taxon". [4]
b) Describe various classes of chemical compounds and their biological significance in chemotaxonomy. [4]
c) Systematic position of Paeoniaceae. [2]
- Q8)** a) Discuss systematic position of Parietales with reference to pollen characters. [4]
b) Describe floral structure and evolutionary significance in Pandanaceae. [4]
c) Write a note on Palynogram. [2]



Total No. of Questions : 8]

SEAT No. :

P2866

[4732] - 3006

[Total No. of Pages : 2

M.Sc. - II

BOTANY

**BO - 3.43 : Advanced Plant Physiology
(2013 Pattern) (Semester - III) (Credit System)**

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions*
- 2) *All questions carry equal marks.*
- 3) *Sketch neat labelled diagrams wherever necessary.*

- Q1)** a) Describe the role of mycorrhizal fungi in uptake of nutrients by roots. [4]
b) Explain any one factor influence transport of water. [3]
c) Give role of transporters. [3]
- Q2)** a) Explain how soil pH influence the availability of mineral nutrients. [4]
b) Comment on role of PPase. [3]
c) Give disadvantages of conventional methods of application of fertilizers. [3]
- Q3)** a) Comment on photosynthetic ETS in prokaryotic organisms. [4]
b) Give role of PEP case. [3]
c) Explain Schematically CAM pathway. [3]
- Q4)** a) Comment on significance of C₃ and C₄ intermediate pathway. [5]
b) Explain feedback regulation of photosynthesis. [5]
- Q5)** a) Explain role of alternate oxidase. [4]
b) Comment on respiration in response to anoxia. [4]
c) Give role of auxins in plants. [2]

P.T.O.

- Q6)** a) Explain schematically the major pathways of secondary metabolite biosynthesis. [5]
b) Comment on diverse nature of mitochondrial ETS. [5]
- Q7)** a) What is growth? Comment on net assimilation rate. [4]
b) Explain what is circadian rhythm? [4]
c) Give role of compatible solutes. [2]
- Q8)** a) Explain with suitable examples the improvement of any one physiological trait in crop plants. [4]
b) Comment on role of light and dark period in induction of flowering. [4]
c) Give role of any one synthetic auxin in agriculture. [2]



Total No. of Questions : 8]

SEAT No. :

P2867

[4732] - 3007

[Total No. of Pages : 2

M.Sc.

BOTANY

BO - 3.44 : Advanced Genetics & Molecular Biology

(2013 Pattern) (Credit System) (Semester - III)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any Five questions.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat labeled diagrams wherever necessary.*

- Q1)** a) Give general characteristics & mechanism of transposons. [4]
b) Describe mechanism of plasmid DNA replication. [3]
c) Comment on premature lysis experiment. [3]
- Q2)** a) Describe AC and DC elements in maize. [4]
b) Write an account of genome size & evolutionary complexity. [3]
c) Give broad host range of plasmid. [3]
- Q3)** a) Describe polytene chromosome. [4]
b) Comment on morphogenesis & maturation of T₄ bacteriophage. [3]
c) Give importance of transposable element in Drosophila. [3]
- Q4)** a) Describe arrangement of chromatin fibers in a chromosomes. [5]
b) Explain nature of interaction between plasmid & host. [5]
- Q5)** a) Write an account on classification & characterization of gluten protein genes. [4]
b) Explain Hardy-Weinberg principle of gene Frequencies. [4]
c) Give the mechanism of circular chromosome segregation. [2]

P.T.O.

- Q6)** a) Describe the structure of high molecular weight subunit genes. [4]
b) Give the method of DNA polymorphisms with their applications. [4]
c) Write phage Mu transposition. [2]
- Q7)** a) Comment on DNA typing & population substructure. [4]
b) Explain single site-specific recombination. [4]
c) Write on Gene silencing. [2]
- Q8)** a) Describe methods of direct detection of gene mutation. [5]
b) Explain the mechanism of genome mapping. [5]



Total No. of Questions : 8]

SEAT No. :

P2868

[4732] - 3008

[Total No. of Pages : 2

M.Sc.

BOTANY

**BO - 3.45 : Advanced Plant Biotechnology
(2013 Pattern) (Credit System) (Semester - III)**

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *All questions carry equal marks.*

- Q1)** a) Explain the role of transgenics for reducing post harvest losses of fruits and flowers. **[4]**
- b) Enlist any three genes with their use in obtaining virus resistant transgenic plants. **[3]**
- c) State any three nutrient media components and their manipulation for obtaining enhanced secondary metabolite production. **[3]**
- Q2)** a) Discuss applications of PCR technique. **[4]**
- b) Explain parameters of growth analysis for secondary metabolite production. **[3]**
- c) Enlist any three genes with suitable examples for obtaining salt stress resistance. **[3]**
- Q3)** a) Explain the types of tissue culture systems used for secondary metabolite production. **[4]**
- b) Discuss the concept of promoter and enhancer traps. **[3]**
- c) Write a note on 'Knock out mutants'. **[3]**
- Q4)** a) Describe any one method of DNA sequencing. **[5]**
- b) Explain any one method of alteration in gene expression. **[5]**

P.T.O.

- Q5)** a) Enlist three genes with suitable transgenic examples for obtaining herbicide resistance. [4]
b) Explain the use of phage vectors in gene cloning. [3]
c) What are restriction endonucleases? Enlist any three examples of restriction endonucleases. [3]
- Q6)** a) Name the gene and successful example of insect resistant plant. [4]
b) Write the use of antisense technology in gene silencing. [3]
c) Write a short note on 'Applications of southern blotting'. [3]
- Q7)** a) Explain the strategies to obtain disease resistant transgenic plants. [4]
b) Explain any one technique used in improving secondary metabolite production in culture. [3]
c) What is insertional mutagenesis? Enlist its uses in altering gene expression. [3]
- Q8)** a) Explain method of in vivo gene cloning with the help of any two vectors. [5]
b) Explain the methods of PCR. Add a note on applications of PCR. [5]



Total No. of Questions : 8]

SEAT No. :

P2869

[4732] - 3009

[Total No. of Pages : 2

M.Sc.

BOTANY

BO - 3.46 : Advanced Medicinal Botany

(New) (2013 Pattern) (Semester - III) (Credit System)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any Five questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat labelled diagrams must be drawn wherever necessary.*

- Q1)** a) Discuss cultivation and utilization of medicinal plants of India. [4]
b) Comment on cultivation, collection and processing of any one herbal drug. [3]
c) Write a note on scope of pharmacognosy. [3]
- Q2)** a) Comment on physical and Biological methods of drug evaluation. [4]
b) Discuss a case study of any one Ayurvedic drug. [3]
c) Write a note on biogenesis of phytopharmaceuticals. [3]
- Q3)** a) Comment on Marine drugs. [4]
b) Write on Ayurvedic profile of Amla. [3]
c) Describe pyrethrum as natural pesticide. [3]
- Q4)** a) Give detailed account on source, cultivation and collection of Aloes and Dioscorea. [5]
b) Give Macroscopic characters of Brahmi and Henna. [5]
- Q5)** a) Comment on alternative system of medicine. [4]
b) Write a note on Indian trade in medicinal and aromatic plants. [4]
c) What is pharmacognosy? [2]

P.T.O.

- Q6)** a) Comment on morphological and chemical method of drug evaluation. [4]
b) Give the importance of plant tissue culture for phytopharmaceuticals. [4]
c) What is quality control? [2]
- Q7)** a) Write in details about phytopharmaceutical prospects. [4]
b) Discuss cosmeceuticals. [4]
c) What are nutraceuticals? [2]
- Q8)** a) Give applications of Camphor and Eucalyptus. [5]
b) Write a note on papain and Belladonna. [5]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages :2

P2835

[4732] - 301

M.Sc. (Part -II)

BOTANY

**BO-3.1: Developmental Botany and Plant Tissue Culture
(2008 Pattern) (Semester - III) (Old Course)**

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Answer any five questions, selecting at least two questions from each section.*
- 2) Answer to the two sections should be written in separate answer books.*
- 3) All questions carry equal marks.*
- 4) Neat labelled diagrams must be drawn wherever necessary.*

SECTION - I

Q1) Give detailed account of programmed cell death. **[16]**

Q2) a) Explain polarity and symmetry. **[8]**

b) Elaborate the concept of Juvenility. **[8]**

Q3) Write any two of the following. **[16]**

a) Morphological changes during transition of vegetative to flowering in shoot apex.

b) Ultrastructure of Zygote.

c) Androgenesis in vivo.

Q4) Write short notes any two. **[16]**

a) Pollen stigma interaction.

b) Embryogenesis and seedling development.

c) Applications of developmental Botany

d) Cell lineages.

P.T.O.

SECTION - II

Q5) Describe scope of plant tissue culture. [16]

Q6) a) Micropropagation. [8]

b) Hormonal requirement for regeneration. [8]

Q7) Write any two of the following. [16]

a) Protoplast culture.

b) Cyto differentiation in vitro

c) Selection methods for somaclonal variants.

Q8) Write short notes. (Any two). [16]

a) Embryo rescue technique.

b) Production of haploids.

c) PTC for crop improvement

d) Endosperm culture.



Total No. of Questions : 8]

SEAT No. :

P2870

[4732] - 3011

[Total No. of Pages : 2

M.Sc.

BOTANY

BO - 3.48 : Advanced Seed Technology

(New) (2013 Pattern) (Credit System) (Semester - III)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any Five questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat labelled diagrams must be drawn wherever necessary.*

- Q1)** a) Comment on important seed industries in India. [4]
b) What are gametocides? Explain their role in seed production. [3]
c) Write a note on self incompatibility. [3]
- Q2)** a) Explain Factors affecting seed germination. [4]
b) Comment on classes of seeds. [3]
c) Explain embryo development in dicot seed. [3]
- Q3)** a) Comment on ELISA test. [4]
b) Give an account of entry point and mechanism of seed transmission. [3]
c) Comment on constructional Features for good seed warehouse. [3]
- Q4)** a) Write note on RFLP and RAPD. [5]
b) Comment on integrated management of seed borne diseases. [5]
- Q5)** a) Explain Floral biology and mode of pollination in self pollinated crops. [4]
b) Give brief account of seed production in tomato. [2]
c) Define seed dormancy. [4]

P.T.O.

- Q6)** a) Comment on packaging and handling of seeds. [4]
b) Give brief account of seed production in onion. [4]
c) Define autogamy. [2]
- Q7)** a) Explain in detail any two germination tests. [4]
b) Comment on artificial seeds. [4]
c) What is sanitation? [2]
- Q8)** a) Give an account of general procedure for seed certification. [5]
b) Comment on quarantine for seed. [5]



Total No. of Questions : 8]

SEAT No. :

P2871

[4732] - 3013

[Total No. of Pages : 2

M.Sc. - II

BOTANY

BO - 3.50 : Advanced Biodiversity

(2013 Pattern) (Credit System) (Special Paper - I) (Semester - III)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any Five questions.*
- 2) *All Questions carry equal marks.*
- 3) *Neat diagram must be drawn wherever necessary.*

- Q1)** a) Describe algal biodiversity w.r.t. species, habit, habitat and distribution at taxonomic level. [4]
b) Explain scope and importance of biodiversity. [3]
c) Describe nature and origin of genetic variations. [3]
- Q2)** a) Comment on gymnosperm diversity w.r.t. habit, habitat and evolutionary success at taxonomic level. [4]
b) Write in brief about species richness and species abundance. [3]
c) Give a brief account of Peri-urban diversity. [3]
- Q3)** a) Describe Global distribution of biodiversity. [4]
b) Give sampling techniques for monitoring of insect biodiversity. [3]
c) Give the common features of threatened species. [3]
- Q4)** a) Explain in detail Endemic biodiversity. [5]
b) Explain factors affects genetic diversity. [5]
- Q5)** a) Comment on role of biosphere reserves in insitu conservation. [4]
b) Chipko movement. [4]
c) Comment on conservation of species diversity. [2]

P.T.O.

- Q6)** a) Describe any two methods of ex-situ conservation. [4]
b) Explain sacred groves and sthalavrikshas. [4]
c) Write a brief note on ecosystem restoration. [2]
- Q7)** a) Give an account on ethical values of biodiversity and use of biodiversity in food. [4]
b) Describe abundance of species in different ecosystems of the world. [4]
c) What is the role of biotechnology in conservation of biodiversity. [2]
- Q8)** a) Describe the factors affecting species distribution. [5]
b) Explain the role of biotechnology in assessment of biodiversity and bioresources. [5]



Total No. of Questions : 8]

SEAT No. :

P2836

[4732] - 302

[Total No. of Pages :2

M.Sc.

BOTANY

**BO - 3.2 : Environmental Botany and Plant Diversity
(Semester - III) (2008 Pattern)**

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answer any Five questions, selecting at least two questions from each section.*
- 2) *Answer to the two sections should be written in separate answer book.*
- 3) *All questions carry equal marks.*
- 4) *Neat Labelled diagrams must be drawn wherever necessary.*

SECTION - I

Q1) What is ecosystem? Explain concepts of pond ecosystem.

- Q2)** a) Describe modern tools required for environmental study.
b) Explain the adaptive features of Mangrove.

Q3) Write any Two of the following:

- a) Ecological pyramids.
- b) GPS.
- c) IUCN.

Q4) Write short notes on any TWO of the following:

- a) Air pollution Act.
- b) Natality.
- c) Soil pollutants.
- d) Forest Act.

P.T.O.

SECTION - II

Q5) Describe various values of biodiversity.

- Q6)** a) Explain the principles of DNA biodiversity.
b) Describe the diversity indices.

Q7) Write any Two of the following:

- a) Photofiltration.
b) Sociological approaches of biodiversity.
c) CITIES.

Q8) Write short notes on any Two of the following:

- a) Species inventory.
b) Phytoremediation.
c) Causes of loss of biodiversity.
d) CBD.



Total No. of Questions : 8]

SEAT No. :

P2837

[4732] - 304

[Total No. of Pages : 2

M.Sc. - II

BOTANY

**BO - 3.32 : Mycology and Plant Pathology - I
(Special Paper - I) (Old Course) (2008 Pattern) (Semester - III)**

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any five questions selecting minimum two from each section.*
- 2) *All questions carry equal marks.*
- 3) *Draw figures wherever necessary.*

SECTION - I

Q1) Give classification of fungi as per Alexopoulos, Mims and Blackwell. Add a note on contributions of Anton de Bary.

- Q2)** a) Explain biochemical and evolutionary relationship between different groups of fungi.
- b) Write briefly on fungal habitats.

Q3) Solve any two of the following:

- a) Explain stress tolerant strategy in fungi.
- b) Comment on soil fungi.
- c) Write on fungal sex hormones.

Q4) Write short notes on (any two):

- a) Rhizosphere fungi.
- b) Mycotoxins.
- c) Fungal association with algae.
- d) Genetical aspects of pathogenicity & host resistance.

P.T.O.

SECTION - II

Q5) Give characters of Zygomycotina. Add a note on conidial evolution in mucorales.

- Q6)** a) Comment on Peronosporales.
b) Write briefly on life cycle pattern of Allomyces.

Q7) Solve any two of the following:

- a) What are rusts? Add a note on its life cycle pattern.
b) Comment on fruit bodies in Ascomycotina.
c) Write briefly on carbon nutrition of Fungi.

Q8) Write short notes on (any two):

- a) Fruit bodies in deuteromycetes.
b) Pyrenomycetes.
c) Puffballs and birds nest fungi.
d) Protomycetales.



Total No. of Questions : 8]

SEAT No. :

P2838

[4732] - 305

[Total No. of Pages : 2

M.Sc. (Part - II)

BOTANY

**BO - 3.33 : Angiosperms (Special Paper - I)
(Old Course) (2008 Pattern) (Semester - III)**

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any five questions selecting minimum two from each section.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat labelled diagrams wherever necessary.*

SECTION - I

Q1) What is ICBN? Describe the principles, rules and recommendations of it. Add a note on main divisions of it.

- Q2)** a) Explain 'systematics as a synthetic subject'.
b) "Amentiferae is a taxon of heterogenous assemblage". Comment.

Q3) Attempt any two:

- a) Organization, units and facilities of a botanical garden.
- b) Clausen's experiment.
- c) Major Herbaria of World.

Q4) Write notes on (Any Two):

- a) Angiosperms diversity of Western Ghats.
- b) Systematic position of Loranthaceae.
- c) Biosystematic categories.
- d) Objectives and functions of a botanical garden.

P.T.O.

SECTION - II

Q5) Explain Herbarium as a multipurpose resource institute.

- Q6)** a) Describe the procedure for describing new genus and species.
b) Comment on role of botanical gardens in Teaching and Research.

Q7) Attempt any two:

- a) Role of herbarium in systematics and Floristics.
b) Describe the aims and objectives in biosystematic investigations.
c) Trapa and Paeonia - Systematic position.

Q8) Write notes on (Any Two):

- a) Effective and valid publication.
b) Citation of author(s), and literature.
c) Numerical taxonomy.
d) Heritarium.



Total No. of Questions : 8]

SEAT No. :

P2839

[4732] - 306

[Total No. of Pages : 2

M.Sc. - II

BOTANY

BO - 3.34 : Plant Physiology - I

(Special Paper - I) (Old Course) (2008 Pattern) (Semester - III)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any Five questions.*
- 2) *Solve minimum two questions from each section.*
- 3) *All questions carry equal marks.*
- 4) *Sketch neat labelled diagrams wherever necessary.*

SECTION - I

Q1) What is Stress? Describe the responses and mechanism of tolerance to salt stress. **[16]**

- Q2)** a) Explain physiological implications of water stress. **[8]**
b) Describe methods for improvement of saline-alkaline and sodic soils. **[8]**

Q3) Solve any two of the following: **[16]**
a) Comment on transgenics for drought stress tolerance.
b) Explain mechanism of flooding tolerance.
c) Give brief account of recent research on stress physiology at any two centres in India.

Q4) Write short note on (Any Two): **[16]**
a) Importance of stress physiology.
b) Stress induced proteins.
c) Causes for increase of saline soils in India.
d) Water logging injury.

P.T.O.

SECTION - II

- Q5)** Explain what is ROS? How are they produce during stress? Describe scavenging mechanism for detoxification of ROS. **[16]**
- Q6)** a) Explain metabolic changes occure due to xenobiotic stress. **[8]**
b) Describe the mechanism of photoinhibition. **[8]**
- Q7)** Solve any two of the followings: **[16]**
- a) Comment on causes of Ion toxicity.
- b) Explain the strategies applied by plants to overcome the effects of radiation stress.
- c) Give brief account of mechanism of ion stress tolerance.
- Q8)** Write short notes on (Any Two) of the followings: **[16]**
- a) Scope and importance of pollution stress.
- b) Photoinhibition.
- c) Effect of UV-B radiation on plant metabolism.
- d) Phenotypic changes in leaf structure and behaviour of plants under stress.



Total No. of Questions : 8]

SEAT No. :

P2840

[4732] - 307

[Total No. of Pages : 2

M.Sc.

BOTANY

**BO - 3.35 : Genetics, Molecular Biology & Plant Breeding - I
(Old Pattern 2008) (Semester - III)**

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answer any five questions, selecting at least two question from each section.*
- 2) *Answer to the two sections should be written in separate answer book.*
- 3) *All questions carry equal marks.*
- 4) *Neat labelled diagram must be drawn wherever necessary.*

SECTION - I

Q1) Describe structural & organizational complexity of chromosome.

Q2) a) Describe different types of banding patterns & its applications.

b) Explain origin, production & detection of haploids in plant Breeding.

Q3) Attempt any two of the following:

a) Describe the method of bacterial transformation.

b) Explain Chi-square test & its applications.

c) Give merits & demerits of mass selection.

d) Describe the completely randomized block design & its significance.

Q4) Write note on any two:

a) Quantitative inheritance.

b) Chromosome mapping.

c) Null hypothesis.

d) Screening of mutants.

P.T.O.

SECTION - II

Q5) Describe transformation & conjugation method of genetic recombination.

- Q6)** a) Explain the concept of Null hypothesis & give its significance.
b) Describe different types of allopolyploids.

Q7) Attempt any two of the following:

- a) Describe the characters of monosomic & trisomics.
b) Explain the mechanism of alien gene transfer with reference to wheat.
c) Give merits & demerits of pure line selection.
d) Describe the concept of population genetics.

Q8) Write note on any two:

- a) Concept and applications of co-relation in plant breeding.
b) Chemical mutagens.
c) Merits & demerits of hybrid varieties.
d) Germplasm & its importance.



Total No. of Questions : 8]

SEAT No. :

P2841

[4732] - 308

[Total No. of Pages : 2

M.Sc.

BOTANY

BO - 3.36 : Plant Biotechnology - I

(Old Course) (Semester - III) (Special Paper - I) (2008 Course)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answer any Five questions selecting atleast two questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *All questions carry equal marks.*

SECTION - I

Q1) Define micropropagation. Enlist stages of micropropagation and add a note on applications of plant tissue culture technique. **[16]**

Q2) a) Describe somaclonal variation, its selection with suitable example. **[8]**

b) Distinguish between direct and indirect organogenesis. **[8]**

Q3) a) Discuss various Factors influencing morphogenesis in vitro. **[8]**

b) Explain preparation of stock solutions of tissue culture media and add a note on its handling. **[8]**

Q4) Write short notes on Any Two: **[16]**

a) Somatic embryogenesis.

b) Meristem culture.

c) Landmarks of plant biotechnology.

P.T.O.

SECTION - II

Q5) Define transgenics. Explain their applications in production of abiotic stress tolerant plants. **[16]**

Q6) a) Discuss in detail about maintenance of green house. **[8]**

b) Explain role of transgenics in quality improvement of carbohydrates. **[8]**

Q7) a) What are secondary metabolites? How they are obtained in vitro. **[8]**

b) Explain role transgenics in production of plant derived vaccines. **[8]**

Q8) Write short notes on Any Two: **[16]**

a) Methods of Cryopreservation.

b) Applications of mycorrhiza.

c) Single cell proteins.



Total No. of Questions : 8]

SEAT No. :

P2842

[4732] - 309

[Total No. of Pages : 2

M.Sc. - II

BOTANY

BO - 3.37 : Plant Bio Diversity - I

(Old Course) (2008 Pattern) (Special Paper - I) (Semester - III)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answer any Five questions, taking at least two questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *All questions carry equal marks.*
- 4) *Neat diagram must be drawn wherever necessary.*

SECTION - I

Q1) Explain diversity indices and add a note on sampling of bird & fish biodiversity.

- Q2)** a) Explain Micro & Macro evolution.
b) Describe Biodiversity at species level.

Q3) Solve any two:

- a) Comment on identification of diversity hot spots.
- b) Explain Allozyme method.
- c) Give brief account of concept of Biodiversity.

Q4) Write short notes on any two:

- a) History of life on earth.
- b) Endemism and biodiversity.
- c) Genetic diversity Vs Transgenic Organisms.
- d) Problems in inventorying species.

P.T.O.

SECTION - II

Q5) Describe Freshwater wetlands & marine ecosystems in detail.

- Q6)** a) Explain species Richness & Species Abundance.
b) Describe dispersal and diversification.

Q7) Solve any two:

- a) Explain nature of Urban biodiversity.
b) Comment on diversity of domesticated species.
c) Give brief account on fungal diversity.

Q8) Write short notes on any two:

- a) Act of domestication.
b) Monitoring species diversity.
c) Microbial diversity.
d) Gymnosperm diversity.



Total No. of Questions : 8]

SEAT No. :

P2843

[4732] - 310

[Total No. of Pages : 2

M.Sc.

BOTANY

BO - 3.38 : Seed Technology - I

(Old 2008 Pattern) (Special Paper - I) (Semester - III)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Answer any Five questions taking atleast two from each section.*
- 2) Answer to the two sections should be written in separate answer books.*
- 3) All questions carry equal marks.*
- 4) Neat labelled diagrams must be drawn wherever necessary.*

SECTION - I

Q1) Give an account of development and structure of Male gametophyte.

Q2) Explain:

- a) Relevance of dormancy to seed production.
- b) Seed vigour test.

Q3) Describe:

- a) Factors affecting seed germination.
- b) Significance of seed transmission.

Q4) Write notes on any two of the following:

- a) Biochemical changes during seed germination.
- b) Seed health testing methods.
- c) Entry points and mechanism of seed transmission.

P.T.O.

SECTION - II

Q5) Explain life cycle of a Fibre crop pest. Add a note on its control measures.

Q6) Comment on:

- a) Causes of seed deterioration.
- b) Factors affecting seed longevity in storage.

Q7) Explain:

- a) Store grain pests during storage.
- b) Impact of seed infection on seed and planting value.

Q8) Write short notes on any two of the following:

- a) Fumigation and dehumidification.
- b) Quarantine for seed.
- c) Role, goal and opportunities of Seed Technology.



Total No. of Questions : 8]

SEAT No. :

P2872

[4732] - 4001

[Total No. of Pages : 3

M.Sc. -II

BOTANY

BO-4.1: Computational Botany

(2013 Course) (Credit System) (New) (Semester -IV)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *All questions carry equal marks.*

Q1) a) Following are the weight (in kg) of Brinjal fruit from 11 plants.

13.2,15.4,14.4,15.0,16.6,13.2,16,17.2,16.2,16.6,14.4.

Compute mean, median and mode.

b) Draw a scattered diagram of following data and write your conclusion.

Temperature: 15 17 19 20 22 23 25 26 30 35

No. of germinated: 10 15 18 19 21 20 22 24 28 34

seeds

c) Comment on Enzyme activity.

Q2) a) Comment on EMBEL and NCBI.

b) Distinguish between RefSeq and Gene bank.

c) What is primary and secondary database?

Q3) a) Explain Nerst's and Goldman Equations.

b) How many grams of solid NaOH are required to prepare 500ml of 0.04M solution? Express the concentration of the solution in terms of normality (N) and percent (W/V).

c) What is Normality?

P.T.O.

- Q4)** a) Write Fisher's basic principles for good experimental design.
 b) Explain Tukey's test for pairwise comparison of treatment.
 c) Write a critical difference.

- Q5)** a) Calculate value of chi-square from the following data

	X_1	X_2	X_3
Y_1	7	8	5
Y_2	8	9	6
Y_3	9	7	8

- b) Calculate Pearson's coefficient correlations cultivation cost and profit of cotton.

Cultivation cost per acre (in Rs.)	Profit (in Rs) Thousand
390	47
650	53
620	58
900	86
820	62
750	68
250	60
980	91
360	51
780	84

- Q6)** a) Describe completely randomized design (CDR).
b) What are fields used to search the databases? Give some examples.
- Q7)** a) Explain the making of radioisotope solution.
b) Describe procedure in FASTA.
- Q8)** a) Comment on osmolarity and osmotic pressure.
b) Give the properties of Mean, Median and Mode.



Total No. of Questions : 8]

SEAT No. :

P2873

[4732]-4002

[Total No. of Pages : 2

M.Sc.-II

BOTANY

**BO-4.2 : Plant-Organism Interaction
(2013 Pattern) (Semester-IV) (Credit System)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat labelled diagrams must be drawn wherever necessary.*

- Q1)** a) Comment on symbiotic association in Lichens. [4]
b) Give difference between ectomycorrhizae and endomycorrhizae. [4]
c) What are endophytes? [2]
- Q2)** a) Discuss rhizobia-plant association. [4]
b) Explain "Algae-coral association is beautiful symbiosis. [4]
c) What is Frankia-plant association? [2]
- Q3)** a) Comment on ambrogel fungi symbiosis. [4]
b) Give difference between self and cross pollination. [4]
c) Write on mimicry. [2]
- Q4)** a) Explain humming bird-plant interaction. [4]
b) Comment on co-evolution of pollinators as Fig-Fig wasp interaction. [4]
c) Briefly comment on fruit morphology and its dispersal method. [2]

P.T.O.

- Q5)** a) Comment on epiphytic plants. [5]
b) Discuss the phenomenon of allelopathy with examples. [5]
- Q6)** a) Comment on parasitic association in plants. [5]
b) Give different aspects of defence mechanism in plants against herbivores. [5]
- Q7)** a) State different competitive mechanism in plants. [5]
b) With examples discuss genetic engineering and herbivory. [5]
- Q8)** a) Give an account of carnivory in plants. [5]
b) State different aspects of herbivore insect-plant interactions. [5]



Total No. of Questions : 8]

SEAT No. :

P2874

[4732]-4003

[Total No. of Pages : 2

M.Sc.-II

BOTANY

BO-4.3 : Industrial Botany-II

(2013 Pattern) (Semester-IV) (New) (Credit System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat labelled diagrams must be drawn wherever necessary.*

- Q1)** a) What is explant? Explain various types of explants used in micropropagation. [4]
- b) Discuss different factors affecting flower production. [4]
- c) Comment on prospects of herbal technology. [2]
- Q2)** a) Describe the process of initiation of cultures during micropropagation of Lilium. [4]
- b) Explain procedure of manufacturing of jams and jellies. [4]
- c) Write a note on indoor gardening. [2]
- Q3)** a) Enlist medicinal mushrooms and explain their role for healthy life. [4]
- b) Write about role of Bixa seeds in cotton and silk industry. [4]
- c) Write a note on design of plant tissue culture laboratory. [2]
- Q4)** a) Describe role of medicinal herbs in hair dying and in cosmetics. [4]
- b) Discuss in brief about landscaping of highways. [4]
- c) Comment on International trade in tropical fruits. [2]

P.T.O.

- Q5)** a) Explain cultivation of carnation. [5]
b) Describe role of aromatic plants as source of essence. [5]
- Q6)** a) Write various steps involved in micropropagation of banana. [5]
b) Explain biological factors affecting deterioration of fruits. [5]
- Q7)** a) Discuss principles of conventional methods of preservation of fruits. [5]
b) Write about economics of micropropagation of Gerbera. [5]
- Q8)** a) Explain the role of phyto-technology in value addition to biodiversity through chemo prospection. [5]
b) Discuss the significance of forest industries. [5]



Total No. of Questions : 8]

SEAT No. :

P2875

[4732]-4004

[Total No. of Pages :2

M.Sc. -II

BOTANY

BO- 4.4: Plant Pathology

(2013 Pattern) (Credit System) (New) (Semester - IV)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat labelled diagrams must be drawn wherever necessary.*

- Q1)** a) Comment on viral diseases of plants. [4]
b) Give an account of pathogenicity of necrotrophs. [4]
c) What are post harvest diseases? Give examples. [2]
- Q2)** a) How Fungicides are used in control of plant diseases? [4]
b) Comment on forecasting of plant diseases. [4]
c) What are phytotoxins? [2]
- Q3)** a) Comment on hypersensitivity defense reaction. [4]
b) Give an account of breeding methods for improving resistance in plants. [4]
c) Give classificaton of plant diseases on the basis of symptoms. [2]
- Q4)** a) How pathogens affect physiology of host? Explain. [4]
b) Explain phytoalexin synthesis. [4]
c) What are effector molecules? [2]

P.T.O.

- Q5)** a) Explain role of environmental factors in disease development. [5]
b) Comment on nematodal diseases of plants. [5]
- Q6)** a) Write objectives of plant pathology. [5]
b) Comment on mode of infection in plant diseases. [5]
- Q7)** a) Give role of biotechnology in plant pathology. [5]
b) Explain diagnostic methods for detecting pathogens. [5]
- Q8)** a) Discuss bio-control as a effective procedure for disease control. [5]
b) Explain vertical and horizontal resistance in plants. [5]

EEE

Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages :2

P2844

[4732] - 401

M.Sc. - II

BOTANY

**BO-4.1: Plant Resources and Evolution
(2008 Pattern) (Semester - IV) (Old Course)**

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answer any five questions, selecting at least two questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *All questions carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*

SECTION - I

Q1) Give importance of Ethnobotany in India. Comment on energy plantations. **[16]**

Q2) a) Comment on forensic Botany. **[8]**

b) Write how plants acts as source of food and spices. **[8]**

Q3) Solve any two of the following. **[16]**

a) Explain chromatographic technique for phytochemical analysis.

b) Write on resins and dyes.

c) Comment on flower and seed drugs.

Q4) Write short notes (Any two). **[16]**

a) Botanical Gardens.

b) Leaf and Flower drugs.

c) Cellulose, starch and its products.

d) Plant beverages.

P.T.O.

SECTION - II

Q5) Discuss Hardy Weinberg's law w.r.t. concept of evolution. [16]

Q6) a) Write on pteidospermales. [8]

b) Comment on origin of unicellular and multicellular organisms. [8]

Q7) Solve any two of the following. [16]

a) Explain molecular tools in phylogeny.

b) Briefly describe origin of new genes & proteins.

c) Comment on calamitales.

Q8) Write short notes. (Any two). [16]

a) Concept of opairn and Halden.

b) Origin of prokaryotic and eukaryotic cell.

c) Mendelism.

d) Allopatricality and sympatricality.



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P2845

[4732]-402

M.Sc. (Part-II)

BOTANY

BO-4.2 : Applied Botany

(2008 Pattern) (Semester-IV) (Old Course)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Attempt any five questions selecting minimum two from each section.*
- 2) All questions carry equal marks.*
- 3) Draw figures wherever necessary.*

SECTION-I

Q1) Discuss necessity, principles and methodology of sea weed farming.

Q2) Explain on BGA and its commercial applications.

Q3) Solve Any Two of the following:

- a) Give an account of fungal production of growth regulators and vitamins.
- b) Comment on fungal production of antibiotics.
- c) Write on solid substrate fermentation.

Q4) Write short notes on (Any Two):

- a) Mycorrhizae in agriculture.
- b) Fungi in treatment of effluents.
- c) Mycoweedicides.
- d) Lignocellulose conversion in paper industry.

P.T.O.

SECTION-II

Q5) Discuss clinical and control aspects of aspergillosis and candidiasis.

Q6) a) Comment on regression analysis.

b) Give overview of bioinformatics.

Q7) Solve Any Two of the following:

a) Write briefly on t-test.

b) Comment on error level of significance.

c) Explain concept of motif analysis and fermentation.

Q8) Write short notes on (Any Two):

a) Fungi in ayurvedic and homeopathic medicines.

b) Mycetoma.

c) Chisquare test.

d) Data mining methods for sequence analysis.



Total No. of Questions : 8]

SEAT No. :

P2846

[4732] - 404

[Total No. of Pages :2

M.Sc.

BOTANY

BO - 4.42 : Mycology and Plant Pathology - II

(2008 Pattern) (Old Course) (Special Paper - II) (Semester - IV)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any five questions selecting minimum two questions from each section.*
- 2) *All questions carry equal marks.*
- 3) *Draw figures wherever necessary.*

SECTION - I

Q1) What are primary and secondary metabolites of fungi. Add a note on fermentation methods.

Q2) a) Comment on immunoregulators.

b) Give applications of fungi in Homeopathy and Ayurvedic medicines.

Q3) Write any two of the following:

- a) Give applications of fungi in treatment of industrial effluents and detoxification of pesticides.
- b) Comment on antibiotic fermentation.
- c) Explain role of fungi in bioremediation and particulate adsorption.

Q4) Write short notes on (any two):

- a) Fungal SCP.
- b) Mycofungicides and Mycoweedicides.
- c) Industrial alcohol fermentation.
- d) Mycorrhiza and its applications.

P.T.O.

SECTION - II

Q5) What is superficial mycosis and mucormycosis? Add a note on Tinea and its clinical aspects.

- Q6)** a) Write beneficial aspects of fungi.
b) Give contributions of any two plant pathologists.

Q7) Attempt any two of the following:

- a) Give classification of plant diseases based on causal organism.
b) Describe any four symptoms of plant diseases with examples.
c) Write on structural defence mechanism.

Q8) Write short notes on (any two):

- a) Effect of environment on plant diseases.
b) Seed pathology.
c) Role of biotechnology in plant pathology.
d) Effect of plant diseases on photosynthesis.



Total No. of Questions : 8]

SEAT No. :

P2847

[4732] - 405

[Total No. of Pages :2

M.Sc.

BOTANY

**BO - 4.43 : Angiosperm (Special Paper - II)
(2008 Pattern) (Old Course) (Semester - IV)**

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answer any five questions selecting atleast two questions from each section.*
- 2) *Answer to the two sections should be written on separate answer books.*
- 3) *All questions carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*

SECTION - I

Q1) What is arboretum? Describe organization, function and importance of an Arboretum. **[16]**

Q2) Answer the following: **[16]**

- a) Explain basic features of an arborescent form.
- b) Describe elements of wood.

Q3) Solve any two: **[16]**

- a) Comment on gross structure and organization of wood.
- b) Explain Ultra Structure of any one wood element.
- c) Give brief account on distribution of wood elements in T.S.

Q4) Write short notes on any two: **[16]**

- a) Arboretum versus Natural Forest.
- b) VAM application in Arboretum.
- c) Application of androgenesis in Arboriculture.

P.T.O.

SECTION - II

Q5) What is pollen biology? Comment on pollen Ultra Structure. **[16]**

Q6) Answer the following: **[16]**

- a) Explain pollen growth and development.
- b) Describe in vivo and in vitro pollen germination.

Q7) Solve any two of the following: **[16]**

- a) Comment on Androgenesis and Gynogenesis.
- b) Explain ultra structure of Endosperm.
- c) Give brief account on artificial pollination.

Q8) Write short notes on any two of the following: **[16]**

- a) Embryo rescue.
- b) In vitro fertilization.
- c) Polyembryony.



Total No. of Questions : 8]

SEAT No. :

P2848

[4732] - 406

[Total No. of Pages :2

M.Sc. - II

BOTANY

BO - 4.44 : Plant Physiology - II

(2008 Old Pattern) (Special Paper - II) (Semester - IV)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt any five questions selecting minimum two from each section.*
- 2) *All questions carry equal marks.*
- 3) *Draw figures wherever necessary.*

SECTION - I

Q1) How elevated CO₂ & O₂ affects NAR? Add a note on their effect on crop productivity. **[16]**

Q2) a) Write a note on current scenario of crop physiology. **[8]**

b) Give details about haeme & chlorophyll biosynthesis. **[8]**

Q3) Solve any two of the following: **[16]**

- a) What is photorespiration? How it affects crop productivity?
- b) Write on the effect of global warming on plant metabolism.
- c) What are allelochemicals? Write their effects on plants with examples.
- d) Give an account on photochemical reaction.

Q4) Write short notes on any two of the following: **[16]**

- a) Effect of green house gases on NAR.
- b) Importance of crop physiology.
- c) Pigment organization in thylakoid membrane.
- d) Photosynthetic electron transport system.

P.T.O.

SECTION - II

Q5) Explain in detail on the effect of fungal & viral infection on plant metabolism. **[16]**

Q6) a) Give detailed account on 'defense chemicals' & their role.
b) Write about biochemical & photochemical properties of photoreceptors. **[16]**

Q7) Solve any two of the following: **[16]**

- a) Explain circadian clock. Add a note on its regulation.
- b) Write a note on monoculturing & discuss its limitation.
- c) Give detailed account on mycoplasma infections.
- d) What are advantages of transgenics for disease resistance.

Q8) Write short notes on any two of the following: **[16]**

- a) SAR.
- b) R-genes.
- c) Bt - Brinjal.
- d) Soil health.



Total No. of Questions : 8]

SEAT No. :

P2849

[4732] - 407

[Total No. of Pages :2

M.Sc. - II

BOTANY

**BO - 4.45 : Genetics, Molecular Biology and Plant Breeding - II
(2008 Pattern) (Special Paper - II) (Semester - IV)**

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answer any five questions taking at least two questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *All questions carry equal marks.*
- 4) *Neat diagram must be drawn wherever necessary.*

SECTION - I

Q1) Explain different methods for physical mapping.

- Q2)** a) Describe microdissection.
b) Explain DNA finger Printing.

Q3) Write any two of the following:

- a) Nucleic acid purification.
- b) Mitochondrial genome.
- c) DNA amplification in vitro.

Q4) Write short notes on any two:

- a) RT-PCR.
- b) Colony hybridization.
- c) Gene cloning.
- d) Partial digestion.

P.T.O.

SECTION - II

Q5) What are genomic libraries? How are they constructed.

Q6) a) Give different types of abiotic stresses.

b) Describe dehydration avoidance.

Q7) Write any two of the following:

a) Land races for drought resistance.

b) Amino acid balance.

Q8) Write short notes on any two:

a) Elimination of toxic substances.

b) Fatty acids.

c) Domestication of Crops.

d) Mutation breeding.



Total No. of Questions : 8]

SEAT No. :

P2850

[4732] - 408

[Total No. of Pages :2

M.Sc. - II

BOTANY

BO - 4.46 : Plant Biotechnology - II

(Old Course) (Special Paper - II) (Semester - IV) (2008 Pattern)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Answer any five questions selecting atleast two questions from each section.*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) All questions carry equal marks.*

SECTION - I

Q1) Define DNA sequencing. Explain any two Methods of DNA sequencing and add a note on its limitations.

Q2) a) Explain the principle and method of southern blotting.

b) Discuss the role of proteomics in screening of diagnostic markers.

Q3) a) Discuss various blotting techniques and their applications with suitable examples.

b) Describe the importance vectors in gene cloning.

Q4) Write short notes on Any Two of the following:

a) Gene synthesis Machine.

b) Strategies in proteomics.

c) DNA polymorphism.

P.T.O.

SECTION - II

- Q5)** What are genomic libraries? Discuss in brief construction and use of gene library.
- Q6)** a) Explain principle and method of RFLP and add a note on its applications.
b) Discuss role of structural and functional genomics.
- Q7)** a) Describe role of Biotechnology using microbes for leaching of metals.
b) Explain the chromosome walking and jumping mechanism.
- Q8)** Write notes on Any Two:
- a) Applications of biotechnology in Agriculture.
b) Nod genes.
c) Use of biotechnology in waste water treatment.



Total No. of Questions : 8]

SEAT No. :

P2851

[4732] - 409

[Total No. of Pages :2

M.Sc. - II

BOTANY

BO - 4.47 : Plant Biodiversity - II

(2008 Pattern) (Old Course) (Special Paper - II) (Semester - IV)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answer any Five questions, taking at least two questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *All questions carry equal marks.*
- 4) *Neat diagram must be drawn wherever necessary.*

SECTION - I

Q1) Explain the factors affecting ecosystem degradation and loss and enumerate reasons for loss in diversity of tropical forests.

Q2) a) Explain exsitu conservation.

b) Describe the role of UNESCO and WWF in framing policies and methodologies for management of plant biodiversity.

Q3) Solve any two:

- a) Comment on the process responsible for species extinction.
- b) Explain the concept of sustainable development.
- c) Give a brief account on International Biodiversity Law.

Q4) Write short notes on any two:

- a) Loss of biodiversity as an economic process.
- b) Role of universities in Biodiversity conservation.
- c) Ramsar convention.
- d) Ecosystem Restoration.

P.T.O.

SECTION - II

Q5) Explain Biodiversity Act and add a note on distribution of biodiversity information.

Q6) a) Explain role of Biotechnology in biodiversity conservation.

b) Describe ecological impact of biological invasions.

Q7) Solve any two:

a) Comment on CBD.

b) Explain Traditional Resource Rights.

c) Adverse impacts of Biotechnology on biodiversity.

Q8) Write short notes on any two:

a) Ethical and aesthetic values of biodiversity.

b) Bioprospecting.

c) Use of Biodiversity in agroforestry.

d) Plant biodiversity as a source for carbon sinks.



Total No. of Questions : 8]

SEAT No. :

P2852

[4732]-410

[Total No. of Pages : 2

M.Sc.

BOTANY

BO-4.48 : Seed Technology

(Old 2008 Pattern) (Semester-IV) (Special Paper-II)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Answer any five questions taking at least two from each section.*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) All questions carry equal marks.*
- 4) Neat labelled diagrams must be drawn wherever required.*

SECTION-I

Q1) Give an account of seed production of tomato and soyabean.

Q2) Explain:

- a) Characteristics and importance of quality seeds.
- b) Grading and separation of seed.

Q3) Comment on:

- a) Seed treatments.
- b) Packing and handling of seeds.

Q4) Write short notes on Any Two of the following:

- a) Seed village concept.
- b) Maintenance of breeders seeds in self pollinated crops.
- c) True potato seed production.

P.T.O.

SECTION-II

Q5) Explain various methods used to check genetic purity and quality of seed.

Q6) Comment on:

- a) Central seed committee and their functions.
- b) RAPD and RFLP.

Q7) Describe:

- a) Concept and procedure for artificial seed.
- b) DCR and southern hybridization techniques in varietal identification.

Q8) Write short notes on Any Two of the following:

- a) GOT and TZ tests.
- b) Layout of seed processing plant.
- c) Colour separator.



Total No. of Questions : 8]

SEAT No. :

P3067

[4733] - 1001

[Total No. of Pages :2

M.Sc. (Environmental Science)
EVSC-101: Environmental Biology
(2013 Pattern) (Semester - I) (Credit System)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) All questions carry equal marks.*
- 2) Figures to the right indicate full marks.*
- 3) You are advised to attempt not more than 5 questions.*
- 4) Your answers will be valued as a whole.*

- Q1)** a) Explain structure and functions of Ecosystem in detail. [4]
b) Write brief note on scope and development of ecology. [4]
c) Define synecology. [2]
- Q2)** a) What is a population? Give concise account of various characteristics of population. [4]
b) Differentiate between 'r' selected and 'k' selected species with suitable examples. [4]
c) Define ecads and ecotypes. [2]
- Q3)** a) What are ecological pyramids? Explain pyramid of energy in detail. [4]
b) Write a brief note on influence of climatic factor on organisms. [4]
c) Write short note Ecological niche. [2]

P.T.O.

- Q4)** a) What are biomes? Explain terrestrial biomes in detail. [5]
b) Discuss feeding behaviour of plants and animals giving suitable examples. [5]
- Q5)** a) Explain various factor's that affect growth of micro-organisms. [4]
b) Explain in brief, role of microbes in bio-remedial process. [4]
c) Write short note on micro-organisms and their association with plants. [2]
- Q6)** a) Write an essay on population growth and growth curves. [4]
b) Explain single channel energy flow model in detail. [4]
c) Define Vulnerable and extinct species. [2]
- Q7)** a) What is succession? Explain the process of succession in detail. [4]
b) Write short note on 'Energy fixation in ecosystem'. [4]
c) Define phytoplankton and zooplankton. [2]
- Q8)** a) What are biogeo-chemical cycles? Discuss phosphorus cycle in detail. [5]
b) Explain Heinrich walter's Biome climate diagram in detail. [5]



Total No. of Questions : 8]

SEAT No. :

P3068

[4733] - 1002

[Total No. of Pages : 2

M.Sc.

ENVIRONMENTAL SCIENCE

EVSC - 102 : Environmental Chemistry

(Credit System) (Semester - I) (2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *You are advised to attempt not more than 5 questions.*

- Q1)** a) Explain the biological function of RNA. [4]
b) Write the Principle and working of HPLC with suitable diagram. [4]
c) Structure DDT. [2]
- Q2)** a) What are the merit and demerits of NAA. [4]
b) Explain the sample preparation methods for gas chromatography. [4]
c) Lambert Beer's Law. Define. [2]
- Q3)** a) Explain the polarographic techniques in detail. [4]
b) What are the effects of lead in environment in brief. [4]
c) Define cationic surfactants. [2]
- Q4)** a) Explain the properties of modified detergents. [5]
b) Sketch a labelled diagram of colorimeter. [5]
- Q5)** a) Write a note on polymer decay. [4]
b) What are different biological function of enzyme in biodegradation. [4]
c) Define- mRNA. [2]

P.T.O.

- Q6)** a) Explain the role of tracer in isotope dilution methods. [4]
b) Sketch a neat labelled diagram of XRF. [4]
c) Define cationic surfactants. [2]
- Q7)** a) Explain the process of decomposition of synthetic polymer. [4]
b) Explain the methods for distribution of aflatoxins. [4]
c) Define mutation. [2]
- Q8)** a) Explain the biological impact of DDT in ecosystem. [5]
b) Write a note on UN guidelines for classification of waste. [5]



Total No. of Questions : 8]

SEAT No. :

P3069

[4733] - 1003

[Total No. of Pages :2

M.Sc. (Environmental Science)
EVSC-103: ENVIRONMENTAL GEOSCIENCES
(2013 Pattern Credit System) (Semester - I)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Neat diagram must be drawn wherever necessary.*
- 2) Figures to the right indicate full marks.*
- 3) You are advised to attempt not more than 5 questions.*

Q1) a) Describe the internal structure of the earth. **[4]**

b) Give the characteristics of Metamorphic rocks. **[4]**

c) What is meant by “Rock cycle”. **[2]**

Q2) a) Explain the theory of continental drift. **[4]**

b) What are plates? Name the major tectonic plates. **[4]**

c) What is geological time scale? **[2]**

Q3) a) Explain the cycle of erosion. **[4]**

b) Describe any two depositional features with neat diagrams of glaciated region. **[4]**

c) Explain the term “Weathering” **[2]**

Q4) a) Draw a neat, labelled diagram of soil profile. **[5]**

b) Explain land capability classification. **[5]**

P.T.O.

- Q5)** a) Describe the types of aquifers. [4]
b) Discuss the effects of evapotranspiration on groundwater level changes. [4]
c) Enlist the rocks, forming aquifers. [2]
- Q6)** a) Discuss about properties of sea water. [4]
b) Explain how oceanic currents are developed. [4]
c) Enumerate the effects of sea-level changes. [2]
- Q7)** a) Discuss the effects of river erosion. [4]
b) Explain the process of desertification. [4]
c) What are Thunderstorms? [2]
- Q8)** a) Discuss the environmental impacts of river-valley projects. [5]
b) Discuss the causes and effects of slope-failures. [5]



Total No. of Questions : 8]

SEAT No. :

P3070

[4733] -1004

[Total No. of Pages : 2

M.Sc.

ENVIRONMENTAL SCIENCE

EVSC - 104: Environmental Statistics

(2013 Pattern) (Credit System) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any FIVE questions.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks of the respective question.*
- 4) *Use of calculator is allowed.*
- 5) *Statistical tables and graph paper will be provided on request.*

Q1) Define the following terms:

[5 × 2 = 10]

- a) Random variable
- b) Parameter
- c) Bivariate data
- d) Sampling Unit
- e) Population

Q2) a) What are measures of central tendency? Discuss median and mode. **[5]**

b) Draw the less than ogive curve for the following data: **[5]**

Sr. No.	Class	Frequency
1	05-15	5
2	15-25	14
3	25-35	27
4	35-45	36
5	45-55	19
6	55-65	12
7	65-75	8

P.T.O.

- Q3)** a) Discuss the difference between standard deviation and coefficient of variation. [5]
 b) Compute standard deviation for the data given in Q2 b. [5]

- Q4)** a) Define the term correlation coefficient. State the formula and discuss in brief the interpretation from it. [5]
 b) Draw the scatter plot for the data given below and comment on it. [5]

X	15	18	19	45	85	95	105	107	99
Y	23	28	47	65	90	104	102	105	103

- Q5)** a) State the probability distribution of normal distribution. Also discuss its properties. [5]
 b) If $X \sim N(10, 64)$ Compute the probabilities $P[X > 12]$ and $P[-12 < X < 12]$ [5]

- Q6)** a) Discuss the procedure of fitting parabolic curve. [5]
 b) If equation of regression line is $Y = 0.8250 X + 20.2093$ then compute fitted values for data in Q4 b. [5]

- Q7)** a) Discuss Chi square test for goodness of fit. [5]
 b) Test whether attributes A and B are independent in the following contingency table. [5]

	A →	Present	Absent
B			
	Present	45	59
	Absent	75	63

- Q8)** a) Discuss in brief Population growth model. [5]
 b) Discuss in brief Cohort Projection. [5]



Total No. of Questions : 8]

SEAT No. :

P3049

[4733] - 101

[Total No. of Pages :2

**M.Sc. (Environmental Science)
ENV-101: Environmental Geoscience
(2008 Pattern) (Semester - I)**

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate books.*
- 2) All questions carry equal marks.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) All questions are compulsory.*

SECTION- I

Q1) Answer any two of the following.

- a) Explain with suitable example about evolution of earth's atmosphere.
- b) Explain terrestrial radiation effects on earth's atmosphere.
- c) Explain in brief about inversion of temperature and atmospheric stability.

Q2) Attempt any two of the following.

- a) Describe in brief about Cyclones in Indian subcontinent.
- b) Describe in brief Hydrological cycle.
- c) Discuss various factors responsible for drought with Indian examples.

Q3) Answer any two of the following.

- a) Describe inversion of temperature and its effect on atmospheric stability.
- b) Discuss in short Environmental lapse rate.
- c) Describe in detail green house effect on heat budget.

P.T.O.

Q4) Write notes on any two of the following:

- a) Jet stream.
- b) Factors effecting wind.
- c) Chemical composition of atmosphere.

SECTION - II

Q5) Attempt any two of the following.

- a) Define Rock? Give an brief account on the calssification of Metamorphic rocks.
- b) Define Mineral? Give an brief account on the classification of non metallic minerals.
- c) Give an brief account on the soils of India.

Q6) Attempt any two of the following.

- a) Explain various factors responsible for fluctuation of sea levels.
- b) Explain various factors influencing the surface water.
- c) Explain with suitable examples physical factors responsible for weathering of rocks.

Q7) Attempt any two of the following.

- a) Describe with suitable examples about mobility of trace elements.
- b) Describe in short biochemical factors in environmental health.
- c) Describe the concepts of REE and write an account on classification of trace element.

Q8) Write notes on any two of the following.

- a) Hazards associated with volcanoes.
- b) Disease induced by human use of land.
- c) Mitigation measures required to reduce earthquake hazards.



Total No. of Questions : 8]

SEAT No. :

P3050

[4733] - 102

[Total No. of Pages :2

M.Sc. - I

ENVIRONMENTAL SCIENCE

ENV - 102 : Environmental Chemistry

(2008 Pattern) (Semester - I)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *All questions carry equal marks.*
- 4) *All questions are compulsory.*
- 5) *Figures to the right indicate full marks.*

SECTION - I

Q1) Attempt any two from the following:

- a) Explain various segments of environment with suitable diagram.
- b) With suitable diagram explain the process of replication.
- c) Explain how organic compounds acts as carcinogens?

Q2) Answer any two from the following:

- a) With suitable diagram explain the structure and properties of DNA and give its significance in living cell.
- b) Write in detail the segments of Atmosphere.
- c) What are the effects of hydrocarbons on living organisms.

Q3) Attempt any two from the following:

- a) Draw the structure of surfactant? Explain role of detergents in washing process.
- b) Explain in detail the hydrogen bonding in biological systems.
- c) Explain role of microbes in polymer decay.

P.T.O.

Q4) Write a notes on any two:

- a) Aflatoxin toxicity.
- b) Modified detergents.
- c) Health effects of lead.

SECTION - II

Q5) Attempt any two from the following:

- a) Explain process of biomagnification with reference to DDT.
- b) Explain with suitable diagram the phosphorus cycle.
- c) Explain in detail the formation of photochemical smog with reactions involved

Q6) Answer any two from the following:

- a) Explain in detail colorimetric techniques.
- b) Write merits of XRD.
- c) Enlist merits and demerits of ion-exchange chromatography.

Q7) Attempt any two from the following:

- a) What is Neutron activation analysis. Give its limitation.
- b) Explain principle and working of gas chromatography.
- c) Define:
 - i) Gibb's energy
 - ii) Builders in detergents
 - iii) Polymers
 - iv) Surfactant
 - v) Plumbism

Q8) Write short notes on any two:

- a) Solubility product.
- b) Chromatographic techniques.
- c) Distruction of Aflatoxins.



Total No. of Questions : 8]

SEAT No. :

P3051

[4733] - 103

[Total No. of Pages :2

**M.Sc. (Environmental Science)
ENV-103: ENVIRONMENTAL BIOLOGY
(2008 Pattern) (Semester - I) (Old)**

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate books.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) All questions carry equal marks.*

SECTION - I

Q1) Attempt any Two of the following. [10]

- a) What is Ecosystem? Explain terrestrial ecosystem in brief.
- b) What are biogeochemical cycles? Explain phosphorus cycle in detail.
- c) What is food web? Explain with suitable example.

Q2) Attempt any Two of the following. [10]

- a) What are Biomes? Discuss desert biome in detail.
- b) What are wetlands? Give significance of wet land flora.
- c) Discuss the impact of climate change on Indian biodiversity.

Q3) Attempt any two of the following. [10]

- a) Explain the role of communities in wildlife management.
- b) What is Energy flow in Ecosystem? Explain single channeled energy flow model in detail.
- c) Write short note on Role of microbes as anti microbial agents.

P.T.O.

Q4) Write short notes on (any two) **[10]**

- a) Nutritional flux
- b) Ecotone
- c) Food chain.

SECTION - II

Q5) Attempt any two from the following. **[10]**

- a) Discuss IUCN categories in detail.
- b) Write short note on protected Area network in India.
- c) Write short note on tools of data collection.

Q6) Attempt any two of the following. **[10]**

- a) Write short note on 'Project Tiger'.
- b) Discuss coastal and open sea environment.
- c) Define conservation? Explain Human-wildlife conflict in detail with suitable example.

Q7) Answer any two of the following. **[10]**

- a) Discuss Biodiversity out in detail.
- b) Write short note on Endemic species and their status in India.
- c) Write short note on Indian forest and it's significance.

Q8) Write short notes on (Any Two). **[10]**

- a) Ecological niche
- b) CBD.
- c) Red data book.



Total No. of Questions : 4]

SEAT No. :

P3052

[4733] - 104

[Total No. of Pages : 2

M.Sc.

ENVIRONMENTAL SCIENCE

ENV - 104 : Statistical & Research Methods

(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *All questions carry equal marks.*
- 4) *Figures to right indicate full marks.*
- 5) *Statistical tables will be provided on request.*
- 6) *Pocket calculators are allowed.*

SECTION - I

Q1) Solve any two from the following:

[20]

- a) Explain in brief the following terms:
 - i) Classification
 - ii) Sampling
 - iii) Class limits
 - iv) Relative frequency
- b) Explain the term 'dispersion'. What are the different measures of dispersion. Explain any one out of it.
- c) Following is the data on weight (gm)

Weight in gm	Frequency
485-490	12
490-495	18
495-500	20
500-505	22
505-510	24
510-515	04

Compute mean, median and mode.

P.T.O.

Q2) Solve any two of the following: [20]

- a) Partial calculations using data on two variables X and Y.
 $n = 10, \Sigma(x - 45) = -40, \Sigma(x - 45)^2 = 4400, \Sigma(y - 150) = 280,$
 $\Sigma(y - 150)^2 = 167432, \Sigma(x - 45)(y - 150) = 21080$
Compute coefficient of correlation between X and Y.
- b) How many regression lines are there? Explain in brief the properties of regression lines and regression coefficients.
- c) Explain the term 'symmetric distribution'. What are the different measures of skewness used to measure the extent of asymmetry.

SECTION - II

Q3) Solve any two of the following: [20]

- a) Write short notes on:
- i) Parameter
 - ii) Statistic
 - iii) Hypothesis
 - iv) p-value
- b) If $X \sim N(4, 9)$ then compute $P[0 < X < 2], P[-1 < X < 1]$
- c) Explain in detail the procedure of one way analysis of variance.

Q4) Solve any two of the following: [20]

- a) i) Explain the procedure of paired t-test.
ii) Explain the procedure of Chi-square test of independence.
- b) Obtain the solution of the following system of linear equations:

$$\begin{aligned}4x_1 - 2x_2 + 3x_3 &= 0 \\2x_1 + 3x_2 - 4x_3 &= 0 \\-3x_1 + 4x_2 + 2x_3 &= 0\end{aligned}$$

- c) Sample from lots gives following weight (kg)

Sample	1	2	3	4	5	6	7	8	9	10
No										
I	7	6.5	6.5	6.4	6.9	6.3	6.5	7	7.1	6.2
II	7	4	5.1	4.5	6.5	6.7	5.6	6	5.3	6.8

Test whether two lots have same variation. Use 5% LOS.



Total No. of Questions : 8]

SEAT No. :

P3071

[4733] - 2001

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

**EVSC-201: Environmental Pollution & Control - I (Water & Soil)
(2013 New Pattern) (Credit System) (Semester - II)**

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *You are advised to attempt not more than 5 questions.*

Q1) a) Write an account on importance of pollution control laws in water pollution monitoring. **[4]**

b) Write about the consequences of salt water intrusion on water environment. **[4]**

c) Define Eutrophication. **[2]**

Q2) a) Discuss various inorganic pollutants affecting the water quality. **[4]**

b) Explain various types of samples in water quality monitoring. **[4]**

c) What is artificial recharge. **[2]**

Q3) a) Give a brief account of consequences of water pollution on human health. **[4]**

b) Give an account of water pollution with respect to India as a developing country. **[4]**

c) Define Bioaccumulation. **[2]**

P.T.O.

- Q4)** a) Explain the process of restoring a eutrophic lake. [5]
b) Discuss about various economic effects of water pollution. [5]
- Q5)** a) Explain the difference between eutrophic and oligotrophic lake based on various parameters. [4]
b) Explain the process of restoration of a land degraded due to dumping of over burden. [4]
c) Give the examples of Pathogenic bacteria in water. [2]
- Q6)** a) Write in detail the effect of mining on marine ecosystem. [4]
b) Give a brief account of sanitary land fill. [4]
c) Brief where exactly the Geojutes are used. [2]
- Q7)** a) Why eutrophication is also called as 'Aeging of lakes'. [4]
b) Compare water pollution on with respect to lentic and lotic water ecosystems. [4]
c) Define Active Restoration. [2]
- Q8)** a) Write the types, effects and control measures of soil pollution. [5]
b) Explain the importance of water quality standards. [5]



Total No. of Questions : 8]

SEAT No. :

P3072

[4733] - 2002

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

EVSC - 202 : Biodiversity Forestry & Natural Resources

(Credit System) (2013 Pattern) (Semester - II)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Figures to the right indicate full marks.*
- 2) *All questions carry equal marks.*
- 3) *You are advised to attempt not more than 5 questions.*
- 4) *Your answers will be valued as a whole.*

- Q1)** a) Discuss the roles of animals in modern society and economy. [4]
b) Give a detail account of magnitude & distribution of Indian Biodiversity. [4]
c) Explain in short about in situ & exsitu conservation methods for plants. [2]
- Q2)** a) Discuss the value of bio-resources. [4]
b) Write a note on role of wild & domesticated gene-pool in human nutrition. [4]
c) Explain in brief traditional cultivars of crop species. [2]
- Q3)** a) Discuss the value of microbes in medicinal & Scientific research. [4]
b) Discuss different measures for conservation of biodiversity and its sustainable utilization. [4]
c) Explain the terms exploitation & sustainability. [2]
- Q4)** a) Discuss the role of plants in natural ecosystem and life support systems. [5]
b) Write a note on assessment of Biodiversity & its valuation. [5]

P.T.O.

- Q5)** a) Explain the role of eco-tourism. [4]
b) Discuss in detail the environmental cost of human conflict. [4]
c) Short note on WCS. [2]
- Q6)** a) Explain the significance of environment education at academic level. [4]
b) Discuss the value of ecosystems in national economy. [4]
c) Short note on Eco-development. [2]
- Q7)** a) Explain the role of traditional knowledge in forest conservation. [4]
b) Discuss different forest types of India. [4]
c) Write a short note on forest plantation. [2]
- Q8)** a) Discuss the Joint forest Management to explain community participation in forestry. [5]
b) Write a note on strategies for involving communities (urban & rural) in conservation of bio-resources. [5]



Total No. of Questions : 8]

SEAT No. :

P3073

[4733]-2003

[Total No. of Pages : 2

M.Sc.

ENVIRONMENTAL SCIENCE

EVSC-203 : Atmospheric Science

(2013 Pattern) (Semester-II) (Credit System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Your are advised to attempt not more than 5 questions.*

Q1) a) Describe the chemical characteristics of atmosphere. [4]

b) Why there is need to study atmosphere in Environmental Science. [4]

c) Define in brief climatology [2]

Q2) a) Discuss in detail laws of Radiation. [4]

b) Write in detail seasonal radiation distribution on earth. [4]

c) Explain heat budget of earth in brief. [2]

Q3) a) Why dry and wet temperature is measured? [4]

b) Write in brief distribution of temperature in atmosphere. [4]

c) What is Inversion? [2]

Q4) a) Write in brief distribution of pressure on the earth. [4]

b) Discuss in detail factors affecting the wind. [4]

c) What is geostrophic wind. [2]

P.T.O.

- Q5)** a) Write in detail any one theory of precipitation. [4]
b) What is Hadely cell? Explain. [4]
c) Write a note on EI-Nino. [2]
- Q6)** a) What is atmospheric stability? [4]
b) Classify air masses and add a note on front. [4]
c) What is Laps Rate. [2]
- Q7)** a) How globe warming contribute to climate change? Explain. [4]
b) Write a note on ocean current and their effect. [4]
c) Discuss causes and consequence of lightning. [2]
- Q8)** a) Explain the significance of emission inventory. [4]
b) What is plume behavior? [4]
c) Write a note on air quality standards. [2]



Total No. of Questions : 8]

SEAT No. :

P3074

[4733] - 2004

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

EVSC - 204 : Remote Sensing and GIS

(Credit System) (2013 Pattern) (Semester - II)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *You are advised to attempt not more than 5 questions.*

- Q1)** a) Describe the interaction of EMR with the atmosphere. [4]
b) Explain the spectral signatures of different earth objects with their specific characteristics. [4]
c) Define active remote sensing with suitable example. [2]
- Q2)** a) Explain briefly about the satellite orbits. [4]
b) What is along the track scanning? Example with suitable example. [4]
c) List the steps involved in Remote sensing data acquisition. [2]
- Q3)** a) Write briefly on the Lansat series of satellities. [4]
b) Explain the wave theory of Electromagnetic energy. [4]
c) What is radiometric resolution. [2]
- Q4)** a) Explain the factors governing image interpretation. [5]
b) How to measure height on an aerial photograph. [5]

P.T.O.

- Q5)** a) What are the components of GIS. [4]
b) How map projections are classified. [4]
c) What is scale factor in map projection. [2]
- Q6)** a) Explain briefly about the vector data model. [4]
b) Enumerate the types of errors in GIS database. [4]
c) What is Triangulated Irregular Network (TIN). [2]
- Q7)** a) Explain the various Digital Elevation Models. [4]
b) What are the various types of overlays operations in GIS. [4]
c) Describe line in polygon operation. [2]
- Q8)** a) Explain the use of Remote Sensing and GIS in natural hazards and hazard management. [5]
b) Write a note on Remote sensing & GIS application forest cover mapping. [5]



Total No. of Questions : 8]

SEAT No. :

P3053

[4733] - 201

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

ENV-201: Environmental Economics

(2008 Pattern) (Semester - II)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate books.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) All questions carry equal marks*

SECTION - I

Q1) Solve (any two).

[10]

- a) Explain the theory of public goods.
- b) Explain the design of environmental policies.
- c) What is meant by subsidies?

Q2) Justify the statement (any two).

[10]

- a) Direct foreign investment effects local market.
- b) Subsidies support sustainable development.
- c) Climate change effect environmental economic for a long time.

Q3) Answer any two from the following.

[10]

- a) What are the reasons for market failure?
- b) Explain the approaches of sustainable development.
- c) Write a note on renewable resources.

P.T.O.

Q4) Write notes on any two. **[10]**

- a) Foreign direct investment.
- b) Economic growth
- c) Sustainable development.

SECTION - II

Q5) Attempt any two of the following. **[10]**

- a) Discuss the long term impact of climate change on economy.
- b) Economic reform improves market at local level.
- c) Enlist and discuss challenges in Indian economy.

Q6) Justify the statement (any two). **[10]**

- a) Strategic planning is necessary to achieve goals of sustainable development.
- b) Long term impact effects the economy at various stages.
- c) Climate change is responsible for regional vulnerability.

Q7) Answer any two of the following. **[10]**

- a) How long term and short term climate change effects local market.
- b) Write a short note on economy of natural resources.
- c) Write a short note on recent challenges in Indian economy.

Q8) Write notes on any two. **[10]**

- a) Threats of global warming to environmental economy.
- b) Strategic planning for sustainable development.
- c) Market failure effects and causes.



Total No. of Questions : 8]

SEAT No. :

P3054

[4733] - 202

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

ENV - 202 : Water & Wastewater Engineering

(2008 Pattern) (Semester - II)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *All questions carry equal marks.*
- 4) *All questions are compulsory.*

SECTION - I

Q1) Answer any two of the following:

- a) What is water demand? Explain in detail variations in water demand.
- b) Enlist the different methods of population forecasting. Elaborate on any one method.
- c) Comment on the different sources of water, availability and quality.

Q2) Attempt any two of the following:

- a) What is the need of water quality standards? Discuss the different standards for drinking water quality.
- b) What is the impact of growth and development on water quality.
- c) Write a note on collection & pumping of water.

Q3) Answer any two of the following:

- a) Give the principle of sedimentation and its application in water treatment.
- b) Why is it necessary to remove hardness from water? Elaborate on any one method of hardness removal.
- c) Draw a neatly labelled flowchart of a water treatment plant for a city.

P.T.O.

Q4) Write short notes on any two:

- a) Iron removal.
- b) Logistic method of population forecasting.
- c) Ozonization.

SECTION - II

Q5) Answer any two of the following:

- a) What are the Indian standards for disposal of treated wastewater on land? Comment on the use of wastewater for irrigation.
- b) Explain the significance of DO, BOD and TDS in wastewater in detail.
- c) Why is grit removal essential at the beginning of wastewater treatment.

Q6) Attempt any two of the following:

- a) Explain the role of screening in wastewater treatment. What are the different types of screens?
- b) Write about the role of microorganisms in biological treatment in detail.
- c) Write a note on collection and pumping of sewage.

Q7) Answer any two of the following:

- a) Explain with diagram working of trickling filter with merits and demerits.
- b) How can biotechnology be applied for wastewater treatment? Explain with examples.
- c) Give the various sources of wastewater in dairy industry and draw a flowsheet of dairy ETP.

Q8) Write short notes on any two:

- a) Treatment of distillery spentwash.
- b) Sludge recycling.
- c) Anaerobic treatment.



Total No. of Questions : 8]

SEAT No. :

P3055

[4733]-203

[Total No. of Pages : 2

M.Sc.

ENVIRONMENTAL SCIENCE

**ENV-203 : Environmental Pollution : Water & Soil
(2008 Pattern) (Semester-II)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *All questions are compulsory.*

SECTION-I

Q1) Answer Any Two of the following: [10]

- a) Define pollution. Explain types & sources of water pollution.
- b) Explain in detail Indian drinking water standards.
- c) Write a note on water sampling methods to assess its quality.

Q2) Answer Any Two of the following: [10]

- a) Justify, sewage is manly responsible for surface water pollution.
- b) Explain the impacts of industrial waste disposal on marine environment.
- c) Write a note on water quality parameters.

Q3) Answer Any Two of the following: [10]

- a) Explain in detail different health effects of water pollution.
- b) Explain the types sources & consequenses of marine pollution.
- c) Give an account of spesification for disposals of sewage in to sea.

P.T.O.

- Q4) Write a note on Any Two:** [10]
- a) Impacts of Heavy metals on water quality.
 - b) Characteristics of agricultural waste.
 - c) Biological pollutants.

SECTION-II

- Q5) Answer Any Two:** [10]
- a) Explain the types, sources & consequences of soil pollution.
 - b) Explain the impacts of fly ash disposal on soil quality.
 - c) Explain the impacts of sewage & effluent on ground water quality.

- Q6) Answer Any Two:** [10]
- a) Explain types, sources & consequences of solid waste.
 - b) Justify solid waste may be used for energy generation.
 - c) Explain in detail the characteristics of Municipal solid waste.

- Q7) Answer Any Two:** [10]
- a) Explain the types, sources & consequences of Radiation pollution.
 - b) Explain the Biological impacts of ionising radiation.
 - c) Explain in detail methods of Radioactive waste disposal.

- Q8) Write a note on Any Two:** [10]
- a) Radio active decay.
 - b) 3R.
 - c) Impacts of Hazardous waste.



Total No. of Questions : 8]

SEAT No. :

P3056

[4733] - 204

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

ENV - 204 : Environmental Law Ethics & Policy

(Old 2008 Pattern) (Semester - II)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate books.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) All questions carry equal marks.*
- 5) All questions are compulsory*

SECTION - I

Q1) Answer any two of the following: [10]

- a) What are the outcomes of Rio conference?
- b) Discuss the salient features of motor vehicle Act in relation with environment.
- c) What are the important provisions of Air Act, 1981 to protect environment?

Q2) Answer any two of the following: [10]

- a) Write an account on global multilateral agreements carried out to protect environment.
- b) What are the causes and effects of global warming?
- c) What is the role of United Nations authorities to protect global environment?

Q3) Answer any two of the following: [10]

- a) Discuss the salient features of Water Act, 1974.
- b) Write an account on objectives and positive aspects of various antipollution acts.
- c) What are the constitutional provisions to protect Indian environment?

P.T.O.

Q4) Write short notes on any two of the following: [10]

- a) Nairobi Declaration.
- b) Fundamental Right and Duties.
- c) Factories Act.

SECTION - II

Q5) Answer any two of the following: [10]

- a) Differentiate between exploitation of resources and safeguards for conservation.
- b) Discuss the functions of central and state pollution control boards to safeguard the environment.
- c) How economic growth and social development is necessary for sustainable development?

Q6) Answer any two of the following: [10]

- a) Write an account on Hazardous Waste Management rules.
- b) What are the drawbacks involved in traditional evaluation of development?
- c) What are the objectives and strategies under National Environmental Policy?

Q7) Answer any two of the following: [10]

- a) Discuss the basic pillar's of sustainable development.
- b) What is the importance of environmental conservation in sustainable development?
- c) What are the requirements under rule 14 for environmental audit.

Q8) Write short notes on any two of the following: [10]

- a) Cost benefit analysis in environmental studies.
- b) Ecological growth.
- c) Carrying capacity of environment.



Total No. of Questions : 8]

SEAT No. :

P3075

[4733] - 3001

[Total No. of Pages :2

M.Sc. (Environmental Science)

**EVSC-301: Environmental Impact Analysis & Environmental Audit
(2013 Pattern) (Semester - III) (Credit System)**

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *All questions carry equal marks.*
- 2) *Figures to the right indicate full marks.*
- 3) *Your are advised to attempt nor more than 5 questions.*
- 4) *Your answers will be valued as a whole.*

- Q1)** a) Discuss the defination & objectives of EIA. [4]
- b) With reference to EIA notification 2006, explain the four stages of environmental clearance process. [4]
- c) Discuss in brief, the benefits of EIA. [2]
- Q2)** a) How meteorological data is significant in EIA. [4]
- b) Discuss the advantages & disadvantages of public participation in EIA. [4]
- c) Write in brief about accreditation scheme for EIA consultants proposed by Quality council of India. [2]
- Q3)** a) What is base line data in case of EIA? Explain methodology for data collection. [4]
- b) Discuss the overlay and matrices method of impact assessment. [4]
- c) Write a note on secondary data & its sources. [2]

P.T.O.

- Q4)** a) Discuss the impact causing factors, in case of distillery project and propose preventive, controls & mitigation measures. [5]
- b) Which are significant factors for dam (river valley development) project? Explain how? [5]
- Q5)** a) Discuss environment management plans for air & noise aspect for highway projects. [4]
- b) Write a note on ecological studies conducted for collecting baseline data. [4]
- c) Write a short note on pollution audit. [2]
- Q6)** a) With reference to EIA notification 2006, discuss the generic structure of EIA report. [4]
- b) Explain pre & post activities of Environment audit. [4]
- c) Write a short note on ISO 14000. [2]
- Q7)** a) Write a note on consumption & solid waste audit. [4]
- b) Why environment audit is important? [4]
- c) Write in brief on audit tools. [2]
- Q8)** a) Prepare environment management plan for a songe iron industry. [5]
- b) Explain a general structure of disaster management plan. [5]



Total No. of Questions : 8]

SEAT No. :

P3076

[4733] - 3002

[Total No. of Pages :2

M.Sc. - II

ENVIRONMENTAL SCIENCE

(EVSC 302) Environmental Pollution - II: Air, Noise and Radiation

(Credit System) (Semester - III) (2013 Pattern)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *Your are advised to attempt not more than 5 questions.*

- Q1)** a) What are the economic effects of air pollution?
b) What are the consequences of global warming?
c) Write the chemical composition of atmosphere.

- Q2)** a) What is acid rain? Explain its effects on living and non-living things.
b) Write about the noise standards given by CPCB.
c) What is half life period? Write any one example.

- Q3)** a) What is ozone depletion? Explain its effect on living organisms.
b) Explain various way of control of exhaust emissions.
c) Define the dB scale.

- Q4)** a) Write a note on semiconductor detector.
b) Explain working of wet scrubbers with suitable diagram.

- Q5)** a) Explain the health effects of gaseous air pollutants.
b) Explain how nuclear power plants causes air and radiation pollution.
c) Why stratosphere is important?

P.T.O.

- Q6)** a) Explain lead pollution with reference to vehicular exhaust.
- b) Explain preventive measures for industrial air pollution.
- c) What is meant by Acoustic trauma?

- Q7)** a) Explain how air pollution is controlled by Fuel selection.
- b) Explain the three miles disaster.
- c) What is meant by PTS, and TTS.

- Q8)** a) Write a note on 'alternative fuels for Fossil Fuels'.
- b) Write a note on ICRP recommendations.



Total No. of Questions : 8]

SEAT No. :

P3077

[4733] - 3003

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

EVSC-303: Water & Wastewater Technology

(2013 Pattern) (Credit system) (Semester - III)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *You are advised to attempt not more than 5 questions.*
- 5) *Your answers will be valued as a whole.*

- Q1)** a) What is water demand and how is it calculated? [4]
- b) Write about the need for water quality standards for different uses. [4]
- c) Explain briefly the logistic method of population forecasting. [2]
- Q2)** a) Write about the different sources of water? What are the merits and demerits of using ground water. [4]
- b) Give the standards for quality of drinking water. Explain the significance of chlorides & fluorides. [4]
- c) What is the significance of design period? [2]
- Q3)** a) Write a note on the collection and pumping of water. [4]
- b) Describe the principle of flocculation and its application in water treatment. [4]
- c) What is the significance of iron removal from drinking water? [2]

P.T.O.

- Q4)** a) Draw a flowsheet for a conventional water treatment plant for a city. Write the functions of each unit. [5]
- b) Why is it necessary to remove hardness from water? What are the different methods used? Explain the sodalime process in detail. [5]
- Q5)** a) How does the quality of life affect the generation of sewage? [4]
- b) What is the objective of primary treatment of sewage? [4]
- c) Why is it essential to remove oil and grease from wastewater before secondary treatment? [2]
- Q6)** a) What are the impacts of disposal of untreated sewage on a water body? [4]
- b) Explain the working of dissolved air flotation unit. [4]
- c) Give the standards of disposal of treated water into inland surface water. [2]
- Q7)** a) What is the principle of biological treatment of wastewater? Write about suspended growth and attached growth processes. [4]
- b) What are the characteristics of dairy waste water? Give the flow chart of dairy ETP. [4]
- c) Write a short note on sludge drying beds. [2]
- Q8)** a) Write about the different models of anaerobic digestion. Explain any one in detail. [5]
- b) Explain the working of trickling filter with diagram. [5]



Total No. of Questions : 8]

SEAT No. :

P3078

[4733] - 3004

[Total No. of Pages : 2

M.Sc.

ENVIRONMENTAL SCIENCE

EVSC-304: Environmental Law, Ethics & Policy

(New 2013 Pattern) (Credit System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *You are advised to attempt not more than 5 questions.*

Q1) a) What are the limitations to successful implementation of environmental governance? **[4]**

b) Explain the role of constitution in environmental protection. **[4]**

c) State the articles 48A and 58(A). **[2]**

Q2) a) What are the salient features of Air Act, 1981? **[4]**

b) Discuss Biomedical Waste Management rules. **[4]**

c) Mention any four functions of Central Pollution Control Board. **[2]**

Q3) a) Discuss the important provisions of Wildlife (protection) Act, 1972. **[4]**

b) Explain the purpose and features of National Environmental Tribunal Act, 1995. **[4]**

c) What are the ways to handle municipal solid wastes? **[2]**

Q4) a) What are the important aspects to enhance and protect forests under National Forest Policy? **[5]**

b) Write an account on important provisions of National Water Policy. **[5]**

P.T.O.

- Q5)** a) Discuss the principles adopted under world summit on Sustainable Development. [4]
b) Explain the importance of cultural practices in conservation of environment. [4]
c) What is meant by 'Ecocentric View'? [2]
- Q6)** a) What are the various issues involved in environmental ethics? [4]
b) Write an account on Nairobi declaration. [4]
c) Write any two principles of Rio declaration. [2]
- Q7)** a) Discuss the basic pillars of sustainable development. [4]
b) Write an account on provisions under Biological Diversity Act, 2002. [4]
c) What is the importance of biodiversity in line with economic development? [2]
- Q8)** a) Explain the importance of environment protection in sustainable development. [5]
b) Discuss the legal steps taken by India to improve environmental conservation. [5]



Total No. of Questions : 8]

SEAT No. :

P3079

[4733] - 3005

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

EVSC-307: Man & Environmental

(2013 Course) (Semester - III) (Credit System) (Elective)

Time :3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt any five questions.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right side indicate full marks.*

Q1) a) Describe the characters associated with Podobiomes in short. **[4]**

b) Discuss the various characteristic of Fresh Lotic Communities. **[4]**

c) What is an eastuary. **[2]**

Q2) a) Write an account on population density. **[4]**

b) Write in brief about “Primary of cities”. **[4]**

c) Define Mortality. **[2]**

Q3) a) Discuss the food loses effects on soil pollution. **[4]**

b) Distinguish between acute and chronic toxicity of hazardous waste. **[4]**

c) What is meant by Synergism. **[2]**

Q4) a) Justify “Floodplains and Wetland are often mismanaged in environmental protection”. **[5]**

P.T.O.

- b) Justify "It is important to provide recreational space in Urban planning". [5]
- Q5)** a) Discuss the concepts of limiting factors in Himalayan ecosystem. [4]
b) Describe some of the problems associated with modern landfills. [4]
c) State V.E.Shelford Law of tolerance. [2]
- Q6)** a) Explain the liabilities of development indices on policy makers. [4]
b) Explain the principles of Non-governmental Organisation in environmental Acts. [4]
c) What is an Eco-labeling. [2]
- Q7)** a) Give an account on ecological succession. [4]
b) Give the importance of environmental Journalism. [4]
c) Define Kuznets Curves. [2]
- Q8)** Write notes on the following:
- a) Pollution Prevention Hierarchy. [5]
b) Thermal Pollution. [5]



Total No. of Questions : 8]

SEAT No. :

P3080

[4733] - 3006

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

EVSC-308: Environmental Education

(2013 Course) (Semester - III) (Elective) (Credit System)

Time :3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *All questions carry equal marks.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Your are advised to attempt not more than 5 questions.*

Q1) a) How does ESD plays an important role in achiving sustainable development? **[4]**

b) What is the major difference between traditional and community based approaches of teaching? **[4]**

c) What is current ESD system in Indian schools. **[2]**

Q2) a) What are the objectives of 'Nai Taleem'? **[4]**

b) What are the aim and objectives of EE in India? **[4]**

c) Define CEPA. **[2]**

Q3) a) Discuss the linkage between 'Sarva Shiksha Abhiyan' and extra curricular activities at school level. **[4]**

b) Discuss the frame work of National curriculum of EE. **[4]**

c) How an school infrastructure and Habitat is benifited by linkage with sarva shiksha Abhiyan? **[2]**

P.T.O.

- Q4)** a) What are the policies and approaches to public awareness under EE?[5]
b) What is the difference between whole school and whole system approach towards EE? [5]
- Q5)** a) What is the major difference in pre and in service orientation for ESD?[4]
b) Discuss the Role of Mass Communication in EE and ESD. [4]
c) Define collaborative learning and action learning. [2]
- Q6)** Justify the statement.
- a) “Public awareness plays a major role in environmental conservation”. [4]
b) Explain, how curricular and extra curricular approaches both play a vital role in educating students at school level. [4]
c) Define ESD. [2]
- Q7)** a) Enlist modern tools of teaching learning process and discuss the importance. [4]
b) How evaluation of EE and ESD programme is done? [4]
c) What is the difference between Experiencing nature and nature camps?[2]
- Q8)** a) Discuss in brief Role of Educator in EE and ESD. [5]
b) Enlist the policies to public awareness to attain sustainable development. [5]



Total No. of Questions : 8]

SEAT No. :

P3081

[4733] - 3007

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCES

EVSC-309: Environmental Biotechnology

(2013 Course) (Semester - III) (Credit System) (Elective)

Time :3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) All questions carry equal marks.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Your are advised to attempt not more than 5 questions.*

Q1) Answer the following.

- a) Explain the role of environmental biotechnology in degradation of hydrocarbons.
- b) What are biopesticides? Explain its role in abatment of different pollution.
- c) Explain the term Bioleaching.

Q2) Answer the following.

- a) Explain the mechanism of biofuel production.
- b) Write a note on physiological & biochemical characteristics of microbial found.
- c) Write a note on root zone technology.

Q3) Answer the following.

- a) Explain the Nutrient medias of microbes with different types.

P.T.O.

- b) Explain the microbial adaptations to environmental conditions.
- c) Explain immobilization of enzyme.

Q4) Answer the following.

- a) Explain role of Environmental biotechnology in conservation of endangered plant species.
- b) Justify genetically modified plants are more resistance to pathogens & pests.

Q5) Answer the following.

- a) Define Bioremediation? Explain role of Bioremediation in abatement of water pollution.
- b) Write a note on Bioindicators in water pollution.
- c) Write a note on heavy metal degradation.

Q6) Answer the following.

- a) What is Biosafety? Write about biosafety regarding GMOS.
- b) Explain the different applications of Biosensors.
- c) Write a note on air pollution indicators.

Q7) Answer the following.

- a) Explain the different techniques used for Bacterial isolations.
- b) Explain the diversity of microorganism with special reference to prokaryots & Eukaryots.
- c) Gene pool & Gene Bank.

Q8) Answer the following.

- a) Discuss in detail biocomposting of agricultural waste.
- b) Write an account on water pollution indicator organism.



Total No. of Questions : 8]

SEAT No. :

P3082

[4733] - 3008

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

**EVSC-310: Environmental Resource Monitoring
(2013 Course) (Semester - III) (Credit System) (Elective)**

Time :3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *All questions carry equal marks.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *You are advised to attempt not more than 5 questions.*

Q1) a) What is Air Pollution? Give an account on site selection for air pollution studies. **[4]**

b) Write brief note on Electrostatic Precipitator. **[4]**

c) What are toxic elements? **[2]**

Q2) a) Describe the oxides of nitrogen and their effects with suitable examples. **[4]**

b) Explain the role of micronutrients in soil fertility. **[4]**

c) Write brief note on useful soil microbes. **[2]**

Q3) a) What is significance of Electric conductivity? State its need in analysis. **[4]**

b) What are different methods of determination of forest inventory. **[4]**

c) Write short note on soil carbon & it's significance. **[2]**

Q4) a) Comment on "wetlands are an important water resources". **[5]**

b) Comment on "forest resources are depleting very rapidly". **[5]**

P.T.O.

Q5) Write short notes on

- a) Wildlife census. [4]
- b) Extractable potassium & its role. [4]
- c) Soil profile. [2]

Q6) a) Give an account of handling and storage of soil samples. [4]

- b) What is Noise? Describe the principle & working of sound level meter. [4]
- c) Enlist various safety practices for monitoring of River pollution. [2]

Q7) a) Write an essay on gaseous stack monitoring in detail. [4]

- b) What is climate and weather? Explain the various parameters involved in weather monitoring. [4]
- c) Unit of measurement of Noise. [2]

Q8) a) Discuss the role of Remote sensing in wildlife monitoring with suitable examples. [5]

- b) Elaborate methods of measurement of diameter and girth of trees. [5]



Total No. of Questions : 8]

SEAT No. :

P3057

[4733] - 301

[Total No. of Pages :2

**M.Sc. (Environmental Science)
ENV-301: Air Pollution and Climate Change
(2008 Pattern) (Semester - III)**

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate books.*
- 2) All questions carry equal marks.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) All questions are compulsory.*

SECTION- I

Q1) Answer any two of the following. **[10]**

- a) What are the sources of air pollution?
- b) Describe the reactions in the stratosphere.
- c) What are the primary and secondary air pollutant? Discuss with examples.

Q2) Attempt any two of the following. **[10]**

- a) What are the effect of air pollution?
- b) Describe the method of air pollution control.
- c) What is point and non-point source of air pollution?

Q3) Answer any two of the following. **[10]**

- a) Write a note on green house effect.
- b) Write sources of aerosoles & their effects on human.
- c) What are the causes of air pollution in cement industries?

P.T.O.

Q4) Write short notes (any two). **[10]**

- a) Monitoring method of NO₂
- b) Earth umbrella.
- c) Effect of SO₂ on plants.

SECTION - II

Q5) Answer any two of the following. **[10]**

- a) Enlist in detail methods of air pollution control.
- b) Describe the structure and working of scrubbers.
- c) Write principle of ESP and add a note on its working.

Q6) Attempt any two of the following. **[10]**

- a) What are the different steps involved in absorption of gases.
- b) What is fabric filter? Write its working in detail.
- c) Write the principle and working of cyclon collectors.

Q7) Attempt any two of the following. **[10]**

- a) What is UNFCCC? Write its background and scope.
- b) What is carbon trading? How it helps to control the emissions?
- c) What are the problems arises duet. globe warming?

Q8) Write short notes (any two). **[10]**

- a) Advantages and disadvantages of Inertial seperators.
- b) Effect of air pollution on properties.
- c) IPCC



Total No. of Questions : 8]

SEAT No. :

P3058

[4733] - 302

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

**ENV - 302 : EIA and Environmental Auditing
(Credit System) (2008 Pattern) (Semester - III)**

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate books.*
- 2) *All questions carry equal marks.*
- 3) *Your answers will be valued as a whole.*
- 4) *All questions are compulsory.*

SECTION - I

Q1) Solve any two:

- a) Write a note on history of EIA process. **[5]**
- b) Discuss in detail, the screening & scoping stages of EIA notification 2006. **[5]**
- c) Explain the methodology of baseline data collection. **[5]**

Q2) Solve any two:

- a) Explain the procedure of public hearing. With the help of EIA notification 2006. **[5]**
- b) How the data related Meteorology / climate useful in impact assessment. **[5]**
- c) Prepare an impact assessment statement for a housing complex / township project. **[5]**

Q3) Solve any two:

- a) Elaborate in detail the role of sugar industry in socio-economic development of rural Maharashtra. **[5]**
- b) Prepare Environment Management plan for a thermal power plant. **[5]**
- c) While preparing an EIA report, which aspects are included in project description chapter. **[5]**

P.T.O.

Q4) Write a short note on any two of the following:

- a) Appraisal stage of EIA notification 2006. [5]
- b) Primary and Secondary data collection. [5]
- c) Principles of 'National Environment Policy 2006.' [5]

SECTION - II

Q5) Solve any two:

- a) Discuss Ad-hoc & checklist method of impact assessment. [5]
- b) Describe in detail the impact of mining activity. [5]
- c) Discuss the important impact causing factors of dam/river valley development project. [5]

Q6) Solve any two:

- a) Which are different audit types? Explain the basic structure of an audit. [5]
- b) With reference to environment audit explain the process of consumption and pollution audit. [5]
- c) In case of housing complex/township project which factors are important for its appraisal. [5]

Q7) Solve any two:

- a) What is an ISO-14000? Describe the important clauses covered under the system. [5]
- b) Explain pre & post audit activities. [5]
- c) Discuss the significance of Environment audit. [5]

Q8) Write a note on any two:

- a) Project benefit analysis. [5]
- b) Hazardous waste audit. [5]
- c) Overlay method of impact assessment. [5]



Total No. of Questions : 8]

SEAT No. :

P3059

[4733] - 303

[Total No. of Pages :2

**M.Sc. (Environmental Science)
ENV-303: REMOTE SENSING AND GIS
(2008 Pattern) (Old) (Semester -III)**

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *All questions carry equal marks.*
- 5) *All questions are compulsory.*

SECTION - I

Q1) Answer any two of the following. [10]

- a) Describe various components of remote sensing.
- b) What are the applications of electromagnetic radiations in remote sensing studies?
- c) What is photogrammetry? Explain various techniques involved in it.

Q2) Answer any two of the following. [10]

- a) What are the applications of remote sensing in environmental studies?
- b) Describe in detail various types of remote sensing.
- c) What are the various ways of data acquisition in remote sensing?

Q3) Answer any two of the following. [10]

- a) What is scattering? Explain various types of it.
- b) Write in detail about platforms and sensors with suitable examples.
- c) Discuss in detail about Indian remote sensing programme.

Q4) Write short notes on any two of the following. [10]

- a) Earth Resource Satellite.
- b) Supervised Classification.
- c) Global positioning system.

P.T.O.

SECTION - II

Q5) Answer any two of the following. **[10]**

- a) Define geographical information system. Explain how is it helpful to create maps.
- b) Write in detail about spatial analysis in GIS.
- c) Discuss in detail about raster data and vector data.

Q6) Answer any two of the following. **[10]**

- a) What are various techniques involved in digitization of data?
- b) Discuss in detail various components of GIS?
- c) Explain various methods of data input and editing in GIS.

Q7) Answer any two of the following. **[10]**

- a) What are the applications of GIS in environmental sciences?
- b) How can we create agriculture map using GIS? What are spatial features of it?
- c) What are various stages involved in generation of digital terrain model (DTM).

Q8) Write short notes on any two of the following. **[10]**

- a) Data Base Management system in GIS.
- b) Scales of Measurements in GIS.
- c) Data Modelling.



Total No. of Questions : 8]

SEAT No. :

P3060

[4733] - 304

[Total No. of Pages : 2

M.Sc.

ENVIRONMENTAL SCIENCE

ENV - 311 : Restoration Ecology

(Old) (2008 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *All questions carry equal marks.*
- 4) *All questions are compulsory.*

SECTION - I

Q1) Answer any two:

[10]

- a) Write the advantages and disadvantages of phytoremediation process.
- b) Explain the process of controlling leachate from the landfill site and add a note on its importance.
- c) Define Restoration and write the importance of Ecosystem Restoration.

Q2) Attempt any two:

[10]

- a) Discuss about the adaptive restoration of wetlands.
- b) What is Bioremediation? Give its types.
- c) Explain the process of phytomining with respect to metals.

Q3) Answer Any two:

[10]

- a) Explain the method of removal of odour using Bioscubber.
- b) What is Rhizosphere degradation & write its significance.
- c) Explain the concept of constructed wet lands in waste water treatment.

P.T.O.

Q4) Write short notes (Any Two): **[10]**

- a) Organic fertilizers.
- b) Reference Ecosystem.
- c) Role of Mangrooves in coastal ecosystem.

SECTION - II

Q5) Answer any two: **[10]**

- a) Explain the role of NGOs in watershed development programme.
- b) Explain the role of Agroforestry in ecological balance.
- c) Explain how watershed Management is important in changing socio-economic conditions of villages with suitable examples.

Q6) Attempt any two: **[10]**

- a) Explain the process of stream conservation by constructing spring Box.
- b) Explain the role of watershed management committees in watershed programme.
- c) Explain the concept of ethnosilvicultural refugia.

Q7) Answer any two: **[10]**

- a) Explain various soil conservation measures.
- b) Write the role of Gram Sabha in developing sustainable village communities.
- c) Briefly explain land use classification.

Q8) Write short notes: **[10]**

- a) Drain line treatment.
- b) Agrosilvopastoral systems.
- c) Roof top harvesting techniques.



Total No. of Questions : 8]

SEAT No. :

P3061

[4733] - 305

[Total No. of Pages : 2

M.Sc.

ENVIRONMENTAL SCIENCE

ENV - 312 : Biodiversity and Conservation

(Old 2008 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *All questions carry equal marks.*

SECTION - I

Q1) Answer any two:

[10]

- a) Explain the concept of assessing and Monitoring of specific taxon.
- b) Explain the correlation between Biodiversity and ecosystem functioning.
- c) Discuss different levels of Biodiversity.

Q2) Attempt any two:

[10]

- a) Discuss about IUCN classification of threatened species.
- b) Explain with examples habitat fragmentation.
- c) Write the levels of inventory techniques and information provided by it for assessing Biodiversity.

Q3) Answer Any two:

[10]

- a) Discuss various Biogeographic zones in India.
- b) Write in brief about causes of species extinction.
- c) Write an account of keystone species.

P.T.O.

Q4) Write short notes (any two): [10]

- a) Levels of Biodiversity.
- b) Ecosystem services.
- c) Hotspots of Biodiversity.

SECTION - II

Q5) Answer any two: [10]

- a) Write in brief about IUCN protected area Management categories.
- b) Discuss the Project Tiger.
- c) Define and explain cryopreservation.

Q6) Attempt any two: [10]

- a) Write different ex-situ methods of conservation.
- b) Discuss in detail the role of educational institutions in Biodiversity conservation.
- c) What are Indegenous knowledge systems and how to protect them under IPR.

Q7) Answer any two: [10]

- a) Write the importance of Ramzar convention in conservation of wetlands in India.
- b) Give an account of National Parks in India with respect to Flagship species.
- c) Write in detail about convention on Biodiversity.

Q8) Write short notes: [10]

- a) Community participation in conservation.
- b) People's Biodiversity Regester.
- c) In situ conservation.



Total No. of Questions : 8]

SEAT No. :

P3083

[4733] - 4001

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

**EVSC-401: Environmental Toxicology, Health and Safety
(2013 Pattern) (Semester - IV) (Credit System)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.*
- 2) Figures to the right indicate full marks.*
- 3) All questions carry equal marks.*
- 4) You are advised to attempt not more than 5 questions.*

Q1) a) What are various aspects of ISO 18000?

b) Explain EHS aspects involved in developmental projects with suitable example.

Q2)a) Explain methods used for risk management.

b) What are the sources of Arsenic and its compounds? Explain its toxicity.

Q3) a) Explain safety and health issues of any one industry.

b) What are the different methods used to assess toxicity.

Q4) a) What is meant by epidemic diseases? Explain any one waterborne epidemic disease.

b) Explain the terms

i) Accute toxicity

P.T.O.

- ii) LD₅₀
- iii) Hazard
- iv) Toxicology
- v) Xenobiotic

Q5) a) Explain any one airborne disease.

b) Explain chemical carcinogenesis with suitable example.

Q6) a) Explain role of WHO in public health and hygiene development.

b) Explain methods used for lethal toxicity studies.

Q7) a) Discuss role of NGO's in environmental sanitation.

b) Explain health effects of volatile organic compounds with suitable examples.

Q8) a) Write a note on safety standards and management systems.

b) Write a note on Hazardous waste management.



Total No. of Questions : 8]

SEAT No. :

P3084

[4733] - 4002

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

**EVSc - 402 : Restoration Ecology & Water Shed Management
(Credit System) (2013 Pattern) (Semester - IV)**

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.*
- 2) Figures to the right indicate full marks.*
- 3) All questions carry equal marks.*
- 4) You are advised to attempt not more than 5 questions.*

Q1) Answer the following:

- a) Define ecorestoration and explain why it is required.
- b) Explain methodology of investigation of surface springs.

Q2) Explain with suitable examples.

- a) Major functions/phenomena of ecology are useful in restoration activity.
- b) Watershed characterization.

Q3) Explain the significance of the following:

- a) Succession process in restoration.
- b) Waterbalance and hydrological equations.

Q4) Justify the statements:

- a) Restoration of mangrove habitat offers protection to coastal areas.
- b) Bunding is an important activity in watershed management.

P.T.O.

Q5) Explain in detail with significance:

- a) Check dam and gully plug.
- b) Wetlands and their restoration.

Q6) Answer the following:

- a) Discuss any two major problems associated with watershed management.
- b) Explain role of key species in restoration of degraded forest patches.

Q7) Attempt the following:

- a) Describe the restoration process of any open cast mining.
- b) Explain watershed functions in detail.

Q8) Write short notes on:

- a) In situ conservation.
- b) Live hedges.



Total No. of Questions : 8]

SEAT No. :

P3085

[4733]-4003

[Total No. of Pages : 2

M.Sc.

ENVIRONMENTAL SCIENCE

**EVSC-403 : Waste and Hazardous Waste Management
(2013 Pattern) (Semester-IV) (Credit System)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *All questions carry equal marks.*
- 3) *You are advised to attempt not more than 5 questions.*

Q1) a) What are environmental effects of solid waste?

b) Write in detail characteristics of MSW.

Q2) a) '3R principle in solid waste management is important'. Discuss.

b) Differentiate between hazardous and non-hazardous waste.

Q3) a) What are the criteria in selection of landfill site?

b) Write the problems in handling of bio-medical waste.

Q4) a) Discuss the methods of composting in brief.

b) What are the advantages of SW disposal for environment?

Q5) a) Why medical waste handled differently than other waste?

b) What are the point and non-point sources of SW in textile industry.

Q6) a) Explain the process of pyrolysis in detail.

b) Write a note on government policy for SW management.

P.T.O.

- Q7)** a) What is E-waste? Give their sources in detail.
b) What is risk associated with radioactive waste?

Q8) Write a note on:

- a) Mining and solid waste.
b) Disposal of fly ash.



Total No. of Questions : 8]

SEAT No. :

P3086

[4733] - 4004

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

EVSC - 404 : Renewable & Non-Renewable Energy

(2013 Pattern) (Credit System) (Semester - IV)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *You are advised to attempt not more than 5 questions.*

- Q1)** a) Explain the problems associated with coal Exploration, processing, Transportation & use.
b) Give an account on Biogas generation system.
- Q2)** a) Write a note on Energy sources & Their classification.
b) Explain briefly solar collector & concentrators.
- Q3)** a) Explain in brief condition required for Thermonuclear Fusion.
b) Enumerate the different main application of Solar Energy. Describe hot water supply system.
- Q4)** a) What are the main component of Flatplate collectors? Explain its working.
b) Explain indetail waste to energy conversion system.
- Q5)** a) Describe the main consideration in selecting site for wind energy generation.
b) What is mean by anaerobic digestion? Explain briefly factors affecting rate of biodegradation.

P.T.O.

- Q6)** a) What are the applications, advantages & disadvantages of Geothermal energy?
b) What is tidal energy? Explain Operational methods of utilization of tidal energy.

- Q7)** a) What is wave energy? Write a note on wave energy conversion by Floats.
b) Give an account on hydroelectricity.

Q8) Write short note:

- a) Hazards related to hydropower.
b) Solar cooker.



Total No. of Questions : 8]

SEAT No. :

P3087

[4733] - 4005

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

**EVSC-406: Forestry and Habitat Management
(2013 Pattern) (Semester - IV) (Credit System)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *You are advised to attempt not more than 5 questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

Q1) a) What is 'forest stand'? Explain structure and dynamics of forest stand.

b) Explain forest types in India.

Q2) a) Explain gene conservation by in situ method.

b) What are the objectives of social forestry.

Q3) a) Explain the role of forestry in soil conservation.

b) Explain in brief 'Volume estimation of stand'.

Q4) a) Give details of biotic components of forest ecosystem.

b) Explain silviculture practices in cold desert.

Q5) a) Explain the traditional methods of silviculture.

b) What are impacts of developmental projects on environment.

P.T.O.

Q6) a) Give an account of indirect services of forest.

b) Write a note on 'Forest Working plan'.

Q7) a) What are principles of forest Economics.

b) Enumerate Ecological factors influencing vegetation.

Q8) Write Note on:

a) Shifting cultivation

b) NTFPs.



Total No. of Questions : 8]

SEAT No. :

P3088

[4733] - 4006

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

EVSC-407: Environmental Economics

(2013 Pattern) (Semester - IV) (Elective) (Credit System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Your are advised to attempt not more than 5 questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

Q1) a) “Environment and Economy linked together”. Explain.

b) Define social-cost and discuss the problems associated with it with examples.

Q2) a) Discuss in detail functional role of economic instrument in protection of environment.

b) How incentives and subsidies decrease the quality of environment?

Q3) a) “Economy is dependant on exploitation of resources”. Justify.

b) Why cost-benefit analysis is important for protection of Environment?

Q4) a) Differentiate between renewable and non-renewable resources.

b) Discuss the need of Environmental policies for protection.

Q5) a) Write in brief note on concept and issue in sustainable development.

b) Enlist the various methods of environmental quality measurement.

P.T.O.

- Q6)** a) What is IPCC? Write its role in protection of environment.
b) Write a note on Kyoto protocol.

- Q7)** a) What is demand and supply? How it can be maintained?
b) What is sustainable development? How it is achieved?

Q8) Write Short Notes on:

- a) Theory of public good.
b) Component of strategic planning.



Total No. of Questions : 8]

SEAT No. :

P3089

[4733] - 4007

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

**EVSC-408: Sustainable Agriculture and Organic Farming
(2013 Pattern) (Semester - IV) (Credit System)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Your are advised to attempt not more than 5 questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

Q1) a) Comment on traditional sustainable agricultural practices.

b) Discuss 'post Green Revolution' situation in India.

Q2) a) Discuss role of research and education in sustainable agriculture.

b) Explain biological methods of weed management.

Q3) a) Discuss principles of organic farming.

b) Comment on economics of sustainable agriculture.

Q4) a) Explain types of composting.

b) Explain the role of grazing herbivores in sustainable agriculture system.

Q5) a) What is integrated pest management? Explain it with suitable examples.

b) Discuss factors influencing vermicomposting process.

P.T.O.

- Q6)** a) Discuss concept of Extensive Livestock.
b) Comment on Integrated farming system model for wetlands.

- Q7)** a) What is permaculture?
b) Discuss the need of sustainable agriculture in India.

Q8) Write Short Notes on:

- a) Agroecology
b) Biofertilizers.



Total No. of Questions : 8]

SEAT No. :

P3090

[4733] - 4008

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

**EVSC-409: Wild life Management and Conservation
(2013 Pattern) (New Course) (Semester - IV) (Credit System)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Your are advised to attempt not more than 5 questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

Q1) a) What is the importance of wild flora and fauna in development of human society?

b) What is meant by in-situ conservation? Discuss with suitable examples.

Q2) a) What is ornithology? Why is it important to study?

b) Write an account on zoogeography of India.

Q3) a) What is population ecology? How is it important in wildlife studies?

b) Which are major rivers of India? Discuss biodiversity existing in it.

Q4) a) What are national parks? Discuss the measures taken by government to conserve biodiversity in it.

b) Discuss in detail on wild flora of India.

Q5) a) What are the various legal measures taken by India for management of wildlife?

b) Describe, why should wildlife of India be protected?

P.T.O.

Q6) a) Discuss biodiversity of any two protected areas of our country?

b) Describe coastal biodiversity of India.

Q7) a) Discuss the role of various authorities created under Indian and state forest services.

b) What are biodiversity registers? How are they useful in management of wild life?

Q8) a) Biodiversity of Indian Islands.

b) Mammalogy.



Total No. of Questions : 8]

SEAT No. :

P3062

[4733] - 401

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

ENV-401: Environmental Toxicology, Health & Safety

(2008 Pattern) (Semester -IV)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate books.*
- 2) All questions carry equal marks.*
- 3) Your answers will be valued as a whole.*
- 4) All questions are compulsory.*

SECTION - I

Q1) Answer any two of the following.

- a) What is health and safety risk management? Explain its importance.
- b) What are the safety concerns in development projects.
- c) Write about interactive approach between health, safety and environment.

Q2) Attempt any two of the following.

- a) How are safety standards integrated in management systems?
- b) Discuss the strategies for reducing accidents in industries.
- c) What are the responsibilities of workers in a participatory awareness programme.

Q3) Answer any two of the following.

- a) What are the National standards for emissions from chemical industries.
- b) Describe the role of authority in mitigation of risks.
- c) Write a note on industrial environmental conditions.

P.T.O.

Q4) Write short note on any two.

- a) ISO 18000
- b) Public awareness for safety
- c) Potential health risk in industries

SECTION - II

Q5) Answer any two of the following.

- a) What is toxicology? Explain the significance of toxicology in environmental sciences.
- b) What is hazardous waste and what are its effects on flora and fauna.
- c) Describe the effects of lead toxicity.

Q6) Attempt any two of the following.

- a) Explain with examples about carcinogens and mutagens.
- b) How are toxic materials classified?
- c) What is biological warfare? What are the agents used.

Q7) Answer any two of the following.

- a) Write a note on measures to safeguard water sources.
- b) What is the role of WHO? Add a note on malaria control programme.
- c) How do public awareness programmes help in maintaining sanitation.

Q8) Write short notes on any two.

- a) Epidemics
- b) Anticancer drugs
- c) Historical perspective of toxicology



Total No. of Questions : 8]

SEAT No. :

P3063

[4733] - 402

[Total No. of Pages :2

M.Sc.

ENVIRONMENTAL SCIENCE

ENV - 402 : Watershed Management

(2008 Pattern) (Semester - IV)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *All questions carry equal marks.*
- 4) *All questions are compulsory.*

SECTION - I

Q1) Answer any two of the following:

- a) Discuss the objectives of watershed management.
- b) Describe hypsometric analysis of watershed.
- c) Explain the importance of linear aspects in watershed management.

Q2) Attempt any two of the following:

- a) Describe the classification of gullies according to land capability.
- b) Discuss the techniques used for promotion of people's participation in Watershed development.
- c) Describe soil conservation practices for cultivation lands.

Q3) Solve any two of the following questions:

- a) Mention the main features of plan formulation in watershed.
- b) Discuss the environmental impact of Watershed Project.
- c) Mention the guidelines of Watershed resource appraisal.

Q4) Write notes on: (Any two)

- a) Resource Map.
- b) Coding of watershed.
- c) Precipitation and infiltration.

P.T.O.

SECTION - II

Q5) Answer any two of the following:

- a) Explain the role of different factors affecting wind erosion.
- b) Discuss the effects of terraces and graded bunds in restricting soil erosion.
- c) Enumerate different conservation measures for non-aerable lands and describe contour trenches and temporary structures.

Q6) Attempt any two of the following:

- a) Describe in brief different techniques of water harvesting.
- b) Discuss different mechanical methods used to control soil and water erosion.
- c) Explain the benefits of conservation horticulture.

Q7) Answer any two of the following:

- a) Describe the measures taken to develop the watershed at Hiwre Bazar.
- b) Discuss about the role of NGO's in Watershed development.
- c) Explain the measures taken for rehabilitation of Mining areas.

Q8) Write notes on: (Any two)

- a) Energy Plants.
- b) Tillage practices.
- c) Benefits of Agroforestry.



Total No. of Questions : 8]

SEAT No. :

P3064

[4733]-403

[Total No. of Pages : 2

M.Sc.

ENVIRONMENTAL SCIENCE

**ENV-411 : Forestry and Habitat Management
(2008 Pattern) (Semester-IV)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *All questions carry equal marks.*

SECTION-I

Q1) Attempt Any Two from the following:

- a) What are the importance of participatory approach in social forestry.
- b) Explain the ecological factors influencing vegetation.
- c) What is tribology? Explain the stages of tribal economy.

Q2) Justify Any Two:

- a) “Development activity influencing forest resources”.
- b) In economy nature has utmost importance.
- c) Tribal education policy will improve the conservation programme.

Q3) Attempt Any Two from the following:

- a) Explain the Maharashtra Government initiatives for forest conservation.
- b) Explain the importance of tree improvement.
- c) Write in brief the biotic components of forest.

P.T.O.

Q4) Write short notes on Any Two:

- a) Seed technology.
- b) In-situ conservation.
- c) Deforestation.

SECTION-II

Q5) Attempt Any Two from the following:

- a) Enlist the objectives of forest management system.
- b) Mention various methods to control forest damage.
- c) Discuss the forest-policy, 1927.

Q6) Solve Any Two from the following:

- a) What are demerits of shifting cultivation.
- b) Explain the impact of climate change on forest.
- c) What is importance of public participation in tree plantation?

Q7) Attempt Any Two from the following:

- a) What are the Salient-features of wild life protection act?
- b) How biotechnology will help in forest resource preservation and propagation.
- c) How GIS and remote sensing technique will help in management programme.

Q8) Write short notes on Any Two:

- a) Forest working plan.
- b) Tribology.
- c) Forest-engineering.



Total No. of Questions : 8]

SEAT No. :

P3065

[4733]-404

[Total No. of Pages : 2

M.Sc.

ENVIRONMENTAL SCIENCE

**ENV-412 : Environmental Planning and Management
(2008 Pattern) (Optional) (Semester-IV)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *All questions carry equal marks.*
- 4) *All questions are compulsory.*

SECTION-I

Q1) Answer Any Two of the following: [10]

- a) 'Public willingness play important role in development' justify.
- b) Discuss in brief parameters required for urban planning.
- c) "Natural resources are essential for development". Comment the statement.

Q2) Attempt Any Two of the following: [10]

- a) What is planning? Write concept of rural planning.
- b) What are the problem associated with rehabilitation?
- c) Give significance of regional planning.

Q3) Answer Any Two of the following: [10]

- a) Write a note on social willingness.
- b) Comment on development verses population.
- c) Discuss historical importance of planning.

P.T.O.

- Q4)** Write short notes on (Any Two): **[10]**
- a) Problems in planning.
 - b) Socio-economic issues.
 - c) Impact of planning.

SECTION-II

- Q5)** Answer Any Two of the following: **[10]**
- a) “Environment and development are two side of same coin” comment on the statement.
 - b) “EIA is essential tool for planning”. Justify.
 - c) Enlist the Indian laws for protection of environment.

- Q6)** Attempt Any Two of the following: **[10]**
- a) Is biomedical waste require planning? Explain.
 - b) Discuss the role of pollution control board in protection of environment.
 - c) “Industrial development depends on natural resources”. Comment.

- Q7)** Answer Any Two of the following: **[10]**
- a) What is development? Discuss parameter considered for it.
 - b) Write in detail methods of conservation.
 - c) “Environmental policies are essential for any development” comment on statement.

- Q8)** Write short notes (Any Two): **[10]**
- a) Exploitation of environment.
 - b) National policy on environment.
 - c) Impact of environmental protection act.



Total No. of Questions : 8]

SEAT No. :

P3066

[4733]-405

[Total No. of Pages : 2

M.Sc.

ENVIRONMENTAL SCIENCE

ENV-413 : Environmental Management System

(2008 Pattern) (Semester-IV)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *All questions carry equal marks.*
- 5) *All questions are compulsory.*

SECTION-I

Q1) Answer Any Two of the following: [10]

- a) What are the basic requirements for environment management.
- b) Write an account on planning and implementation stages of EMS.
- c) Discuss with suitable examples cradle to grave and cradle to gate approach.

Q2) Answer Any Two of the following: [10]

- a) Write an account on environmental design requirements for urban planning.
- b) What are the benefits of implementation of EMS.
- c) How inventory and environmental impacts are assessed in LCA studies?

Q3) Answer Any Two of the following: [10]

- a) Write an account on economic costs associated with implementation of EMS.
- b) What are the important aspects involved in review and improvement stages of EMS?
- c) What are the limitations involved in LCA studies.

P.T.O.

Q4) Write short notes on Any Two of the following: [10]

- a) Procedure for LCA.
- b) Plan, Do, Check and Act model.
- c) Well to wheel approach.

SECTION-II

Q5) Answer Any Two of the following: [10]

- a) Write an account on benefits associated with municipal solid waste management.
- b) Explain the recent trends in hazardous waste management in relation with India.
- c) Discuss various steps involved in pyrolysis. Also mention benefits of it.

Q6) Answer Any Two of the following: [10]

- a) What are various steps involved in municipal solid waste management?
- b) What are benefits and limitations associated with sanitary land fills?
- c) Discuss the various health impacts caused by hazardous wastes.

Q7) Answer Any Two of the following: [10]

- a) With suitable diagram discuss the process of incineration of hazardous wastes.
- b) Write an account on present situation of MSW in India.
- c) Discuss the reasons behind improper treatment of municipal solid wastes.

Q8) Write short notes on Any Two of the following: [10]

- a) Possible areas for improvement in MSW.
- b) Engineering principles behind solid waste treatment.
- c) Types and properties of hazardous wastes.

Total No. of Questions : 8]

SEAT No. :

P2912

[4734] - 1001

[Total No. of Pages :3

M.Sc. -I

ELECTRONIC SCIENCE

**EL1UT-01: Mathematical Methods in Electronics and Network Analysis
(2013 Pattern) (Semester - I) (Credit System)**

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of non-programmable calculator is allowed.*

Q1) Answer the following.

- a) Determine the stability of given denominator polynomial $Q(S)$
 $Q(S) = S^3 + S^2 + 2S + 24$ [4]
- b) Define the terms homogeneous and linear differential equations of order two with suitable examples. [3]
- c) Derive the mathematical model of active low pass filter. Assume order of filter one. [3]

Q2) Answer the following.

- a) Solve the difference equation, $f(n+2) + 3f(n+1) + 2f(n) = 0$ with $f(0) = 0$, $f(1) = 1$. [4]
- b) Compare the performance of state variable approach over transfer function approach to analyse a given system. [3]
- c) What are the types of mathematical modelling? List applications of each. [3]

Q3) Solve the following.

- a) What is 'Hurwitz polynomial'. Test the following polynomial
 $P(S) = S^4 + 4S^3 + 8S^2 + 12S + 15$ [4]

P.T.O.

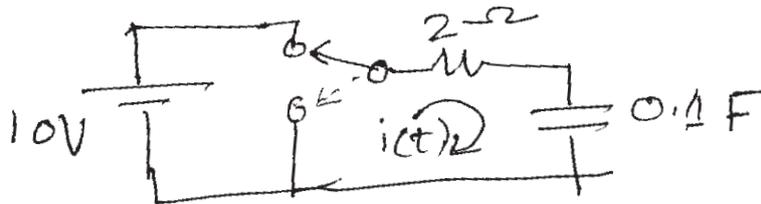
- b) What do you mean by Bessel's function of 1st kind? List some applications. [3]
- c) State and explain Norton's theorem using a suitable example. [3]

Q4) Solve the following.

- a) Find the Laplace transforms of $f(t) = t^n$ and $f(t) = \cos 5(t)$. [4]
- b) Solve the following equation $\frac{d^2x}{dt^2} + \frac{k}{m}x = 0$, where k and m are positive. [3]
- c) How mesh and nodal analysis is used to analyse resistive network. [3]

Q5) Solve the following.

a)



Consider the above circuit. Determine the current $i(t)$ after the switch is closed at time $t = 0$. Assume initial conditions zero. [4]

- b) Represent the cartesian coordinate (8.66, 5, 3.74) in spherical coordinate system. [3]
- c) What is meant by T to π and π to T transformation. [3]

Q6) Solve the following.

a) The Z-transform of a sequence $x(z)$ is given by

$$x(z) = \frac{1}{0.5z^{-2} + 1.5z^{-1} + 1}$$

Determine the first three terms of a sequence. [4]

- b) State final value theorem. Using this theorem, determine the final value of

$$F(s) = \frac{6}{s(s+1)}. \quad [3]$$

- c) Apply the state variable approach to series LCR circuit with the excitation of unit step function. [3]

Q7) Solve the following.

- a) How physical systems can be analyzed by converting them into an electrical equivalent system. Explain using suitable example. [5]
- b) Represent Laplacian of function V in cartesian and cylindrical system. List any two examples of Laplace equation. [5]

Q8) Solve the following.

- a) Determine the inverse Laplace transform of $\frac{1}{s^2(s^2 - a^2)}$ using convolution theorem. [5]
- b) State and prove Maximum power transfer theorem for AC Circuit. [5]



Total No. of Questions : 8]

SEAT No. :

P2913

[4734] - 1002

[Total No. of Pages :4

M.Sc. - I

ELECTRONIC SCIENCE

ELI UT - 02 : Analogue Circuit Design

(2013 Pattern) (Credit System) (Semester - I)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *All the questions carry equal marks.*
- 3) *Use of log table/non-programmable calculator is allowed.*
- 4) *Figures to the right indicate full marks.*

Q1) Attempt the following questions:

- a) A tank circuit has a capacitance of 100pF and an inductor of inductance 100 μ H and resistance 5 Ω . Determine the resonant frequency, quality factor and bandwidth. **[4]**
- b) Draw the diagram of a Wien Bridge oscillator using BJTs and write the expression for its frequency. **[3]**
- c) Find the frequency of oscillations for BJT based RC phase shift oscillator with R = 10k Ω , C = 0.01 μ F and collector resistor of 2.2k Ω . **[3]**

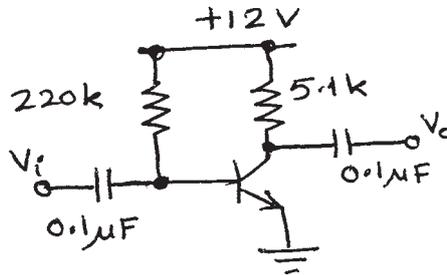
Q2) Attempt the following questions:

- a) Distinguish between Zener breakdown and avalanche breakdown in PN junction diode. **[4]**
- b) Draw the equivalent circuit of an OP-AMP and label it. Draw the ideal voltage transfer curve. **[3]**
- c) Give the design steps for a practical differentiator circuit. **[3]**

P.T.O.

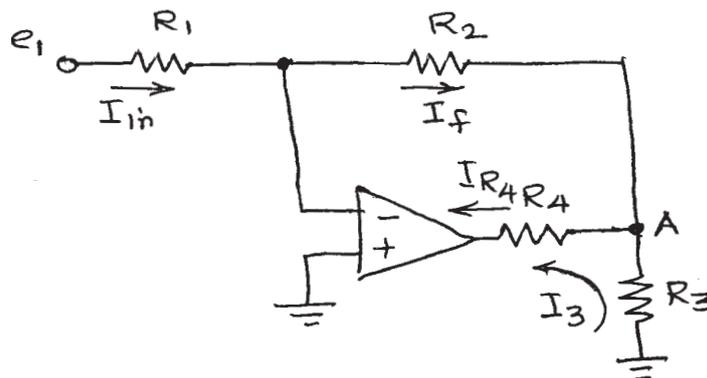
Q3) Attempt the following questions:

- a) For the following CE amplifier, with the transistor $h_{fe} = 60$, $h_{ie} = 500 \Omega$ and $I_c = 3\text{mA}$, draw the hybrid equivalent circuit and determine A_v and Z_i [4]



- b) Show that the following circuit generates through the floating load R_4 , a current that is independent of R_4 and equal to $\frac{e_1 R_2}{(R_1 R_3)}$ [3]

Assume $R_2 \gg R_3$.



- c) Mention the applications of class-C tuned amplifier. [3]

Q4) Attempt the following questions:

- a) Draw the general hybrid model for a two-port active (BJT) network and obtain the expression for current gain and input impedance. [4]
- b) What is a tuned amplifier? Define Q factor of a resonant circuit. [3]
- c) What is a clamper? Explain the working of a clamper with neat circuit diagram and waveforms. [3]

Q5) Answer the following questions:

- a) Draw the diagram of a three OP-AMP instrumentation amplifier and obtain the expression for its output. [4]
- b) With neat diagrams showing the structure of each, explain how the construction of MOSFET is different from JFET. [3]
- c) State the diode current equation and explain each term in it. If the reverse saturation current of a Ge diode at room temperature is $0.3 \mu\text{A}$, determine the diode current for forward bias of 0.15V at room temperature. [3]

Q6) Answer the following questions:

- a) Draw the diagram of a two stage direct coupled amplifier. State one advantage and one disadvantage of direct coupled amplifier. [4]
- b) Discuss how a transistor configuration is selected in a cascade amplifier. [3]
- c) Draw the typical transfer characteristics of JFET and write the expression for saturation drain current. [3]

Q7) Answer the following questions:

- a) Draw the diagram of a single-stage RC coupled BJT amplifier. Let $V_{CC} = 10\text{V}$, $I_C = 4\text{mA}$, $h_{fe} = 100$, $h_{ie} = 1\text{k}\Omega$ and $R_L = 100\text{k}\Omega$.
Calculate R_1 , R_2 , R_C & R_E . [5]
- b) What are active filters? What are their advantages over passive filters? Compare between Butterworth and Chebyshev filters. Draw the circuit diagram of second order low-pass Butterworth filter and write its design equations. [5]

Q8) Answer the following questions:

- a) Draw the emitter feedback bias circuit for a BJT with $V_{CC} = 10V$, $R_C = 1.5k\Omega$, $R_B = 270k\Omega$ and $R_E = 1k\Omega$, $\beta=50$. Determine stability factor S , base current I_B , collector current I_C , collector-to-emitter voltage V_{CE} , collector voltage V_C , emitter voltage V_E , base voltage V_B and base-to-collector voltage V_{BC} . **[5]**
- b) Draw the diagram of a Hartley oscillator and obtain the condition for maintenance of oscillations i.e. $h_{fe} = \frac{L_1 + M}{L_2 + M}$.

Where L_1 and L_2 are inductances of the tank circuit and M is mutual inductance between L_1 and L_2 .

[Given: the general equation for oscillator is $h_{ie}(Z_1 + Z_2 + Z_3) + Z_1Z_2(1 + h_{fe}) + Z_1Z_3 = 0$ where Z_1, Z_2 & Z_3 are impedances in the L_C tank circuit with Z_3 parallel to Z_1 and Z_2 .] **[5]**



Total No. of Questions : 8]

SEAT No. :

P2914

[4734] - 1003

[Total No. of Pages :3

M.Sc.

ELECTRONIC SCIENCE

EL1UT03: Digital System Design

(2013 Pattern) (Semester - I) (Credit System)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any FIVE Questions.*
- 2) All questions carry equal marks.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

Q1) Attempt the following.

- a) Explain how to implement digital system on FPGA? **[4]**
- b) Design 3-bit Gray to binary code converter. **[3]**
- c) Explain with block diagram an architecture of CPLD. **[3]**

Q2) Attempt the following.

- a) Write a task 'cntr' with clk, reset as input and 20 bit q as output. Write verilog module, for 4-bit binary counter, use task 'cntr' to convert 4MHz clock to 1Hz to be used for 4-bit binary counter. **[4]**
- b) Draw block diagram of 4-bit up/down ripple counter. Draw timing diagram. **[3]**
- c) Implement the following using PLA. **[3]**

$$f_1(x,y,z) = \sum_m(0,3,4,7)$$

$$f_2(x,y,z) = \sum_m(1,2,5,7)$$

P.T.O.

Q3) Attempt the following.

- a) Write verilog module 'arithmetic_unit (sum, max, operand 1, operand 2) along with functions 'function [4:0] sum 1 and 'function [3:0] max 1' defined in the same module, to find sum and largest of two 4-bit unsigned numbers. [4]
- b) Explain with circuit diagram, 4-bit parallel adder using full adders. Explain, how you can obtain overflow bit in the circuit? [3]
- c) Draw the circuit diagram and timing diagram of 3-bit synchronous counter using JK flip flops. [3]

Q4) Attempt the following.

- a) What is priority encoder? Write verilog code for 8 to 3 priority encoder using behavioral modeling. (Use 'casex' statement). [4]
- b) Draw block diagram of Moore model of sequential circuit. Write excitation table and draw state diagram of JK flip flop. [3]
- c) Draw the circuit diagram of DRAM memory cell. What is \overline{RAS} and \overline{CAS} in DRAM? How many address lines will be required in 512×8 DRAM. [3]

Q5) Attempt the following.

- a) Write verilog code for 4-bit Johnson counter using behavioral modeling. Write test bench for 4-bit Johnson counter. [4]
- b) Draw the basic architecture of FPGA. How FPGA differs from CPLD. [3]
- c) Design 5-bit magnitude comparator using 4-bit magnitude comparator. [3]

Q6) Attempt the following.

- a) Write the comparison between 'blocking' and 'non-blocking' assignment statements. Write 'shiftreg(din, dout, clk, rst)' verilog module using blocking assignment statements for 4-bit serial in serial out shift register. [4]

- b) Minimize the following expression using K-map and realize using basic gates. [3]

$$y = \sum m (0,1,2,5,7,8,9,11,14)$$

- c) Write the types of semiconductor read only memories. Explain, how data is stored in EEPROM? [3]

Q7) Attempt the following.

- a) Write verilog module for half subtractor. Write verilog code for full subtractor using structural modeling. (Use half subtractor module). [5]
- b) Design 3-bit synchronous gray counter using T flip flops. [5]

Q8) Attempt the following.

- a) Write verilog code, using behavioural modeling for one digit BCD counter, displaying count on common cathode seven segment display. [5]
- b) Draw schematic of MOS SRAM memory cell. Explain bit read and bit write operation for MOS SRAM memory cell. [5]



Total No. of Questions : 6]

SEAT No. :

P2915

[4734] - 1004

[Total No. of Pages : 2

M.Sc.

ELECTRONIC SCIENCE

**EL1UT - 04 : Advanced 'C' Programming
(2013 Pattern) (Credit System) (Semester - I)**

Time : 2½ Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *Attempt any four of the following questions.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right side indicate full marks.*

Q1) Answer the following:

- a) Discuss the scope and lifetime of variables. **[4]**
- b) Explain Union in C with suitable example. **[3]**
- c) Write a C program to arrange given n numbers in ascending order. **[3]**

Q2) Answer the following:

- a) Explain with suitable example various loop statements in C. **[4]**
- b) Explain the term 'Function overloading'. **[3]**
- c) Explain with example the difference between 'call by value' and 'call by reference'. **[3]**

Q3) Answer the following:

- a) State the different modes in which file can be opened. Write a C-program to read five numbers from File and calculate sum of them. **[4]**
- b) Define the dynamic memory allocation. State the various memory allocation functions. **[3]**
- c) Write a C program to make LED ON and OFF, interfaced to the D0 pin of the parallel port. **[3]**

P.T.O.

Q4) Answer the following:

- a) Give the significance of Keyword 'class'. State its components. [4]
- b) Write a program to draw the symbol of NPN transistor using graphics statements. [3]
- c) Explain with example the command line argument in C-language. [3]

Q5) Answer the following:

- a) Explain with the help of suitable example the concept of Pointer in C-language. [5]
- b) Write a C-program to calculate the resistance value using color code.[5]

Q6) Answer the following.

- a) Write a short note on 'Video adaptor and Video graphics modes'. [5]
- b) Explain with suitable example the functions available in C-language to access the parallel port. Write a program to read ON-OFF switch interfaced to the D3 pin of the parallel port. If switch is open then print, 'open', otherwise print 'close'. [5]



Total No. of Questions : 5]

SEAT No. :

P2904

[4734] - 101

[Total No. of Pages :3

M.Sc.

ELECTRONIC SCIENCE

EL1UT01: Foundation of Semiconductor Devices

(2008 Pattern) (Semester - I)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Draw neat diagrams wherever necessary.*
- 3) Use of non-programmable calculator is allowed.*

Q1) Attempt any two of the following.

[2×8 = 16]

- a) Discuss the distribution function and Fermi energy with suitable example by drawing discrete energy states for the system.
- b) What is tunneling effect? Explain with energy diagram this effect in p-n junction diode.
- c) Describe qualitatively formation of extrinsic semiconductor. Draw the corresponding energy band diagrams with doping Boron into Silicon.

Q2) Attempt any two of the following.

[2×8 = 16]

- a) What is the importance of equivalent models in electronics? Explain in detail Ebers Moll model for BJT device.
- b) Explain the construction of MOSFET. Discuss small dimension effects with respect to the threshold voltage and narrow width.
- c) What is MESFET? Draw cross section diagram of idealized MESFET. Explain D-MESFET and E-MESFET in brief.

P.T.O.

Q3) Attempt any four of the following.

[4×4 = 16]

- a) “The formation and growth of single crystal material is an important part of semiconductor technology”, comment.
- b) Explain why the polarity of Hall voltage changes depending on the conducting type of semiconductor. Describe the concept of excess carrier concentration and recombination across a semiconductor junction.
- c) What is the junction capacitance of a reverse biased p-n junction diode? Explain it in detail.
- d) Explain with diagram switching characteristics of a BJT. List important parameters from it.
- e) Draw a diagram for MOSFET as two port network. Obtain relation for channel conductance and mutual conductance.

Q4) Attempt any four of the following.

[4×4 = 16]

- a) What are Miller indices? State its significance in crystallography.
- b) Find momentum and energy of a particle with mass 5×10^{-31} kg and de Broglie wavelength of 180 \AA .
- c) In a bipolar transistor biased in the forward active region the base current is $6.0 \mu\text{A}$ and the collector current is $500 \mu\text{A}$. Determine α , β and i_E .
- d) Write short note on MOS technology.
- e) Draw large signal equivalent circuit for pnp BJT based on Ebers Moll equations. Discuss from it how Ebers Moll equations are used in SPICE program.

Q5) Attempt any four of the following.

[4×4 = 16]

- a) Show that the total electron concentration and the total hole concentration are functions of the quasi Fermi levels.
- b) Assume that the Fermi energy is $0.27eX$ above the valence band energy. The value of N_v for silicon at $T = 300K$ is $N_v = 1.04 \times 10^{19} \text{ cm}^{-3}$. Calculate the thermal equilibrium hole concentration in silicon at $T = 400K$ with this data.
- c) What is a PIN photodiode? Explain its working in brief.
- d) Explain with diagram I-V characteristics of SCR. Define various switching terms from it.
- e) Write short note on modern FET structures.



Total No. of Questions : 5]

SEAT No. :

P2905

[4734] - 102

[Total No. of Pages :3

M.Sc.

ELECTRONIC SCIENCE

EL1 UT - 02 : Analog Circuit Design and Analysis

(2008 Pattern) (Semester - I)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicates full marks.*
- 3) *Draw neat diagram wherever necessary.*
- 4) *Use of log-table / non programmable calculator is allowed.*

Q1) Attempt any two:

- a) i) Plot location of poles and zeros for the given network function. [4]

$$N(s) = \frac{s(s + 2)}{(s + 3)(s + 1 + j1)(s + 1 - j1)}$$

- ii) In a two port network, explain in brief the different forms of transfer function. [4]
- b) i) Derive an expression for Hybrid-Parameters. [4]
- ii) Explain in brief, the response of series RLC circuit to step sinusoidal voltage. [4]
- c) i) Write a short note on Frequency compensation (phase compensation) for an op-amp. [4]
- ii) Discuss the effect of negative feedback on input impedance, output impedance and harmonic distortion of an amplifier. [4]

Q2) Attempt any two:

- a) i) Explain the working of cascade current source. What is its advantage? [4]
- ii) Discuss the concept of temperature independent biasing. Explain the working of Zener diode bias reference. [4]

P.T.O.

- b) i) Write a short note on All Pass Filter. [4]
- ii) Distinguish between Butterworth and Chebyshev filter approximation techniques. [4]
- c) i) Explain the working of current mirror circuit. How to improve its performance? [4]
- ii) Find the Laplace Transform of $\sin(at)$. [4]

Q3) Attempt any two:

- a) i) Derive an ideal performance equation for an op-amp integrator circuit. State its output equation including error terms due to offset voltage and bias current. [4]
- ii) Explain the working of Half Wave precision Rectifier Circuit. Why it is better than ordinary half-wave rectifier? [4]
- b) i) What are Equalisers? Explain shunt equaliser in brief. [4]
- ii) What do you mean by Attenuator? State its usefulness. Draw the circuit for symmetrical Π -attenuator with design equations. [4]
- c) i) Explain in brief Band-Gap Voltage Reference. [4]
- ii) Explain the working of transducer Bridge-Amplifier. [4]

Q4) Attempt any two:

- a) i) What is the need of Low power design? Enlist the parameter values of a typical micropower op-amp. [4]
- ii) State the output voltage and current capabilities of a general purpose op-amp IC. With circuit diagram explain the method to improve the output voltage capacity of an op-amp. [4]
- b) i) Design a second order high pass active filter with gain for the following specifications op-amp is in non-inverting mode. [4]
 $A_{CL} = 5$; $F_C = 5\text{kHz}$ and $C = 0.01\ \mu\text{f}$.
- ii) With proper timing diagram, explain acquisition time (t_{AQ}) and aperture time (t_{AP}) for sample-and-Hold amplifier. [4]

- c) i) Write short note on shielding and guarding techniques in op-amp circuits. [4]
- ii) What is the need of high-power op-amp? Explain the relevant parameters of a typical high power op-amp. [4]

Q5) Attempt any two:

- a) i) An audio signal is oversampled with a 12-bit ADC. Find the oversampling frequency needed to achieve a 16-bit resolution. Calculate the maximum signal to noise ratio. [4]
- ii) Explain in brief the working of charge redistribution ADC. [4]
- b) Explain R-2R Ladder type D-A conversion technique. What do you mean by current mode ladder and voltage mode ladder? [8]
- c) Explain with block diagram, the working of first order sigma-delta analog to digital converter. [8]



Total No. of Questions : 5]

SEAT No. :

P2906

[4734] - 103

[Total No. of Pages :4

M.Sc. (Electronic Science)

**EL 1UT03: INSTRUMENTATION AND MEASUREMENT
TECHNIQUES**

(2008 Pattern) (Semester - I)

Time : 3Hours]

[Max. Marks : 80

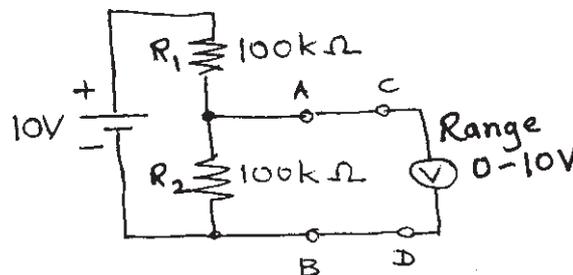
Instructions to the candidates:

- 1) All the questions are compulsory.
- 2) All questions carry equal marks.
- 3) Draw neat labeled diagrams wherever necessary.
- 4) Use of Logarithmic Table and non-programmable calculator is allowed.

Q1) a) Answer any Two of the following questions:

[2×6 = 12]

- i) State different sources of noise. Explain the terms noise factor and noise figure. An amplifier whose bandwidth is 100KHz has a noise power spectrum density input of 7×10^{-21} J. If the resistance is $50K \Omega$ and amplifier gain is 100, what is the noise output voltage?
- ii) In the following circuit diagram, determine the voltage indicated by the meter, if the meter resistance is $100K \Omega$. What is the % error in measurement? How can the error be reduced? Draw the circuit that can be connected between the points AB and CD to reduce the error.



- iii) What is the need for chopper-stabilised amplifier? Draw the block diagram of Chopper-stabilised amplifier and explain its working.

P.T.O.

b) Answer any ONE of the following questions: [1×4 = 4]

i) Explain the following terms:

Linearity, threshold, dead zone and span, with suitable examples.

ii) Draw the block diagram of a DC signal conditioning system and explain the function of each block.

Q2) a) Answer any TWO of the following questions: [2×6 = 12]

i) What is the difference between OP-AMP subtractor and Instrumentation amplifier? Explain with suitable circuit diagrams and expressions for output voltage of each circuit.

ii) Explain the construction and working of LVDT with suitable diagrams. How will you use LVDT to measure force/weight? Draw the necessary diagram.

iii) Explain the construction and working of Dead Weight Gauge. How can it be used to calibrate a pressure gauge?

b) Answer any ONE of the following questions: [1×4 = 4]

i) A first order temperature sensor is suddenly dipped in a water bath at 100°C. After 3 seconds the sensor reads 80°C. Find the time constant of the sensor. Calculate the error in temperature sensing after 2 seconds.

ii) How can a potentiometer be used to measure angular displacement? Derive the expression for its voltage 'V' output with change in angle ' θ '.

Q3) a) Answer any TWO of the following questions: [2×6 = 12]

i) What is a strain gauge? What are the different types of strain gauges? Write the expression for gauge factor and explain each term. How will you use strain gauges to make a column-type load cell? Draw the necessary schematic diagram showing the arrangement and circuit diagram(of the bridge) and give the expression for the output of the bridge.

- ii) What is a 'synchro'? With the help of a neat diagram explain the use of synchros in error detection of rotary shaft.
- iii) With a neat diagram explain the construction and working of 'thermocouple gauge'. What is it used for?

b) Answer any ONE of the following questions: [1×4 = 4]

- i) A strain gauge is bonded to a steel beam 10cm long and having a cross section of 4 square cm. Young's modulus of steel is 205G N/m^2 . Unstrained resistance of strain gauge is 120Ω and gauge factor is 2. When the load is applied to the beam gauge resistance becomes 120.01Ω . Find the change in length of steel beam and hence the load applied
- ii) What is 'linearity' of a transducer? An LVDT gives output voltage 1.5V at maximum displacement. At a load of $0.5 \text{M} \Omega$ the deviation from linearity is maximum and it is $\pm 0.003 \text{V}$ from a straight line through origin. Find the linearity at the given load.

Q4) a) Answer any TWO of the following questions: [2×6 = 12]

- i) Explain the principle and working of an ultrasonic flow meter with necessary diagram and expression for fluid velocity. What are its advantages?
- ii) What are thermocouples? State and explain the Laws of Thermocouples. What is 'cold junction compensation'?
- iii) Draw the block diagram of a sound-level meter and write the function of each block. Which are the transducers used in sound-level meter? Explain the working of any one transducer used in sound-level meter, with necessary schematic diagram.

b) Answer any ONE of the following questions: [1×4 = 4]

- i) With a neat diagram explain the working principle of Hot-wire Anemometer.
- ii) What is a spectrum analyser? Draw the block diagram of a spectrum analyser and explain its working.

Q5) Answer any FOUR of the following questions:

[4×4 = 16]

- a) Draw the block diagram of a DVM (digital volt meter) and explain the working of any one type of ADC used in DVM.
- b) Draw the block diagram of a servo-type pen recorder and explain the function of each block.
- c) How can a D' Arsonval movement be used to measure peak-value and average-value of an a.c. signal? Draw the necessary circuit diagrams.
- d) What is telemetry? Give any two methods of land-line telemetry which are commonly used and compare them with voltage telemetry.
- e) Describe different methods used for pulse modulation in telemetry.
- f) Compare TDM and FDM as applied to telemetry. Draw the block diagram of TDM telemetry system.



Total No. of Questions : 8]

SEAT No. :

P2916

[4734] - 2001

[Total No. of Pages :3

M.Sc. -I

ELECTRONIC SCIENCE

**EL2UT-05: Applied Electromagnetics, Microwaves and Antennas
(2013 Pattern) (Credit System) (Semester -II)**

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *All the questions carry equal marks.*
- 3) *Use of log table/non-programmable calculator is allowed.*
- 4) *Figures to the right indicate full marks.*

Q1) Answer the following questions:

- a) A rectangular wave guide has dimensions $a = 2.5\text{cm}$, $b = 1.5\text{cm}$. The medium inside the waveguide has $\sigma = 0$, $\epsilon = \epsilon_0$ and $\mu_r = 1$. Write the expression for cut off frequency for this waveguide. Determine the cut off frequency for TE_{01} mode. **[4]**
- b) What are waveguides? Why are waveguides preferred for transmission of energy at very high frequency? **[3]**
- c) Explain the term 'Radiation pattern' of an antenna with suitable diagrams. **[3]**

Q2) Answer the following questions:

- a) With the help of a neat graphical sketch explain the electric field and magnetic field configuration in a rectangular wave guide for TE_{10} mode. **[4]**
- b) Determine the propagation constant of a transmission line with $R = 2\Omega/\text{m}$, $G = 0.5\text{mmh}_0/\text{m}$, $L = 6\text{nH}/\text{m}$, $C = 0.27\text{pF}$ and $f = 1\text{GHZ}$. **[3]**
- c) Why are circular waveguides generally avoided? **[3]**

Q3) Answer the following questions:

- a) State the Maxwell's equations in time-domain and obtain the expressions for electric and magnetic wave equations in time domain. **[4]**

P.T.O.

- b) What is 'skin depth'? The attenuation constant of a medium for a certain plane wave is 0.3 Np/m . Find its skin depth. [3]
- c) Determine the transmission coefficient for a transmission line with characteristic impedance of $70 + j 50 \Omega$ and load impedance of $75 + j 0.01 \Omega$. [3]

Q4) Answer the following questions:

- a) Starting with Maxwell's equations obtain the expression for Poynting theorem. [4]
- b) State the boundary conditions for the boundary between a perfect conductor and a perfect dielectric and explain each condition. [3]
- c) What are waveguide components? Enlist different waveguide components (atleast 4). [3]

Q5) Answer the following question:

- a) What is the maximum effective area of a $\frac{\lambda}{2}$ wire dipole operating at 30MHz? [Given: Radiation resistance = 73Ω and $\eta = 120 \pi$]. [4]
- b) Find the expression for transmission coefficient for a uniform plane wave normally incident on plane boundary between two dielectrics. [3]
- c) What is a multi-mode step index optical fibre? [3]

Q6) Answer the following questions:

- a) What is Gunn effect? Draw the schematic diagram of n-type GaAs diode and explain the same. [4]
- b) A loss-less line has characteristic impedance of 50Ω and is terminated in $R_L = 75 \Omega$. The source connected to the line has output impedance of 50Ω . Find the input impedance. [3]
- c) How is Smith chart used for impedance matching in transmission lines? [3]

Q7) Answer the following questions:

- a) Using distributed circuit theory, draw the schematic circuit of two conductor transmission line, and obtain the transmission line equations in phasor form of frequency domain. [5]
- b) With the help of a neat diagram explain in brief, working of a Klystron. Where are Klystrons used? [5]

Q8) Answer the following questions:

- a) Obtain the expression for transmission coefficient $\left(= \frac{2Z_l}{Z_l + Z_o} \right)$ for a transmission line terminated with load impedance Z_l and with voltage and current waves travelling along the line given by [5]

$$V = V_+ e^{-\gamma z} + V_- e^{+\gamma z}$$

$$I = I_+ e^{-\gamma z} + I_- e^{+\gamma z}$$

- b) For a lossless medium, $\eta = 60\pi$, $\mu_r = 1$ and $\vec{H} = -0.1$

$$\cos(\omega t - z)\hat{a}_x + 0.5 \sin(\omega t - z)\hat{a}_y \text{ A / m. Calculate } \epsilon_r \text{ and } \omega. \quad [5]$$



Total No. of Questions : 8]

SEAT No. :

P2917

[4734]-2002

[Total No. of Pages : 4

M.Sc.

ELECTRONIC SCIENCE

**EL2UTO6 : Instrumentation and Measurement Techniques
(2013 Pattern) (Semester-II) (Credit System)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions*
- 2) *All questions carry equal marks..*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of non programmable calculator is allowed.*

- Q1)** a) Draw the block diagram of generalized instrumentation system. Explain function of each element used in the system. **[4]**
- b) Show that the first order electrical system for step input gives an output $e_0 = E_i[1 - \exp(-t/\tau)]$. **[3]**
- c) List the transducers used for pressure measurement. Explain working principle of capacitive displacement pressure transducer. **[3]**
- Q2)** a) Explain the following: **[4]**
- i) Accuracy,
 - ii) Precision,
 - iii) Resolution and
 - iv) Linearity.
- b) Describe the constructional details of resistance potential divider and derive the expression for its output voltage when connected across a meter of finite impedance. **[3]**
- c) What are the errors in measurement system. Explain static error and static correction. A thermometer reads as 45°C and static correction is -0.08°C. Determine the true value of the temperature. **[3]**

P.T.O.

- Q3)** a) What is strain gauge? State different types of strain gauges. Derive the equation for gauge factor of resistive strain gauge in terms of Poisson's ratio. [4]
- b) The out put of LVDT is connected to voltmeter, reads 5V through an amplifier whose amplification factor is 250. An output of 2 mV appears across the terminals of LVDT, when the core moves through a distance of 0.5mm. Calculate the sensitivity of LVDT and that of the whole setup. The millivoltmeter scale has 100 divisions. The scale can be read to 1/5th of a division. Calculate resolution of the instrument in mm. [3]
- c) Describe ultrasonic transducer used for displacement measurement. [3]
- Q4)** a) Describe construction and working of resistance thermometer. What are the materials used in RTD. State advantages of RTD. [4]
- b) Explain working principle of Ionization gage. [3]
- c) Describe the applications of measurement system with suitable example. [3]
- Q5)** a) For Gaussian distribution of data, define the following- [4]
- i) Deviation,
 - ii) Standard deviation,
 - iii) Precision indet and
 - iv) Standard deviation of mean.
- b) List the primary pressure sensing elements and force summing devices. Explain any one with diagram. [3]
- c) Explain loading effect due to shunt connected instrument, state the condition imposed on the measuring instrument to minimize the loading effect. [3]

- Q6)** a) Define dynamic response of a system. Describe steady state and transient response of first order electrical system. [4]
- b) A thermometer has a time constant of 3.5 sec, it is quickly taken from a temperature 0°C to a waterbath of temperature of 100°C. What temperature will be indicated by the thermometer after 1.5 sec? [3]
- c) Classify transducers according to- [3]
- i) Transduction principle,
 - ii) Primary and secondary and
 - iii) Active and passive.

- Q7)** a) A steel cantilever of 0.25mm wide and 4mm thick. [5]
- i) Calculate the value of deflection at the free end of it when a force of 25N is applied at this end.
 - ii) An LVDT with sensitivity of 0.5V/mm is used, the voltage read on 10V voltmeter having 100 divisions. The two tenth of division can be read with certainty.

Calculate the minimum and maximum of force that can be measured.

(Modulus of elasticity of steel = 200 GN/m²).

- b) An experiment is conducted to calibrate copper-constant thermocouple with cold junction at 0°C, emf obtained at boiling point of water and boiling point of sulfur (445°C) are 5 mV and 25 mV respectively.

If the relation assume to be $e_{t_1-t_2} = a_{(t_1-t_2)} + b_{(t_1^2-t_2^2)}$.

Determine the constant a and b .

The above thermocouple indicates 2mV with cold junction at 40°C, determine the hot junction temperature.

What would be the emf when the hot junction is at 500°C, by keeping cold junction at 40°C? [5]

- Q8)** a) Give working principle of McLeod gauge. A McLeod gauge has volume V_B of 150 cm^3 and capillary diameter of 1.5 mm . Calculate the gage reading for pressure of $40 \text{ } \mu\text{m}$ of mercury. [5]
- b) Consider a single strain gauge of resistance of 120Ω mounted along the axial direction of an axially loaded specimen of steel. If the percentage change in length of the rod to loading is 3% and the corresponding change in resistivity of the strain gauge material is 0.3% . Estimate the percentage change in resistance of the strain gauge and its gauge factor (Poisson's ratio = 0.3). If the strain gauge is connected to a measuring device capable of determining change in resistance with an accuracy of $\pm 0.02 \Omega$. What is the uncertainty in stress and strain that would result in using this resistance measuring device? [5]



Total No. of Questions : 8]

SEAT No. :

P2918

[4734] - 2003

[Total No. of Pages :3

M.Sc. - I

ELECTRONIC SCIENCE

EL 2 UT - 07 : Embedded System Design

(2013 Pattern) (Semester - II) (Credit System)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any FIVE questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

Q1) Attempt the following:

- a) With the help of block diagram, explain 8-bit Timer/counter in AVR. Explain the waveform generator in Timer0. **[4]**
- b) Give address map of SFR and general purpose register section of the access bank in PIC 18 microcontroller. Write instructions to add 25 h and 35 h, and store the result in WREG. **[3]**
- c) What are the criteria, the designer should consider in choosing a microcontroller for embedded system development. **[3]**

Q2) Attempt the following:

- a) Draw the interfacing of a common anode seven segment display to PORTD of AVR. Write 'C' program to display one digit decimal counter on seven segment display. **[4]**
- b) Explain status register of PIC microcontroller show the status of all the Flags of status register after execution of following instructions: **[3]**

MOVLW 88H

SUBLW 93H
- c) Write short note on IDE and ICE. **[3]**

P.T.O.

Q3) Attempt the following:

- a) Draw the interfacing of DAC0808 to AVR microcontroller. Write 'C' program to generate negative ramp using DAC. [4]
- b) Write an assembly language program for PIC microcontroller to clear WREG and add five to WREG register ten times and write result to PORTB. [3]
- c) Compare Von Neumann and Harvard architecture. Draw Harvard architecture in AVR, showing interface of CPU with data and code memory. [3]

Q4) Attempt the following:

- a) List any six standard features of PIC18F4550. [4]
- b) Explain the addressing modes of AVR microcontroller. [3]
- c) Write in short about USB and Zig Bee. [3]

Q5) Attempt the following:

- a) Write the steps used in programming ADC in PIC18F4550 microcontroller using polling method. [4]
- b) The following is the TCCR0 register of Atmega16 AVR microcontroller. Explain the bits of this register. [3]

7	6	5	4	3	2	1	0
FC0	WGM00	COM01	COM00	WGM01	CS02	CS01	CS00

- c) Write comparison between RS232 and RS485. [3]

Q6) Attempt the following:

- a) Draw the interfacing of a switch and a stepper motor to PIC microcontroller. Write 'C' program to monitor the status of switch and rotate the stepper motor clockwise if switch is closed and rotate the stepper motor counter clockwise if switch is open. [4]

- b) Explain the meaning of the following instructions in AVR. [3]
- i) LD Rd, Z
 - ii) BRCS K
 - iii) OUT A, Rr
 - iv) SWAP Rd
 - v) SUB Rd, Rr
 - vi) LDI Rd, K
- c) Explain I2C bus protocol. Explain data transfer on I2C bus. [3]

Q7) Attempt the following:

- a) A switch is connected to INT0 CRB01 and LED is connected to RB7 pin. Write 'C' program for PIC microcontroller to transfer data from PORT C to PORT D continuously; it toggles LED every time when INT0 is activated. [5]
- b) A microcontroller based weather monitor system is to be designed to measure and display temperature wind speed, humidity, wind direction, time of the day using RTC. There should be provision of buttons and LCD as user interface.

Draw the scheme in detail covering following points. [5]

- i) Selection of microcontroller
- ii) Block diagram
- iii) PORT pin assignments
- iv) Buttons and LCD interfacing
- v) Flow chart / Algorithm for above system.

Q8) Attempt the following:

- a) Write 'C' program for AVR microcontroller to read temperature from LM 35 and control the heater connected to PORTD. 5 through relay. Turn heater ON, if temperature falls below 30 deg. celsius and turn heater OFF, when temperature rises above 50 deg celsius. [5]
- b) Draw the interfacing of SPI device to microcontroller. Explain SPI single byte write operation. [5]



Total No. of Questions : 6]

SEAT No. :

P2919

[4734]-2004

[Total No. of Pages : 2

M.Sc.-I

ELECTRONIC SCIENCE

EL2 UT08 : Foundations of Semiconductor Devices

(2013 Pattern) (Semester-II) (Credit System)

Time : 2½ Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *Answer any four questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*

Q1) a) Draw 3D diagram of packing of hard spheres in an fcc lattice. Obtain **[4]**

- i) Nearest neighbor distance.
- ii) Radius of sphere.

b) What is miller indices? Explain the concept of equivalence of planes in crystals. **[3]**

c) Explain how electrons in a semiconductor is a statistical system; which distribution function is useful in describing this system. **[3]**

Q2) a) Define the terms: **[4]**

- i) Lattice.
- ii) Basis.
- iii) Primitive vector.
- iv) Unit cell.

b) A Si sample is doped with 10^{16} As atoms per cm^3 . Obtain hole concentration P_0 at 300 °K. Assume the intrinsic carrier concentration $n_i = 1.5 \times 10^{10} \text{ cm}^{-3}$, Boltzmann constant $K = 8.62 \times 10^{-5} \frac{eV}{^\circ K}$. Hence determine where is E_F relative to E_i . **[3]**

c) Classify the solids based on periodic structure, what are their feature? **[3]**

P.T.O.

- Q3)** a) Obtain expression for decay of electrons in a p-type semiconductor by recombination process. [4]
- b) Discuss channel length modulation in MOSFET. [3]
- c) What do you mean binary, ternary and quaternary compounds in semiconductor materials? Give one example of each. [3]
- Q4)** a) Define performance parameters involved in transistor amplification. [4]
- b) Differentiate between: [3]
- i) Reverse breakdown.
- ii) Zener effect.
- iii) Avalanche breakdown.
- c) Explain the variation of Fermi-Distribution function at absolute zero and higher temperature T. Define fermi-level. [3]
- Q5)** a) Explain the Hall effect. Obtain expression of hole concentration P_o in terms of hall voltage, current through sample and magnetic field. Give its applications. [5]
- b) Using Fermi-Dirac distribution function, obtain an expression for concentration of electrons in the conduction band of metal. [5]
- Q6)** a) Draw band diagram and carrier concentration for [5]
- i) intrinsic
- ii) n-type and
- iii) p-type
- Semiconductors at thermal equilibrium. Show that product of electron and hole concentration at thermal equilibrium is given by $n_o p_o = n_i^2$
- b) Discuss qualitatively the I_D - V_D curve for variation of a negative gate bias on JFET. Explain pinch-off of channel with schematic diagram. [5]



Total No. of Questions : 5]

SEAT No. :

P2907

[4734] - 201

[Total No. of Pages :2

M.Sc. - I

ELECTRONIC SCIENCE

**EL2 UT04: Applied Electromagnetics, RF and Microwaves
(2008 Pattern) (Semester - II)**

Time :3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All the questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat diagrams wherever necessary.*
- 4) Use of log tables/calculators is allowed.*

Q1) Attempt any two of the following:

[2×8 = 16]

- a) With necessary diagram explain the principle construction and working of a magnetron.
- b) State Poynting theorem. Starting with Maxwell's equations obtain the equation of poynting theorem in frequency domain, and explain each term in it.
- c) With the help of energy band diagram, explain the working principle of tunnel diode. Explain its characteristics.

Q2) Attempt any two of the following:

[2×8 = 16]

- a) Discuss electromagnetic effects in high speed digital systems with suitable examples.
- b) With the help of necessary diagrams, give the methods of exciting various modes in rectangular waveguides.
- c) What are microstrip-lines? With necessary diagrams explain what are different types of striplines. What are different types of losses in microstriplines?

P.T.O.

Q3) Attempt any four of the following.

[4×4 = 16]

- a) Write a short note on Global Positioning System.
- b) What is a Smith chart? What are its characteristics?
- c) Explain absorption of microwaves by atmosphere/environment.
- d) Draw the diagram of a transmission line and obtain the transmission line equation in voltage form.
- e) A transmission line has characteristic impedance of 75Ω and is terminated in a load impedance of 100Ω . Compute the reflection coefficient.

Q4) Attempt any four of the following:

[4×4 = 16]

- a) What is single-stub matching? Where is it used?
- b) An air-filled rectangular wave guide has inside dimensions $7\text{cm} \times 3.5\text{cm}$. It operates in TE_{10} mode. Find the cut-off frequency.
- c) Write a short note on cavity resonators.
- d) What are the sources of EMI? How can EMI be controlled?
- e) Define 'directive gain' and 'directivity' of an antenna, and explain them.

Q5) Attempt any four of the following:

[4×4 = 16]

- a) Write a short note on "antenna temperature".
- b) Explain the concept of retarded potentials.
- c) Write a note on different types of optical fibres.
- d) Explain 'Gunn effect' with suitable diagrams.
- e) Starting with Maxwell's equation, show that $\nabla^2 \bar{E} = \gamma^2 \bar{E}$.



Total No. of Questions : 5]

SEAT No. :

P2908

[4734]-202

[Total No. of Pages : 2

M.Sc.

ELECTRONIC SCIENCE

EL2UT-05 : Communication Electronics

(2008 Pattern) (Semester-II)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw the neat diagram wherever necessary.*

Q1) Answer Any Four of the following:

[4 x 4 = 16]

- a) Draw the circuit diagram of FM generator using varactor diode and write its working in short.
- b) Describe the terms:
 - i) Atmospheric noise.
 - ii) Noise figure.
- c) With the help of neat diagram, explain collector or base neutralization method.
- d) Explain the working of delta modulation and write the advantages of adaptive delta modulator.
- e) Explain the working of data communication link in short.

Q2) Attempt Any Two of the following:

[2 x 8 = 16]

- a) Draw the block diagram of superheterodyne receiver. Explain the working of each block in detail.
- b) With the help of neat diagram, explain the working of stagger tuning. Write the advantages of it.
- c) Draw the block diagram of pulse code modulation (PCM). Explain the working of each block of PCM in detail.

P.T.O.

Q3) Answer Any Four of the following: [4 x 4 = 16]

- a) Explain the working of local loop of landline telephone.
- b) Draw the circuit diagram of pulse amplitude modulator and explain its working in short.
- c) Write short note on bit oriented protocol.
- d) Draw the diagram of multistage tuned amplifier and write its advantages.
- e) Describe XMODEM protocol in short.

Q4) Attempt Any Two of the following: [2 x 8 = 16]

- a) What is time division multiplexing (TDM)? With the help of block diagram, explain the working of TDM in detail.
- b) Draw the diagram of 8 QAM. Explain the working of 8 QAM in detail.
- c)
 - i) With the help of block diagram, explain the working of digital exchange.
 - ii) What is VSAT? Write its applications.

Q5) Answer Any Four of the following: [4 x 4 = 16]

- a) Write the working of FM stereo transmitter in short.
- b) With the help of block diagram, explain the working of any one method of SSB AM generator. Write the advantages of it.
- c) What is ISDN? List the applications of it.
- d) Describe SDLC basic format in short.
- e) With the help of block diagram, explain the working of frequency shift keying (FSK) in short.
- f) Write the working of diode detector.



Total No. of Questions : 5]

SEAT No. :

P2909

[4734] - 203

[Total No. of Pages :3

M.Sc. - I

ELECTRONIC SCIENCE

EL 2 UT - 06 : Digital System Design Using VHDL

(2008 Pattern) (Semester - II)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt any TWO of the following:

[2 × 8 = 16]

- a) Explain process statement in VHDL. Write VHDL code for
 - i) 4 to 1 multiplexer
 - ii) half adder using process statement
- b) Explain with suitable example
 - i) Types of data objects in VHDL
 - ii) Data types in VHDL
- c) Explain structural modeling in VHDL. Write VHDL code for full adder. Using full adder as a component, write VHDL code for 4-bit parallel adder.

Q2) A) Attempt any TWO of the following:

[2 × 8 = 16]

- a) i) Use K-map to simplify the equation

$$X = A\bar{B}C + \bar{A}BC + \bar{A}\bar{B}C + \bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C}$$

Implement using NAND gates only.

- ii) Design 4-bit binary to gray code converter.

P.T.O.

- b) Implement the following boolean function using 8:1 multiplexer.

$$F = (W, X, Y, Z) = \bar{W} X \bar{Z} + W Y Z + \bar{X} Y Z + \bar{W} \bar{Y} Z$$

- c) Design 2-bit magnitude comparator. Explain how IC 7485 can be used to compare two 4-bit numbers.

B) Attempt any one of the following: [1 × 4 = 4]

- a) Write VHDL code for 4-bit binary up-down counter using behavioral style of modeling.
- b) Design 8-key keyboard encoder with latching.

Q3) Attempt any TWO of the following: [2 × 8 = 16]

- a) Design synchronous counter to generate the sequence 0-1-3-5-7 and repeat using T flip-flops.
- b) Explain with neat diagram 3-bit up/down ripple counter.
- c) Write VHDL code for vending machine control.

Q4) Attempt any TWO of the following: [2 × 6 = 12]

- a) Explain with neat diagram processor unit with scratch pad memory.
- b) What is programmable logic device? Draw block diagram of PLA. Implement the following using PLA.

$$W(A, B, C) = \sum m(1, 2, 4, 6)$$

$$X(A, B, C) = \sum m(0, 1, 6, 7)$$

$$Y(A, B, C) = \sum m(2, 6)$$

- c) Write VHDL code for 4-bit ALU.

Q5) Attempt any TWO of the following:

[2 × 8 = 16]

- a) With neat diagram explain architecture of typical CPLD. Compare FPGA and CPLD.
- b) Explain types of ROM. Explain how data is stored in EPROM. Write applications of ROM.
- c) Explain types of RAM memory. Draw memory read timing diagram. Show read cycle time, access time, data hold time in timing diagram.



Total No. of Questions : 8]

SEAT No. :

P2920

[4734] - 3001

[Total No. of Pages :2

M.Sc. -II

ELECTRONIC SCIENCE

EL3UT09: Communication Electronics

(2013 Pattern) (Semester - III) (Credit System)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

- Q1)** a) Explain the working of balanced modulator used to suppress the carrier. [4]
b) Draw the HDLC format and explain the importance of each field in short. [3]
c) Describe the sky wave propagation of electromagnetic waves. [3]
- Q2)** a) Explain the working of digital exchange in short. [4]
b) Draw the circuit diagram of transistor RF amplifier. Write the advantages of it. Explain the term selectivity in short. [3]
c) Explain the working of pulse amplitude modulation in short. [3]
- Q3)** a) With the help of diagram, describe the construction and working of micro strip patch antenna in short. [4]
b) What is ISDN? Write the features of ISDN services. [3]
c) Draw the block diagram of FM receiver and explain its working in short. [3]
- Q4)** a) With the help of block diagram, explain the working of phase shift keying modulation techniques in short. [4]
b) With reference to smart antenna technology, compare switched beam and adaptive array system. [3]
c) What is transponder? Explain its use in satellite communication. [3]

P.T.O.

- Q5)** a) With the help of circuit diagram, explain the working of diode detector used for AM signal. [4]
- b) Explain any two digital signal encoding format in short. [3]
- c) With the help of diagram, explain the construction and working of Yagi antenna. [3]
- Q6)** a) Write the advantages, disadvantages and applications of 3G Wireless network technology. [4]
- b) For AM, show that the power contained in the sidebands is one third of the total power. [3]
- c) With the help of diagram, explain the working of delta modulator. [3]
- Q7)** a) With reference to small dipole antenna, explain the terms [4]
- i) power density and
- ii) Radiation resistance
- b) With the help of block diagram, explain the working of infrared data association (IrDA) module. [3]
- c) List different methods of AM generators. Explain any one of them in short. [3]
- Q8)** a) With the help of diagram, explain the working of frequency division multiplexing in short. [4]
- b) With reference to antenna, explain the terms in short [3]
- i) Radiation pattern
- ii) Directivity
- iii) Bandwidth
- c) With the help of diagram, explain any two types of couplers used in optical fiber communication. [3]



Total No. of Questions : 5]

SEAT No. :

P2910

[4734] - 301

[Total No. of Pages :2

M.Sc. -II

ELECTRONIC SCIENCE

EL3UT05: Embedded Systems

(2008 Pattern) (Semester - III)

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat diagram wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt any four of the following.

[4×4 = 16]

- a) Distinguish between RISC and CISC architecture.
- b) With help of suitable diagram, describe Inter Integrated circuit (I²C) protocol.
- c) Explain ADC Module and associated registers in PIC microcontroller.
- d) Write note on Linker and Simulator.
- e) Describe any four features of AVR Microcontroller.

Q2) Attempt any four of the following.

[4×4 = 16]

- a) Draw port structure of Po of 8051 Microcontroller and explain its function.
- b) Explain SPI and CAN communication standard in short.
- c) Explain how PWM is generated in AVR?
- d) Write any four features of PIC microcontroller.
- e) Write an assembly/c program to get bit p1.5 and send it to p2.5 after inverting it.

Q3) Attempt any two of the following.

[2×8 = 16]

- a) Draw Internal block diagram of 8051 microcontroller and explain each block in brief.

P.T.O.

- b) i) State the features of RS232 communication standard. Draw connection between RS232 and 8051 microcontroller.
- ii) Explain interfacing of stepper motor to 8051 μ c.
- c) Explain Memory organisation of PIC 16 F877A in detail.

Q4) Attempt any four of the following. **[4×4 = 16]**

- a) Describe any four bit manipulation instructions of 8051 microcontroller with suitable example.
- b) Draw interfacing of DAC to 8051. Write an assembly/c program to generate saw tooth waveforms.
- c) Write short note on Assembler and cross compiler.
- d) Explain interrupt structure of 8051 microcontroller.
- e) Write an assembly/c program to toggle MSB bit of port 1.

Q5) Attempt any two of the following. **[2×8 = 16]**

- a) Explain in detail the development steps of embedded system design.
- b) Draw and describe architecture of AVR microcontroller.
- c) Write 8051 C program to transfer the continuous message “COLLEGE” serially at 4800 baud.



Total No. of Questions : 8]

SEAT No. :

P2921

[4734] - 4001

[Total No. of Pages :3

M.Sc. -II

ELECTRONIC SCIENCE

EL4 UT 10: Control Systems

(2013 Pattern, 4-Credits) (Credit System) (Semester - IV)

Time : 3Hours]

[Max. Marks : 50

Instructions to the candidates:

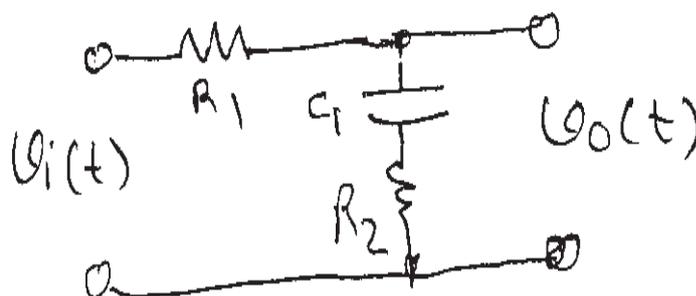
- 1) Answer any five questions.
- 2) All questions are compulsory.
- 3) Figures to the right indicate full marks.
- 4) Draw neat diagrams wherever necessary.
- 5) Use of non-programmable calculator is allowed.

Q1) a) Draw block diagram of open loop system and explain its advantages. [4]

b) Draw pole zero diagram for the transfer function $T(s) = \frac{s+1}{s^2+5s+6}$. [3]

c) Explain the term 'off set' due to change in process load in case of p-control. [3]

Q2) a) Obtain a transfer function of the following phase lag circuit [4]



b) Explain the terms; control lag and dead time in process control applications. [3]

c) Explain the function of annunciator. [3]

P.T.O.

Q3) a) Draw circuit diagram of PI controller. Explain proportional and integral gain of PI controller. [4]

b) With the help of neat diagram explain operating principle of control valve. [3]

c) Write a short note on DDC. [3]

Q4) a) Draw a block diagram of feed-forward control system. How it differs from feedback control system. [4]

b) List the various types of actuator and explain any one. [3]

c) Examine the stability of a system with characteristics equation [3]

$$s^3 - 4s^2 + s + 6 = 0$$

State how many roots are in the right hand plane.

Q5) a) State the advantages of frequency domain approach for analysis of control systems. [4]

b) Explain PID control with the help of mathematical equation. [3]

c) What is process loop tuning? List the methods. [3]

Q6) a) State the advantages and disadvantages of Nyquist plot method. [4]

b) Explain the concept of gain margin and phase margin. How these values help in studying relative stability. [3]

c) Explain three-position controller action with the help of appropriate diagram. [3]

Q7) a) Write a short note on SCADA systems. [5]

b) Draw a circuit diagram of temperature control system and explain its operation. [5]

- Q8) a)** Explain the nature of bode plot for **[5]**
- i) Poles at origin
 - ii) Simple pole and
 - iii) Simple zero
- b) An integral controller is used for speed control with a set point 12 rpm with a range of 10 to 15 rpm. Initial controller output is 22%. The constant $K_I = -0.15\%$ controller output per second per percentage error. If the speed jumps to 13.5 rpm, calculate the controller output after 2 seconds for a constant e_p where K_I is proportional gain and e_p is error. **[5]**



Total No. of Questions : 5]

SEAT No. :

P2911

[4734] - 401

[Total No. of Pages :2

M.Sc. -II

ELECTRONIC SCIENCE

**EL4 UT-06: Control Systems: Theory and Applications
(2008 Pattern) (Semester - IV)**

Time : 3Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

Q1) Solve any two.

[2×8 = 16]

- a) Draw a block diagram of general feedback control system and explain its working. Comment on stability of control systems.
- b)
 - i) Explain the term discrete state process control.
 - ii) Elaborate the role of Laplace transforms in analysis of control systems.
- c)
 - i) Transfer function of a system is given by

$$T(s) = \frac{(s+6)}{s(s+3)(s+4)(s^2+7s+12)}$$

Determine poles, zeroes, characteristic equation and pole-zero plot in S-plane.

- ii) Compare the performance of open-loop and closed-loop control systems.

Q2) Solve any two.

[2×8 =16]

- a) What is meant by process loop tuning? Explain open-loop transient response method for the same.
- b) Explain how to predict stability of control systems in terms of location of closed loop poles. Discuss all cases.
- c) Explain the rules for block diagram reduction.

P.T.O.

Q3) Solve any two. [2×8 =16]

- a) Explain the working of ON-OFF controller circuit. What is meant by differential gap? Why is it necessary ? State applications of ON-OFF controller.
- b) Discuss PI control mode. How would you implement it using op-amps? Give its applications.
- c)
 - i) Explain any two comparison instructions for a typical PLC.
 - ii) Draw PLC ladder diagram to realise two input EXOR gate and explain its working.

Q4) Solve any two. [2×8 =16]

- a)
 - i) Why is memory necessary in PLC? How is it organised? Give typical memory map for a PLC.
 - ii) Explain event sequence and state diagram for a coffee vending machine.
- b) What is PLC processor scanning? Explain the program sweep for series 90-30 PLC.
- c)
 - i) Give advantages and disadvantages of using smart handheld programming terminal.
 - ii) Explain what is meant by soft-PLC?

Q5) Solve any four. [4×4 = 16]

- a) Explain the copy instruction.
- b) Explain the counter instruction 'count-up' (CTU).
- c) Explain how to construct Routh's array. How can it be used to analyse stability?
- d) Discuss feed forward control strategy.
- e) What is watch dog timer in PLC? What is its use?
- f) Explain the need to add documentation to your user program.



Total No. of Questions : 3]

SEAT No. :

P3173

[Total No. of Pages : 1

[4736] - 1001
M.Sc. (Semester - I)
BIOTECHNOLOGY
BT-101 : Advanced Biological Chemistry
(2013 Pattern) (Credit System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer any four questions.

[4 × 5 = 20]

- a) Give the importance of post translational modifications.
- b) What is metabolic engineering. Explain with reference to polypeptides.
- c) Comment upon the pharmacological activities of terpenes.
- d) Explain disorders associated with glycogen storage.
- e) Differentiate between α helix & β sheets structures of protein.
- f) Discuss the structure and function of glycoproteins.

Q2) Write short notes on (any four) :

[4 × 5 = 20]

- a) Atherosclerosis.
- b) Receptor tyrosine kinases.
- c) Protein misfolding.
- d) Extraction methods of secondary metabolites.
- e) Metabolic flux analysis.
- f) Enzyme inhibition.

Q3) Answer any one question :

[1 × 10 = 10]

- a) Explain the shikimic acid pathway for secondary metabolite synthesis.
- b) Insulin counters high blood glucose. Justify.



Total No. of Questions : 3]

SEAT No. :

[Total No. of Pages : 2

P3174

[4736] - 1002

M.Sc. (Semester - I)

BIOTECHNOLOGY

BT - 102 : Molecular Biology

(Credit System) (2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Draw neat and labelled diagram wherever necessary.*
- 3) Figures to right indicate full marks.*

Q1) Write self explanatory notes on any four of the following :

[20]

- a) Aminoacyl t-RNA synthase
- b) Rec BCD genetic recombination
- c) Splicing
- d) Replicative transposons.
- e) Glycosylation
- f) Secretory proteins

Q2) Attempt any four of the following :

[20]

- a) Describe the initiation complex of RNA Pol II transcription.
- b) Compare and contrast Base excision repair and Nucleotide excision repair.
- c) Justify the statement- Alkylating agents cause transversion mutations.
- d) Explain post transcriptional modification in tRNA.
- e) Enlist various element found in eukaryotic genomes giving their characteristics features.
- f) What is codon preferences? Explain with appropriate examples.

P.T.O.

Q3) Attempt any one of the following is 15-20 lines :

[10]

- a) Write a comparative account on DNA replication in prokaryotic and eukaryotic systems.
- b) Explain the concept of gene family, add a note on somatic gene rearrangement with a suitable example.



Total No. of Questions : 3]

SEAT No. :

P3175

[Total No. of Pages : 2

[4736] - 1003

M.Sc. - I (Biotechnology) (Semester - I)

BT - 103 : Environmental Biotechnology
(2013 Pattern) (Credit System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat & labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt any four of the following.

[4 × 5 = 20]

- a) Write a note on objectives of EIA.
- b) Enlist and explain solid waste reuse methods.
- c) Explain biochemical mechanism of activated sludge process. Enlist suitable organisms used for the same.
- d) Explain general methodology of Environmental Audit.
- e) Write a note on genetically modified organisms for biomonitoring
- f) Explain biotechnology interventions in substitution of industrial raw materials.

Q2) Write notes on :

[4 × 5 = 20]

- a) Water quality standards
- b) Activated sludge process
- c) Engineered Bioremediation for soil
- d) Nairobi declaration
- e) Application of remote sensing in forestry
- f) Environmental Impact Assessment

P.T.O.

Q3) Answer any one of the following :

- a) Give overview of The Air Act, 1981. [8]
- b) Enlist key factors important in deciding whether to give an aerobic or anaerobic treatment to effluent. [2]

OR

- a) Elaborate on solid waste remediation and abatement strategies. [8]
- b) Enlist methods used for reuse of solid waste. [2]



Total No. of Questions : 3]

SEAT No. :

P3176

[Total No. of Pages : 2

[4736] - 1004

M.Sc. (Semester - I)
BIOTECHNOLOGY
BT - 104 : Cell Biology
(2013 Pattern) (Credit system)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer any four questions :

[4 × 5 = 20]

- a) Give an account of protein transport into chloroplast.
- b) What are peroxisomes? Briefly discuss their role and function.
- c) Write a short note on structure and function of plasmodesmata.
- d) Discuss the mechanism of oxidative phosphorylation in mitochondria.
- e) Write a note on transformation of cell lines and their characteristics.
- f) Describe in brief the structural organisation of cell membrane.

Q2) Answer any four questions:

[4 × 5 = 20]

- a) Describe JAK - STAT signaling pathway with help of diagrams.
- b) Explain the role of cytokinins in plant development.
- c) Compare PCD in plant and animal systems.
- d) What do you mean by terminal cell differentiation? Explain with suitable examples.
- e) What are microtubules? Discuss their role and mechanism of assembly and disassembly in brief.
- f) What are second messengers? Discuss their role and function.

P.T.O.

Q3) Answer any one question:

[1 × 10 = 10]

- a) Describe the molecular events in cell division with a note on checkpoints.

- b) Give a detailed account of signal transduction events / pathways involving plant hormone gibberellins.



Total No. of Questions : 8]

SEAT No. :

P3157

[Total No. of Pages : 2

[4736] - 101
M.Sc. (Semester - I)
BIOTECHNOLOGY
BT - 11 : Advanced Biological Chemistry
(2008 Pattern)

Time : 3 Hours]

[Maximum Marks : 80

Instructions to the candidates:

- 1) *Attempt not more than 5 questions of which at least 2 questions must be from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) What are biological buffers? Explain the role of bicarbonate buffer in maintaining pH of biological system. [8]
b) Explain secondary structures of the protein and role of non covalent interactions in their stability. [8]
- Q2)** a) Give principle and working of gel filtration chromatography. [8]
b) Discuss significance of phosphorylated intermediates in glycolytic pathway. [8]
- Q3)** Write explanatory notes on
a) Site directed Mutagenesis [8]
b) Secondary Metabolite : Variation in species. [8]
- Q4)** a) Define Metabolic flux. State its application. [8]
b) Distinguish between differential and density gradient centrifugation. [8]

P.T.O.

SECTION - II

- Q5)** a) Explain the role of chaperons in protein folding. [8]
b) State the principle and applications of Isoelectric focusing. [8]
- Q6)** a) Explain principle and working of spectrophotometer with ray diagram. [8]
b) Discuss the role of insulin and glucagon in regulation of carbohydrate metabolism. [8]
- Q7)** a) What are Terpenes? Give its classification with suitable examples and therapeutic uses. [8]
b) Explain different ways by which metabolic pathways are regulated. [8]
- Q8)** Write explanatory notes on
- a) Protein microarray. [8]
b) Phenolics and their medicinal properties. [8]



Total No. of Questions : 8]

SEAT No. :

P3158

[Total No. of Pages : 2

[4736] - 102

M.Sc. (Semester - I)

BIOTECHNOLOGY

**BT - 12 : Molecular and Cell Biology
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt each section on separate answer sheet.*
- 2) *Attempt not more than 5 questions of which at least 2 questions must be from each section.*

SECTION - I

Q1) Write short notes on : **[16]**

- a) Oxidative phosphorylation
- b) Inhibitors of Electron transport chain
- c) Mechanism of electron transfer from cyt a-a₃ to O₂.
- d) Binding change mechanism of Boyer.

Q2) a) Signalling cascade of IP₃ and DAG is essential, justify. **[8]**

b) Describe the activation of protein kinase C by β adrenergic receptor. **[8]**

Q3) a) Explain the role of vasopressin in governing the thermoregulation. **[8]**

b) Describe the role of T₃ and T₄ hormones in maintaining basal metabolic rate. **[8]**

Q4) a) Explain photophosphorytion and Z scheme is photosynthesis. **[8]**

b) What is external respiration? Add a note on factors on which external respiration depends. **[8]**

P.T.O.

SECTION - II

Q5) Write short on : **[16]**

- a) Alternate splicing
- b) Glycosylation
- c) Promoters of transcription in prokaryotic
- d) Natural defences in invertebrates.

Q6) a) Explain the role of SRP in protein translocation. **[8]**

b) Describe the Griffiths experiment proving DNA is genetic material. **[8]**

Q7) a) Describe the process of post transcriptional modifications. **[8]**

b) Explain DNA replication initiation in prokaryotes. **[8]**

Q8) a) Explain natural selection leads to genetic variation. **[8]**

b) Describe the organisation of chromosomes in eukaryotic cells by defining. **[8]**

- i) Pseudogenes
- ii) LINES
- iii) SINES
- iv) Microsattelites



Total No. of Questions : 7]

SEAT No. :

P3159

[Total No. of Pages : 2

[4736] - 103

M.Sc. (Part - I) (Semester - I)

BIOTECHNOLOGY

BT - 13 : Environmental Biotechnology

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Question No. 1 is compulsory.*
- 2) *Answer any four from questions 2 to 7.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt any four of the following :

[4 × 5 = 20]

- a) Write importance of Remote Sensing in Environmental biotechnology.
- b) What is air pollution? Discuss briefly dispersion models of air pollution.
- c) Write a note on Air Quality Standards.
- d) Discuss the objectives of EIA in details.
- e) What are Bioindicators? Explain with examples.
- f) Define thermal inversion. Write its application in air pollution.

Q2) a) Discuss the key features and importance of Agenda 21. **[8]**

b) Explain the principle, working and application of Trickling filters. **[7]**

Q3) a) Write a note on Bio-energy. Explain it with appropriate examples. **[8]**

b) Write an explanatory note on ISO 14000 series. **[7]**

P.T.O.

Q4) Write in details the process of municipal waste water treatment with special emphasis on Activated sludge process. [15]

Q5) Define Bioremediation. Explain its types, methods and applications giving examples. [15]

Q6) a) Write a note on water pollution and its controlling measures. [8]

b) What are SO_x , NO_x & CO_x ? Write their importance in air pollution.[7]

Q7) a) Explain the concept of GIS. Gives its application in environmental hazard prediction. [8]

b) Write a note on mines and Ecomarks in India. [7]



Total No. of Questions : 3]

SEAT No. :

P3177

[Total No. of Pages : 2

[4736] - 2001
M.Sc. (Semester - II)
BIOTECHNOLOGY
BT 201 : Genetic Engineering
(Credit System) (2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Neat diagrams to be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Answer the following. (any 4)

[20]

- a) How are restriction enzymes useful for genetic engineering. Add a note on restriction mapping.
- b) Illustrate the salient features of Cosmid vectors. What makes them superior than the phages.
- c) Give strategy (s) for regulation of recombinant protein by the host cells.
- d) Explain the pronuclear injection method used for cloning in animals.
- e) AFLP markers are superior to RAPD markers. Justify.
- f) Enlist the types of expression hosts used in genetic engineering. How will you choose a appropriate vector for it.

Q2) Answer the following. (any 4)

[20]

- a) Summarize the system that must be satisfied before the gene therapy experiment begins.
- b) Explain the strategy for directional cloning using topoisomerases.
- c) What are the factors taken into consideration while designing primers for a polymerase chain reaction.
- d) Describe in detail use of viral vectors for gene therapy.
- e) Write a note on genetically engineered vaccine.
- f) Give the significance of Human Genome Project to understand dreadful diseases.

P.T.O.

Q3) Answer the following. (any 1)

[10]

- a) How genetic and physical maps are used to determine the order of genes on a chromosome and their approximate distance apart.
- b) Explain protocols involved in event characterization in genetically modified crops.



Total No. of Questions : 2]

SEAT No. :

P3178

[Total No. of Pages : 1

[4736] - 2002

M.Sc. (Semester - II)

BIOTECHNOLOGY

BT - 202 : Immunology

(Credit System) (2013 Pattern)

Time : 1½ Hours]

[Max. Marks : 25

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw the sketches wherever necessary.*

Q1) Attempt any three of the following :

[15]

- a) Write the role of GALT, BALT and MALT as immune tissue in human body.
- b) How exogenous antigen is processed and presented by APC ____ discuss.
- c) Enlist the criteria needed to be considered during designing a vaccine for active immunization.
- d) Comment on SCID-Mouse and its applications.
- e) Give a brief account of the technology of making humanized antibodies of desired specificity.

Q2) Attempt any one of the following :

[10]

- a) What do you mean by autoimmunity? Explain immunopathogenesis of one organ specific and one systemic autoimmune disease of your choice.
- b) T-cells play a keyrole in allograft rejection - discuss.



P.T.O.

Total No. of Questions : 3]

SEAT No. :

P3179

[4736] - 2003

[Total No. of Pages : 2

**M.Sc. (Semester - II)
BIOTECHNOLOGY**

**BT - 203 : Principles of Bacteriology and Virology
(2013 Pattern) (Credit System)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt any four out of the following : **[20]**

- a) Uropathogenic Escherichia coli mediated urinary infection is one of the most common bacterial infections in humans. Discuss the role of o-antigen and capsule for such infection.
- b) Comment on autotrophic mode of nutrition in prokaryotes giving suitable examples.
- c) What are the recommended precautions to be taken to handle pathogens according to the set standards of WHO.
- d) State the objectives and guidelines given by ICTV.
- e) Describe the ultrastructure and replication of any one bacteriophage.
- f) Influenza type A and type B are constantly changing by drift and shift. Justify.

Q2) Attempt any four out of the following : **[20]**

- a) Explain any one method for detecting rising titres of antibody between acute and convalescent stages of viral infection.
- b) Give merits and demerits of recombinant DNA vaccines.
- c) Explain mode of action of antiviral agents active against herpes group of viruses (any one).
- d) Give explanation why obligate anaerobes die in the presence of oxygen.
- e) O.N witt proposed that dye molecules contains chromogen and auxochrome. Explain this concept with the help of suitable examples.
- f) Specify the adaptations that bacteria undergo to survive in hypersaline lakes, saline deserts and salt marshes.

P.T.O.

Q3) Attempt any one out of the following:

[10]

- a) Explain in brief the methods and techniques used for identification of unknown bacteria (species level)
- b) 'Epidemiology plays an important role in essential functions of public health; which makes it possible to identify trends in health and disease'. Explain.



Total No. of Questions : 3]

SEAT No. :

P3180

[Total No. of Pages : 2

[4736] - 2004
M.Sc. (Semester - II)
BIOTECHNOLOGY
BT - 204 : Plant Biotechnology
(2013 Pattern) (Credit System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Attempt any four of the following :

[4 × 5 = 20]

- a) Explain the role of transgene technology in development of plantibodies.
- b) What are double haploids? With suitable examples elaborate their role in crop improvement.
- c) Write a note on strain improvement methods of economically important algae.
- d) Explain vertical and horizontal gene transfer with suitable examples.
- e) Micropropagation can be used in the mass production of fruit crops. Justify using a suitable examples.
- f) Explain Agrobacterium mediated gene transfer methodology.

Q2) Attempt any four of the following :

[4 × 5 = 20]

- a) Somatic hybridisation is a tool to overcome barriers of sexual incompatibility. Explain.
- b) Discuss the nutraceutical potential of Agaricus sps.

P.T.O.

- c) Genetic engineering has been used for enhanced production of secondary metabolites in plants. Elaborate citing suitable examples.
- d) Explain the role of algal transgenics for the generation of pigments.
- e) What is organogenesis? Give the various factors affecting organogenesis.
- f) Transgenic technology can be used for the production of draught tolerance. Explain.

Q3) Attempt any one of the following :

[1 × 10 = 10]

- a) Discuss in detail the approaches used for development of insect tolerant transgenic plants.
- b) Give a detailed account of the various approaches that have been used for increasing productivity by manipulation of nitrogen fixation.



Total No. of Questions : 8]

SEAT No. :

P3160

[Total No. of Pages : 2

[4736] - 201
M.Sc. (Semester - II)
BIOTECHNOLOGY
BT 21 : Genetic Engineering
(2008 Pattern)

Time : 3 Hours]

[Maximum Marks : 80

Instructions to the candidates:

- 1) Attempt not more than 5 questions of which atleast 2 questions must be from each section.*
- 2) Answer to the two sections should be written in separate answer book.*
- 3) Figures to the right indicate full marks.*

SECTION - I

Q1) Write short notes on -

[16]

- a) Transfection
- b) YAC
- c) Type two restriction endonucleases
- d) Phagmid

Q2) a) Discuss the salient features of PAC vectors with suitable example. **[8]**

- b) Explain the strategies involved in expression of mammalian protein in suitable host. **[8]**

Q3) a) Comment on dot blot technique, add a note on its significance. **[8]**

- b) With a suitable example describe any four industrially important products of genetic engineering currently in use. **[8]**

Q4) a) Compare and contrast between prokaryotic host system and eukaryotic host system employed for molecular cloning. **[8]**

- b) Discuss the role of DNA polymerases used in genetic engineering. **[8]**

P.T.O.

SECTION - II

- Q5)** Write short note on - [16]
- a) Biolistic gun
 - b) RFLP
 - c) subunit vaccine
 - d) Transgenic plants
- Q6)** a) Explain sangers method of DNA sequencing. [8]
b) Describe the biotherapeutics and strategies for their development. [8]
- Q7)** a) Write salient features of PCR primer designing. [8]
b) Compare and contract ex - vivo and invivo gene therapy. [8]
- Q8)** a) Distinguish between CDNA & Genomic library. [8]
b) Describe gene annotation add a note on its significance. [8]



Total No. of Questions : 8]

SEAT No. :

P3161

[Total No. of Pages : 2

[4736] - 202

M.Sc. (Semester - II)

BIOTECHNOLOGY

BT - 22 : Bioinformatics

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt a total of any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Write notes of any two of the following :

[2 × 8 = 16]

- a) SCOP
- b) NCBI
- c) Ramachandran plot

Q2) Define Bioinformatics. Discuss the role of databases in bioinformatics. Give their importance and quote two examples. **[16]**

Q3) a) What is Pubmed? Explain information retrieval system of Pubmed and give its importance. **[8]**

b) Explain Homology modeling. What are the important steps in modeling? Explain with examples. **[8]**

Q4) a) What are scoring matrices? Explain PAM matrix giving appropriate example. **[8]**

b) What resources are available in finding chemical information on the internet? Explain SMILES annotation with example. **[8]**

P.T.O.

Q5) Write short note on any two of the following : **[2 × 8 = 16]**

- a) RASMOL
- b) PDB
- c) Psi and Phi angles

Q6) a) Explain protein structure visualization. Enlist and explain tools used in protein structure visualization. **[8]**

b) Enlist Bioinformatics business models? Explain any one. **[8]**

Q7) Explain cheminformatics. Describe its role in drug designing. giving details of steps in designing. **[16]**

Q8) a) Explain abinitio protein structure prediction with example. **[8]**

b) Define max score and e-value in BLAST results & give its importance. **[8]**



Total No. of Questions : 8]

SEAT No. :

P3162

[4736] - 203

[Total No. of Pages : 2

**M.Sc. (Semester - II)
BIOTECHNOLOGY
BT - 23 : Plant Biotechnology
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Attempt a total of five questions selecting at least two from each section.*
- 2) Answer to the two sections should be written in separate answer book.*
- 3) Neat diagram must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Illustrate the process of direct & indirect methods of DNA transfer to produce transgenic plants with example. **[8]**
- b) Describe in detail methods used for seed improvement, certification & testing. **[8]**
- Q2)** a) Describe with example, qualitative improvement in the commercially important alga. **[8]**
- b) Explain the methods used in transgenic plant production improved for increase in production by manipulation of photo synthetic process. **[8]**
- Q3)** a) Explain qualitative and quantitative improvement of economically important fungi using modern techniques. **[8]**
- b) Describe the quality improvement in crop plants with the help of golden rice example. **[8]**
- Q4)** Write explanatory note on any two of the following. **[16]**
- a) Somaclonal variation
 - b) Applications of plant growth regulators.
 - c) Biosafety rules & regulation for release of transgenic crops.

P.T.O.

SECTION - II

- Q5)** a) Describe with suitable examples the use of transgenics for qualitative improvement in proteins & lipids. [8]
b) Explain the term molecular farming. Illustrate how plants can be used for production of pharmaceuticals with suitable diagram. [8]
- Q6)** a) Give the importance of biofertilizers and vermiculture in modern agriculture practices. [8]
b) Describe methods of protoplast isolation and fusion. Add a note on its application for crop improvement. [8]
- Q7)** a) Describe in detail essential steps involved in vermiculture. [8]
b) Explain the approach used in transgenic plant production improved for increase in production by manipulation of nitrogen fixation capacity. [8]
- Q8)** Write short notes on: [16]
a) Large scale production of SCP.
b) Organogenesis
c) Somatic embryogenesis by cell suspension culture.
d) Mass multiplication of forest trees.



Total No. of Questions : 3]

SEAT No. :

P3181

[Total No. of Pages : 1

[4736] - 3001
M.Sc. (Semester - III)
BIOTECHNOLOGY
BT - 301 : Animal Biotechnology
(2013 Pattern) (Credit System)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following (Any Four)

[4 × 5 = 20]

- a) Serum free media : composition, concept and advantages.
- b) Rationale of cryo freezing.
- c) Application of cell culture in production of therapeutic products.
- d) Explain in detail the working action of selective medium in hybridoma technology.
- e) Give an account of markers used for characterization of animal genome.
- f) Write a note on FACS.

Q2) Write notes on the following :(Any four)

[4 × 5 = 20]

- a) Bioethics in transgenic technology.
- b) Scale up of animal cell culture.
- c) Disadvantages of organ culture over histotypic culture.
- d) In vitro fertilization.
- e) Two methods of introduction of transgene in zygote.
- f) Detection of mycoplasma contamination in animal cell culture.

Q3) Explain indetail, how a gene knock out and selective knock out mouse model help in studying human disease. **[10]**

OR

What are induced pluripotent stem cells (iPS). Give a comparative account of induced pluripotent stem cells and embryonic stem cells. **[10]**



Total No. of Questions : 3]

SEAT No. :

P3182

[Total No. of Pages : 2

[4736] - 3002

M.Sc. (Semester - III)

BIOTECHNOLOGY

**BT - 302 : Bioprocess Engineering and Fermentation Technology
(Credit System) (2013 Pattern)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt the following questions in 10-15 lines (any four) **[4 × 5 = 20]**

- a) Describe principle and working of packed bed reactor and Air-lift fermenter.
- b) What are online, inline and offline sensors? Explain methods of determination of inlet and exit gas in bioprocess.
- c) "Cell Permeability alteration is a means to improve yeild of fermentation product." Explain giving suitable example.
- d) "Use of inhibitors in fermentation media can improve. Yeild of a product." Explain with suitable example.
- e) What are probiotic organisms? Give examples & advantages of probiotics.
- f) Explain with one example use of ion exchange chromatography in product recovery.

Q2) Attempt following questions in 10-15 lines (any four) **[4 × 5 = 20]**

- a) Explain the contribution of animal cells in bioprocess with suitable examples.
- b) Explain the following terms :
 - i) Yeild coefficient.
 - ii) Shear stress
 - iii) Nabla factor

P.T.O.

- iv) Oxygen transfer rate
- v) Q_{O_2}
- c) What is scale up? Explain different scale up strategies.
- d) Enlist different methods of microbial preservation. Explain any two methods for long term preservation of industrially important strains.
- e) Explain the monod's model to express constitutive equations of growth & growth linked Product formation.
- f) What is mass transfer? Describe two film theory of mass transfer.

Q3) Answer the following questions : **[10]**

- a) Enlist different types of cheese and explain cheese production process with respect to
 - i) Starter culture.
 - ii) Changes during cheese ripening process.

OR

- a) What is power number & Reynold's number? For a given impeller, the general relationship between power number & Reynold's number depend on flow regime in tank. Explain with power curve.



Total No. of Questions : 2]

SEAT No. :

P3183

[4736] - 3003

[Total No. of Pages : 1

M.Sc. (Semester - III)

BIOTECHNOLOGY

BT - 303 : Database Management and IPR in Biotechnology

(2013 Pattern) (Credit System)

Time : 1½ Hours]

[Max. Marks : 25

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat and labelled diagram wherever necessary.*

Q1) Answer any three :

[3 × 5 = 15]

- a) Describe in brief the procedure for obtaining process patent.
- b) Discuss the role of international Union for protection of new varieties of plants.
- c) Explain in brief the process for obtaining microbial patent.
- d) Discuss the importance and application of PubMed and OM/M database.
- e) What is a database? Give a concise account of types and characteristics of database.

Q2) Answer any one :

[1 × 10 = 10]

- a) What is source documentation? How the various essential documents are managed and maintained? Explain by giving an appropriate example.
- b) Explain in detail the agreements, treaties, conventions and Acts of IPR pertaining to Biotechnology.



Total No. of Questions : 3]

SEAT No. :

P3184

[Total No. of Pages :2

[4736] - 3004

M.Sc. (Semester - III)

BIOTECHNOLOGY

BT : 304 : Advanced Genetics

(2013 Pattern) (Credit system)

Time :2 ½ . Hours]

[Max. Marks :38

Instructions :

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw a neat and labelled diagram wherever necessary.*

Q1) Answer any two.

[2 × 5 = 10]

- a) Describe in detail the Hardy Weinberg principle. Derive the equation. Enlist all the conditions which can cause distorting of the law.
- b) Discuss the significance of using Drosophila as a model system in genetics.
- c) Give an account of role of chloroplast genes in maternally inherited traits in plants.
- d) Enumerate the genetic factors responsible for variation in somaclones.

Q2) Answer any four:

[4 × 5 = 20]

- a) Write a note on syndromes associated with sex chromosomes abnormalities.(one male and one female).
- b) Define inbreeding. How do you calculate inbreeding coefficient? Give example.
- c) Write chromosomal nomenclature, chromosomal formula and phenotypic characters of down syndrome.

P.T.O.

- d) PKU is a syndrome that affects the child in 10,000 in US. PKU is because of homozygous recessive allele (aa). Calculate the frequency of this allele. Calculate the frequency of normal allele. Calculate the percentage of carriers in the population.
- e) Give a brief description of types of apomictic mechanisms in plants.
- f) Describe the molecular genetic mechanisms underlying post zygotic incompatibility in plants.

Q3) Answer any one:

[1 × 8 = 8]

- a) What do you mean by quantitative genetics? Explain with suitable examples.

OR

- b) What is androgenesis? Discuss in detail the factors involved in developmental pathways of such plants.



Total No. of Questions : 2]

SEAT No. :

P3185

[Total No. of Pages : 1

[4736]-3005

M.Sc. (Part - II) (Semester - III)

BIOTECHNOLOGY

BT - 305 : Bioinformatics

(2013 Pattern) (Credit System) (2 Credits)

Time : 1½ Hours]

[Max. Marks : 25

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Solve any three of the following:

[3 x 5 = 15]

- a) What is a database? Explain its classification with examples and write importance of databases in biology.
- b) Write a note on Homology modelling.
- c) What is sequence alignment? Give an account of pairwise sequence alignment.
- d) Describe protein classification system of CATH giving examples.
- e) Write a note on Scoring matrix, explaining PAM with example.

Q2) Solve any one of the following:

[10]

- a) What is Bioinformatics? Elaborate on the concept of Bioinformatics, mentioning tools used and writing important applications.
- b) What are energy optimization methods in structural bioinformatics? Explain ab initio method giving appropriate examples.



Total No. of Questions : 6]

SEAT No. :

P3163

[Total No. of Pages : 2

[4736] - 301
M.Sc. - II (Semester - III)
BIOTECHNOLOGY
BT - 31 : Animal Biotechnology
(2008 Pattern)

Time : 3 Hours]

[Maximum Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Attempt both the sections on separate answer sheets.*
- 3) *Draw neat & labelled diagrams wherever necessary.*

SECTION - I

Q1) Write short notes on (any 3)

[3 × 5 = 15]

- a) Detection on mycoplasma contamination (any two methods)
- b) Cell sorting
- c) Cryo preservation of embryo
- d) Tissue disaggregation methods.

Q2) Write in brief about organ culture. Add a note on advantages and disadvantages of organ culture over monolayer culture. **[10]**

OR

Write a note on different breeding systems in dairy animals. Comment on factors which influence fertility in artificial breeding. **[10]**

Q3) What is complete medium? Add a note on advantages and disadvantages of serum in ATC media. **[15]**

OR

Explain the need of characterization of cell line and different methods of characterization. **[15]**

P.T.O.

SECTION - II

Q4) Write short notes on (any 3) **[3 × 5 = 15]**

- a) Bioethics in Animal Biotechnology.
- b) Adult stem cells.
- c) in vitro fertilization
- d) Cross contamination in ATC

Q5) Enlist properties of stem cells. Explain any two methods of stem cell purification. **[10]**

OR

Explain different methods to insert a transgene in zygote **[10]**

Q6) Explain in detail methods to generate chimeric organisms. **[15]**

OR

Explain in detail in one transgenic mouse model to study human diseases. **[15]**



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P3164

[4736] - 302

M.Sc. (Semester - III)

BIOTECHNOLOGY

**BT - 32 : Fermentation Technology
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt a total of five questions selecting atleast 2 questions from each section.*
- 2) *Answers to the two sections must be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Discuss mass transfer by molecular diffusion in a fermentor. [8]
b) Discuss the kinetics of growth and product formation by a bacteria in continuous culture. [8]
- Q2)** a) 'Metabolic Pathway engineering is a means for strain improvement'. Justify. [8]
b) Describe the significance of membrane filtration over centrifugation. [8]
- Q3)** a) Explain the various cultivation systems used for anaeroves. [8]
b) Describe the applications of cells in agriculture and industrial biotechnology. [8]
- Q4)** a) Discuss the downstream processing steps in product recovery of an antibiotic. [8]
b) Explain the significance of biotransformation in industrial biotechnology with suitable examples. [8]

P.T.O.

SECTION - II

- Q5)** a) Describe in detail the construction of a classical submerged fermentor. **[8]**
b) Discuss the methods for measurement and control of temperature. **[8]**
- Q6)** Describe the significance, estimation methods and factors affecting, KLa. **[16]**
- Q7)** Discuss biomethanation with respect to substrate used, micro-organisms involved and applications. **[16]**
- Q8)** Describe the factors involved in economics of a fermentation process. Add a note on amortized cost. **[16]**



Total No. of Questions : 6]

SEAT No. :

P3165

[Total No. of Pages : 2

[4736] - 303

M.Sc. (Biotechnology) (Semester - III)

BT - 33a : Principles of Virology

(2008 Pattern)

Time : 1½ Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *Attempt total four questions selecting atleast two questions from each section.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

Q1) With neat labelled diagram explain replication cycle of Pox Virus. [10]

Q2) Answer the following :

- a) How is the immunofluorescence used in Viral diagnosis? [5]
- b) Enlist different antiviral agents and give the mode of action of acyclovir.[5]

Q3) Write short notes on : [10]

- a) Structure of T₄ bacteriophage
- b) Subunit vaccine.

SECTION - II

Q4) What are persistent infections? Explain any one such infection. [10]

Q5) How is epidemiology of HIV studied and how the study can help in effective control of HIV? [10]

P.T.O.

Q6) Write short notes on :

[10]

- a) H₁N₁ as new emerging infection
- b) Transmission of plant viruses



Total No. of Questions : 6]

SEAT No. :

P3166

[Total No. of Pages : 2

[4736] - 304

M.Sc. - II (Semester - III)

BIOTECHNOLOGY

BT - 33b : Advanced Immunology

(2008 Pattern)

Time :1½ Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) *Attempt four questions selecting atleast two from each section.*
- 2) *Answers to the sections must be written in separate answer sheets.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Write in detail the morphology and physiology of spleen. [5]
- b) Differentiate between Innate and Acquired immunity. [5]
- Q2)** a) Give schematic representation of classical and alternate pathway of complement system. [5]
- b) What are agglutination reactions? Give the principle of agglutination inhibition. [5]
- Q3)** a) What is hyperacute rejection ? Give examples. [5]
- b) What is autoimmunity ? Describe in brief immunopathogenesis of myasthenia gravis. [5]

P.T.O.

SECTION - II

- Q4)** a) What are stem cells? Write its applications in detail. [5]
- b) How recombinant nectar vaccines are produced? Add a note on its advantages. [5]
- Q5)** Give detailed information on signalling pathways initiated by BCR. [10]
- Q6)** Write in detail the technology of phage display and its significance. [10]



Total No. of Questions : 3]

SEAT No. :

P3186

[Total No. of Pages : 2

[4736] - 4001

M.Sc.

BIOTECHNOLOGY

BT 401 : Genomics and Proteomics

(Credit System) (2013 Pattern) (Semester - IV)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Solve any four of the following :

[4 × 5 = 20]

- a) Annotation of genome makes a foundation for various genomics studies. Explain structural and functional annotation with the help of suitable examples.
- b) Explain concept of transcriptome. Describe the technique of mapping using EST.
- c) Give the principle and explain the working of DNA microarray with suitable diagram.
- d) Comparative genomics is a powerful branch of genome study. Explain its utility in phylogenetic analysis.
- e) Various tools are available for genome sequencing. Explain any two main techniques and compare them with respect to sequence quality and efficiency.
- f) Explain the role of pharmacogenomics in the field of personalized medicine with suitable example.

Q2) Solve any four of the following :

[4 × 5 = 20]

- a) Explain in detail a strategy for identification of a protein of interest from a mixture.
- b) Scientists have purified two proteins A and B. According to them, A is essential for activity of B, but not yet proved. Design the experimental strategy to prove the above.
- c) Enlist the applications of structural proteomics and explain any one in detail.

P.T.O.

- d) Explain any two techniques in proteomics that exploit the properties of m/z ratios for characterization of proteins.
- e) Justify : Anchoring of molecular expression profile in phenotype, dose and time help to define a sequence of key molecular event in the mode of action of a toxicant.
- f) Explain the use of bioinformatics in functional proteomics with suitable example.

Q3) Solve any one of the following :

[1 × 10 = 10]

- a)
 - i) Explain the contribution of pharmacogenomics in studies aiming to understand health and disease states in humans? Explain with example.
 - ii) Justify how proteomics technique have improved the approach towards efficient diagnosis of disease.
- b)
 - i) Define Functional genomics. Give its goals and describe any one method to study functional genomics.
 - ii) What are microarrays? What is its utility? What are the advantages and disadvantages of cDNA microarrays?



Total No. of Questions : 3]

SEAT No. :

P3187

[Total No. of Pages : 2

[4736] - 4002

M.Sc. (Semester - IV)

BIOTECHNOLOGY

**BT - 402 : Advanced Biochemical & Biophysical Techniques
(Credit System) (2013 Pattern)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following (any four) : **[20]**

- a) Give the principle of High performance liquid Chromatography. Add a note on effect of height & width of column on separation.
- b) What are the advantages & disadvantages of scintillation counting?
- c) Explain the working & application of scanning electron microscopy.
- d) Give the significance of use of mass spectrophotometer along with gas Chromatography.
- e) Define Isoelectric point. Give the applications of 2-dimensional electrophoresis.
- f) Write notes on :
 - i) Radio isotopes.
 - ii) Rotational & vibrational excitations.

Q2) Answer the following (any four) : **[20]**

- a) Imaging living cells & tissues is technically more challenging than the sectioning method. Justify.
- b) Explain the methods based upon gas ionization for detection & measurement of Radioactivity.

P.T.O.

- c) Give the applications of x-ray crystallography.
- d) Discuss the principle and application of high performance thin layer chromatography.
- e) Explain method for identification of recombinant proteins.
- f) Write short note :
 - i) Immunoprecipitation.
 - ii) Circular dichroism.

Q3) Answer the following (any one) : **[10]**

- a) Elaborate upon the strategic use of techniques for protein characterization.
- b) Describe the factors affecting profile of NMR and its intensity.



Total No. of Questions : 2]

SEAT No. :

P3188

[Total No. of Pages : 1

[4736] - 4003
M.Sc. (Semester - IV)
BIOTECHNOLOGY
BT - 404 : Nanobiotechnology
(2013 Pattern) (Credit System)

Time : 1½ Hour]

[Max. Marks : 25

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Answer the following (any 3) :

[3 × 5 = 15]

- a) Comment on the methods used for synthesis of nanoparticles using microorganisms.
- b) Explain the process of surface modification of nanoparticles for biofunctionalization.
- c) With the help of La-mer diagram explain the growth of nanoparticles.
- d) Discuss the applications of nanoparticles in chemical sciences.
- e) Describe the physico chemical properties of nanoparticles with change in size of nanoparticles.

Q2) Answer the following (any 1) :

[1 × 10 = 10]

- a) Enlist the methods used for characterization of nanoparticles explain any one.
- b) Explain the applications of lipid nanoparticles for Drug delivery.



Total No. of Questions : 3]

SEAT No. :

P3189

[Total No. of Pages : 2

[4736] - 4004

M.Sc. (Part - II) (Semester - IV)

BIOTECHNOLOGY

BT - 405 : Animal Biotechnology & Stem Cell Technology

(2013 Pattern) (Credit System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt the following questions in 10-15 lines (any 4): **[4 × 5 = 20]**

- a) Explain the structural and functional modifications that take place in sperms in order to enable it to penetrate the egg membrane.
- b) Discuss various issues associated with Human Cloning.
- c) How is anterior-posterior axis determined during early embryonic development?
- d) Explain the concept of cell lineage, describing the salient features of each stage.
- e) What are bottle neck cell? Explain their role in development.
- f) Write a note on "egg metabolic activation" and its significance.

Q2) Attempt the following questions in 10-15 lines (any 4): **[4 × 5 = 20]**

- a) Write a note on cell cycle regulation in stem cells and cells undergoing cleavage.
- b) Explain in detail the embryonic development in Drosophila upto blastula stage.

P.T.O.

- c) Write a note on therapeutic application of stem cells during burn injury.
- d) Explain the concept of Fate Map.
- e) Explain the initiation of organogenesis with appropriate example.
- f) Discuss the concept of metaplasia and transdifferentiation.

Q3) Answer any one :

[1 × 10 = 10]

With the help of appropriate example explain the application of gene therapy using stem cells in neurodegenerative disorders.

OR

Elaborate any one site specific gene insertion method in stem cells.



Total No. of Questions : 3]

SEAT No. :

P3190

[Total No. of Pages : 2

[4736] - 4005

M.Sc. (Semester - IV)

BIOTECHNOLOGY

BT - 406 : Agricultural Biotechnology

(Credit System) (2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat labelled diagrams wherever necessary.*

Q1) Attempt any four of the following :

[4 × 5 = 20]

- a) Elaborate on the importance of apomixis in crop improvement.
- b) Explain with suitable examples the concept of future crops. Add a note on their significance.
- c) Explain chloroplast engineering for production of therapeutic proteins.
- d) Discuss advantages and limitations of RFLP based markers.
- e) Write a note on risks associated with production and release of high and low impact transgenic crops.
- f) Justify importance of virus indexing in plant micropropagation. Comment on methods used for virus indexing.

Q2) Attempt any four of the following :

[4 × 5 = 20]

- a) Discuss advantages and limitations of edible vaccines over conventionally produced vaccines.
- b) What is AFLP? Explain the methodology to carry out AFLP. Add a note on its significance as molecular markers.
- c) With suitable examples, explain role of biotechnological interventions for improvement of vegetable crops.

P.T.O.

- d) Elaborate on causes of somaclonal variations and its importance in crop improvement.
- e) What is agribusiness? How it influences agricultural economics?
- f) What is embryo rescue technique? Discuss its role in agriculture.

Q3) Attempt any one of the following:

[1 × 10 = 10]

- a) Describe in detail, various methods to produce herbicide resistant plants through transgenic technology.
- b) What are bioreactors? Discuss various types of bioreactors used for plant propagation through different pathways.



Total No. of Questions : 8]

SEAT No. :

P3167

[Total No. of Pages : 2

[4736] - 401
M.Sc. (Part - II) (Semester - IV)
BIOTECHNOLOGY
BT-41 : Genomics & Proteomics
(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 60

Instructions to the candidates:

- 1) Attempt any five questions selecting atleast two questions from each section.*
- 2) Answers to the sections must be written on separate answer books.*
- 3) Neat diagrams to be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

SECTION - I

Q1) Write notes on any two :

[2 × 6 = 12]

- a) Comparative genomics.
- b) Genome annotation.
- c) Pyro sequencing.

Q2) Describe various sequencing strategies for the whole genome analysis. Add a note on unique features of human genome project. **[12]**

- Q3)** a) Describe methods used in functional genomics.
b) Give the scope of structural genomics.

[12]

- Q4)** a) Discuss various applications of microarray.
b) Explain the term 'pharmacogenomics' and write its importance in personalized medicine.

[12]

P.T.O.

SECTION - II

Q5) What are protein - protein interactions. Explain how computational approach is used to study such interactions. [12]

Q6) Write explanatory notes on any two : [2 × 6 = 12]

- a) Structural proteomics.
- b) Principle of IEF.
- c) Concept of proteom.

Q7) Explain how are microarray useful in functional proteomics? [12]

Q8) Enlist applications of proteomics. Explain any one application in details. [12]



Total No. of Questions : 8]

SEAT No. :

P3168

[Total No. of Pages : 2

[4736] - 402

M.Sc. (Semester - IV)

BIOTECHNOLOGY

**BT - 42 : Legal and Ethical Aspects in Biotechnology and IPR
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 60

Instructions to the candidates:

- 1) *Attempt a total of five questions selecting at least two questions from each section.*
- 2) *Answers to the sections must be written on separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

Q1) What do you mean by intellectual property? Discuss different forms of IPR. [12]

Q2) Describe in detail procedure for filing patent of biological products. [12]

Q3) Write short notes on :

- a) Rights of Patentee. [6]
- b) Role of WTO in Safeguarding IPR internationally [6]

Q4) a) Write the salient features of Indian Patent Act. 1970. [6]

b) Give a Concise account of Berne Convention. [6]

SECTION - II

Q5) Explain the changes in the Indian patent system after TRIPS Agreement. [12]

Q6) a) Discuss the salient features of Budapest Treaty. [6]

b) Give conditions for grant of breeders right. [6]

P.T.O.

Q7) Write short notes on :

- a) IPR agencies and conventions. [6]
- b) Protection of software programs. [6]

Q8) Explain the procedure for registration under design act 2000. [12]



Total No. of Questions : 6]

SEAT No. :

P3169

[4736] - 403

[Total No. of Pages : 2

M.Sc. (Part - II) (Semester - IV)

BIOTECHNOLOGY

BT - 43 : Clinical Research and Database Management

(2008 Pattern)

Time : 1½ Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) Attempt a total of four questions selecting atleast two questions from each section.*
- 2) Answers to the sections must be written on separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

SECTION - I

Q1) What is FDA? Explain the major legislations in the history of FDA with regard to drugs and medical devices. **[10]**

Q2) What do you mean by biologic? Explain the development and licencing process for a biologic. **[10]**

Q3) Write short notes on any two of the following : **[10]**

- a) Development of medical device.
- b) Pre clinical research.
- c) Schedule Y in clinical trials.

P.T.O.

SECTION - II

Q4) What is clinical data management? What are the processes involved in clinical data management? Explain. Add a note on its significance. **[10]**

Q5) What is a case report form? outline the procedure in the designing of case Report form. Write a note on its importance. **[10]**

Q6) Write notes on any two of the following : **[10]**

- a) Phase III of Clinical Trial and NDA.
- b) Serious adverse event.
- c) Ethical Issues in clinical research.



Total No. of Questions : 6]

SEAT No. :

P3170

[Total No. of Pages : 2

[4736] - 404
M.Sc. (Semester - IV)
BIOTECHNOLOGY
BT - 44 a : Nanobiotechnology
(2008 Pattern)

Time : 1½ Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate books.*
- 2) Attempt not more than 4 questions of which at least 2 questions must be from each section.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

SECTION - I

Q1) Answer the following : **[2 × 5 = 10]**

- a) With a suitable example. Explain how the size of nanoparticle affects its properties.
- b) Explain the recent trends of nanotechnology in chemical sciences.

Q2) Discuss the different methods of biofunctionalization of nanoparticle for its application in life sciences. **[10]**

Q3) Write short notes on : **[2 × 5 = 10]**

- a) Micelle
- b) Transmission electron Microscopy

SECTION - II

Q4) Answer the following : **[2 × 5 = 10]**

- a) Give comparative account on synthesis of nanoparticles by chemical & biological methods.
- b) Explain how nanoparticles are synthesized from semiconductor materials.

P.T.O.

Q5) Enlist the methods used for characterization of nanoparticles. Explain any two in detail. **[10]**

Q6) Write short notes on : **[2 × 5 = 10]**

- a) Sputtering
- b) Biomolecules as nanostructures



Total No. of Questions : 4]

SEAT No. :

P3171

[Total No. of Pages : 2

[4736] - 405

M.Sc. - II (Semester - IV)

BIOTECHNOLOGY

BT - 44 b : Stem Cell Techniques & Reproduction

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 60

Instructions to the candidates:

- 1) *Attempt both the sections on separate answer sheets.*
- 2) *All questions are compulsory.*
- 3) *Draw neat & labelled diagrams wherever necessary.*

SECTION - I

Q1) Write short notes (any three) :

[3 × 5 = 15]

- a) Fast block to polyspermy.
- b) Acrosomal reaction in sea urchin.
- c) Cell movements in pattern formation.
- d) Concept of organiser.

Q2) What is pattern formation? Add a note on role of maternal genes in development & pattern formation of embryo. **[15]**

OR

Give a comparative account of spermatogenesis & oogenesis.

SECTION - II

Q3) Write short notes (any three) :

[3 × 5 = 15]

- a) Gene therapy
- b) Knock-out mice
- c) Bioethics during generation of transgenics
- d) Chimera

P.T.O.

Q4) Explain the process of generation of transgenic animals using retroviral method. **[15]**

OR

What is embryonic stem cell technology? Explain in detail its applications & scope.



Total No. of Questions : 8]

SEAT No. :

P3172

[Total No. of Pages : 2

[4736] - 406
M.Sc. (Semester - IV)
BIOTECHNOLOGY
BT - 44 C : Agricultural Biotechnology
(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 60

Instructions to the candidates:

- 1) Attempt total five questions selecting at least two questions from each section.*
- 2) Answers to the sections must be written on separate answer book.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

SECTION - I

- Q1)* Describe the method of haploid plant production by anther culture & their use in crop improvement. **[12]**
- Q2)* Comment on "Micropropagation can be used for mass multiplication of oil seed crops". **[12]**
- Q3)* Explain in detail use of lioreactors for large scale production of plants with suitable example. **[12]**
- Q4)* Write short notes on any two of the following : **[12]**
- a) Production of triploides.
 - b) Hericide resistant transgenic crops.
 - c) Role of biopesticides in agriculture.

P.T.O.

SECTION - II

Q5) Explain in detail with suitable examples the role of biofertilizers in agriculture. **[12]**

Q6) Describe the role of molecular markers for crop improvement against abiotic stresses with examples. **[12]**

Q7) Explain : **[12]**

- a) Production of transgenic crops for abiotic stress tolerance.
- b) Metabolic engineering.

Q8) Write explanatory notes on any two of the following : **[12]**

- a) Use of somaclonal variation in crop improvement.
- b) Role of apomixis in agriculture.
- c) Application of transgenic plants as source of edible vaccines.



Total No. of Questions : 8]

SEAT No. :

P3211

[Total No. of Pages : 3

[4737] - 1001

M.Sc. (Semester - I)
COMPUTER SCIENCE

CS - 101 : Principles of Programming Languages
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) Answer the following:

- a) What is object closure? Explain with suitable example in C++. [4]
- b) Explain why ordering within an expression is important? [4]
- c) "Interpreter is locus of control during execution of the program". Justify True or False. [2]

Q2) Answer the following:

- a) Explain the concept of free union with suitable example of C. [4]
- b) Consider the following pseudo code: [4]

X : integer := 50

Y : integer :=5

Procedure do_sub

X:= X-Y

write_integer(X)

Procedure foo2(P :procedure)

X: integer :=10

P()

P.T.O.

```

Procedure foo 1
    Y: integer :=4
    foo2(do_sub)
foo1( )
write_integer(X)

```

Discuss the output generated by the program:

- i) If the language uses dynamic scoping with deep binding?
- ii) If the language uses dynamic scoping with shallow binding?
- c) Give any two uses of the preprocessor. [2]

Q3) Answer the following:

- a) Write a Prolog program for finding a^n . [4]
- b) What is dangling pointer? Give sequence operations creating a dangling pointer. [4]
- c) What is an iterator? Name any two languages supporting iterators. [2]

Q4) Answer the following:

- a) What is subroutine? Give characteristics of subprograms. [4]
- b) Explain the difference between virtual and nonvirtual method binding with suitable example. [4]
- c) What is multiway assignment? Name any two languages supporting multiway assignment. [2]

Q5) Answer the following:

- a) Explain the vtable implementation for single inheritance with suitable example. [4]
- b) What is Semaphore? Explain the wait and release operations for semaphore. [4]
- c) Give Output of the following: [2]
 - i) (eq1 14 14.0).
 - ii) (eq1 14 14).

Q6) Answer the following:

- a) What are different levels of concurrency in software execution? [4]
- b) Explain initialization and assignment in C++ with suitable example. [4]
- c) What is slice? Name any two languages supporting slices. [2]

Q7) Answer the following:

- a) Write lisp function for implementing nthcdr (skip first n elements). [5]
- b) Explain various categories of arrays based on binding to subscript ranges and storage. [5]

Q8) Answer the following:

- a) Consider the following sentences: [5]

“X is classmate of Y if X joins same course as Y, X studies in same institute as Y and X, Y are in same class. Ravi, Sunit joins music course and Arts course in Divya’s institute. Sachin, Meeta and Ritu are music students in Divya’s institute. Ravi and Meeta are in Fy class. Ritu and Sachin are in Sy class”.

Write a Prolog program to find classmate of Ravi.

- b) Define: [5]
 - i) Static link.
 - ii) Static chain.
 - iii) Static depth.
 - iv) Nesting depth.
 - v) Chain offset.



Total No. of Questions : 8]

SEAT No. :

P3212

[Total No. of Pages : 3

[4737]-1002

M.Sc. (Computer Science) (Semester - I)

CS-102: ADVANCED NETWORKING CONCEPTS

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt any five questions from given eight questions.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) What is the minimum and maximum frame size of the Ethernet LAN? "Ethernet has imposed restrictions on minimum and maximum length of a frame." Comment. [4]

b) What would be the transformation of the following message using 'Rail Fence Technique' and 'Simple Columnar Transposition Technique'?

Message: YOU MUST WIN THE GAME

While transforming a message using Simple Columnar Transposition, use a rectangle of 5 columns and the random order of columns is 4, 1, 3, 2, 5. [4]

c) A routing table has 15 entries. It did not receive information about 3 routes for about 220 sec. How many timers are running at this time? [2]

Q2) a) Discuss various transition strategies from IPv4 to IPv6. [4]

b) "Key Transformation step in DES symmetric key algorithm is also called 'Compression Permutation'." – Comment. [4]

c) List out four parties involved in User Authentication Protocol used in real life system. Explain each one in brief. [2]

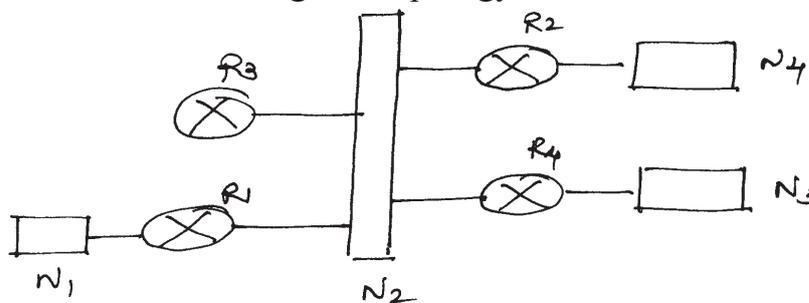
P.T.O.

- Q3) a)** Explain how Certificate-based authentication works?
 “Certificate-based authentication is a stronger mechanism as compared to a password based authentication mechanism.” – Comment. [4]
- b) Why Nagle’s Algorithm is used in most of the TCP implementations?[4]
- c) Summarize the participants involved in the SET system. [2]

- Q4) a)** What are the services offered by Record Protocol in SSL? Explain the operational working of Record Protocol in detail. [4]
- b) Explain the stepwise verification process of a digital certificate. [4]
- c) Explain how the buffer size problem is tackled in Transport Layer? [2]

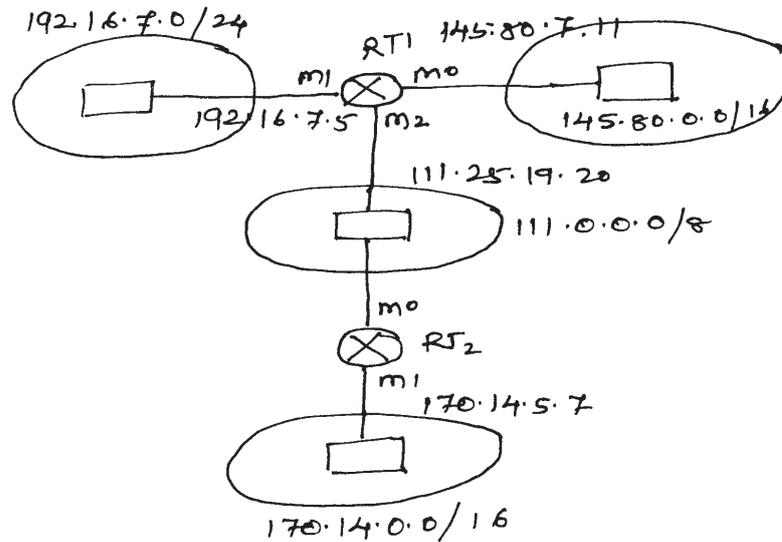
- Q5) a)** Why TCP is not suitable for interactive multimedia traffic? Which transport layer protocols are used to manage interactive real time traffic instead?[4]
- b) To find $a^b \text{ mod } n$, the algorithm is: [4]
 Start
 $c=1$;
 for $i = 1$ to b
 calculate $c = (c * a) \text{ mod } n$
 next i
 end for
 End
 Using this technique, find $9^4 \text{ mod } 117$.
- c) Why options are made part of IPv4 datagram header? Explain in brief, how a record route option is different from strict source route option?[2]

- Q6) a)** Explain four chief principles of security. [4]
- b) In the given network topology, state the type of each link. Find out which router(s) sends out Router Link LSA and which router sends out Network Link LSAs in a given topology? [4]



- c) Compare and contrast packet filters and application gateways in brief.[2]

- Q7) a)** Given is the imaginary part of the Internet. Design routing table(s) for router RT1 using classful addressing. Router RT1 receives a packet with destination address 170.14.89.4. Show how the packet is forwarded. [5]



- b) Explain in detail how the email communication is secured using PGP protocol? [5]
- Q8) a)** What is electronic money? State its classification and explain the double spending problem in short. [5]
- b) Discuss two army problem and explain how it resembles to connection release issue in transport layer. [5]



Total No. of Questions : 8]

SEAT No. :

P3213

[Total No. of Pages : 4

[4737] - 1003

M.Sc. (Computer Science) (Semester - I)

CS-113 : Distributed Database Concepts

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any 5 out of 8 questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*

Q1) Answer the following :

- a) Define the term Distributed computing. State the different things that can be distributed, in a distributed computing system. [4]
- b) Consider the following Query : [4]
SELECT ENAME
FROM EMP,ASG
WHERE EMP.ENO = ASG.ENO
AND ASG.RESP = "Manager" AND EMP.AGE = 60;
State any four equivalent relational algebra query trees that are correct transformations of the above query.
- c) State the three components of a query optimizer. [2]

Q2) Answer the following :

- a) What are the three dimensions based on which the DDB architecture is defined? Explain in brief the concept of Autonomy, in defining DDB architecture. [4]
- b) Consider the following relation Employee(emp_no, ename, ecity,age). Perform a horizontal fragmentation of Employee with respect to the following predicates:
P1 : ecity = "Mumbai"; P2 : ecity = "Pune"
Check the correctness of your fragmentation and state whether your fragmentation is a correct fragmentation. [4]
- c) State the formal definition of a Schedule, S, defined as a partial ordering of operations of participating transactions. [2]

P.T.O.

Q3) Answer the following

- a) Define the following terms with an eg : [4]
i) A simple predicate ii) A derived fragment
- b) Consider the following query [4]
Select C.Cust_name from Customer C, Account A where C.cust_no = A.cust_no and C.age between 30 and 50 and A.balance < 5000;
Apply the centralized Ingres algorithm and optimize the above query.
- c) Draw a query tree for the following query [2]
Select e.ename, e.city from employee e, Dependent d where e.eno = d.eno and e.city in ("pune", "mumbai", "Kolkotta");

Q4) Answer the following

- a) Consider the following Query [4]
Select cake_name, cake_weight from cakes C, Ingredients I, Cake_ingred CI where C.cake_name = 'Pineapple Pastry' and C.cno = CI.cno and I.ino = CI.ino and I.Ingredient_name = "milk cream";
Assume
- cakes has an index on cno,
 - Cake_ingred has an index on ino,
 - Ingredients has an index on ino and an index on ingredient_name
- Apply System R optimization algorithm and determine the best join ordering for cakes ∞ Cake_ingred ∞ Ingredients
- b) Write a short note on Concept of Checkpoints in a database log. [4]
- c) Define the following terms : [2]
i) A Affinity Matrix ii) A Usage Matrix

Q5) Answer the following :

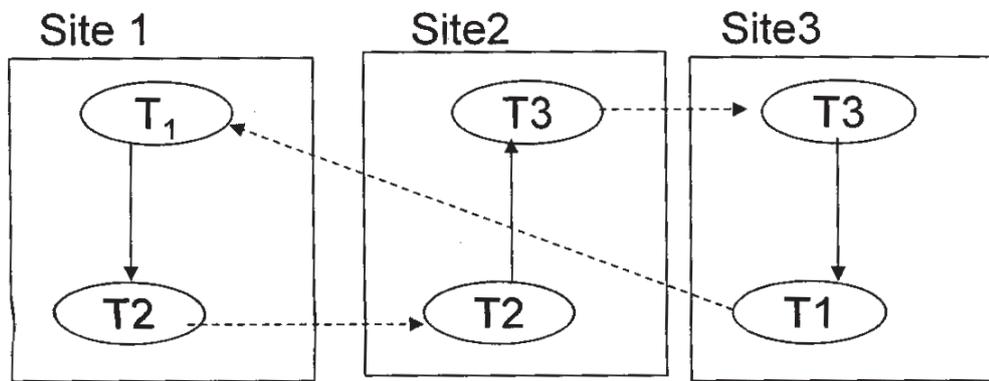
- a) Given the following relations : [4]
Account(AccountNumber, ClientNumber, Balance)
Client(ClientNumber, Name, Birthdate, Branch)
- i) Formulate a query (in SQL and relational algebra) that asks for account holders affiliated with branches in Pune and Mumbai, whose balance < 1000). Draw the operator tree corresponding to the relational algebra expression.
- ii) Extract the selection predicate from the query and transform it into the conjunctive normal form and into the disjunctive normal form
- b) Write a Short note on the 3PC protocol. [4]
- c) Define the term Heterogeneity and state its dimensions. [2]

Q6) Answer the following : [4]

a) Consider the following :
 Data items x and y are stored at site 1, z and w are stored at site 2.
 Determine whether the following executions are serializable or not.
 Find all possible total orders of transactions for serializable schedules.

- i) Execution 1 :
 S1: Ri(x)Rj(x)Wj(y)Wi(x)
 S2: Ri(w)Rj(z)Wj(w)Wi(w)
- ii) Execution 2 :
 S1: Ri(y)Rj(x)Wj(x)
 S2: Wi(z)Ri(w)Rj(w)Wi(w)

b) Consider the following DWFG : [4]



Apply the distributed deadlock detection algorithm and identify a global deadlock, if it exists

c) Consider the following Query : [2]
 Select e.ename, p.pname from employee e, project p, assign a
 Where e.eno = a.eno and a.pno = p.pno and (e.city = 'pune' or p.pno = 5);
 Draw the Query graph and join graph for the above query.

Q7) Answer the following :

a) Consider the following Query, to obtain the salaries of engineers who work on the CAD/CAM project? [5]

$\pi_{SAL}(PAY \bowtie EMP \bowtie ENO(ASG \bowtie PNO(\sigma_{PNAME = CAD/CAM}(PROJ))))$.

Schemas: -

EMP(ENO, ENAME, TITLE), ASG(ENO, PNO, RESP, DUR),

PROJ(PNO, PNAME, BUDGET, LOC), PAY(TITLE, SAL)

Assumptions:

Size of relations is defined as their cardinality

Minimize total cost

Transmission cost between two sites is 1

Ignore local processing cost

$\text{size}(\text{EMP} \bowtie \text{PAY}) = 8$, $\text{size}(\text{PROJ} \bowtie \text{ASG}) = 2$, $\text{size}(\text{ASG} \bowtie \text{EMP}) = 10$

Statistics

Relation	Size	Site
Emp	8	1
Pay	4	2
Proj	1	3
Asg	10	4

Apply the Hill Climbing optimization algorithm and determine the best join ordering alongwith the processing site/s for the join of the above relations.

- b) Consider a data item x stored at site 1 in a distributed database with 2 sites. Let the triple (R_i, j, TS) ((W_i, j, TS)) denote a read (write) request of transaction T_i on the item x generated at site j with timestamp TS . Indicate the behavior of the basic timestamp method with the following sequence of requests. [5]
 $(R_4, 1, 10)$, $(R_5, 1, 11)$, $(W_6, 1, 13)$, $(W_7, 2, 14)$, $(R_8, 1, 14)$, $(R_9, 2, 17)$, $(R_{10}, 1, 16)$, $(W_{11}, 1, 20)$, $(W_{12}, 2, 22)$

Q8) Answer the following :

- a) Given the following fragmentation of relation [5]
Supplier (supNo, supName, code, city) which splits the relation in internal and external suppliers:
Supplier1: $\sigma_{\text{code}='internal'}(\text{supplier})$, Supplier2: $\sigma_{\text{code}='external'}(\text{supplier})$
- i) Fragment relation items(itemNo, itemName, supNo, price) into two relations by separating attribute itemName. The obtained relation with all the other attributes is to be fragmented into cheap (≤ 10 EUR) and expensive (> 10 EUR) items. The expensive items shall once again be partitioned into those bought by internal and those supplied by external suppliers. Provide the relational algebra expressions necessary to partition relation items.
- ii) Indicate which kind of fragmentation is used.
- iii) Draw the join graph and decide on the goodness of the obtained fragmentation.
- b) Write a short note on the Distributed 2PC communication structures.[5]



Total No. of Questions : 8]

SEAT No. :

P3214

[Total No. of Pages :3

[4737]-1004
M.Sc. (Semester - I)
COMPUTER SCIENCE
CS 104 : Design Analysis of Algorithm
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

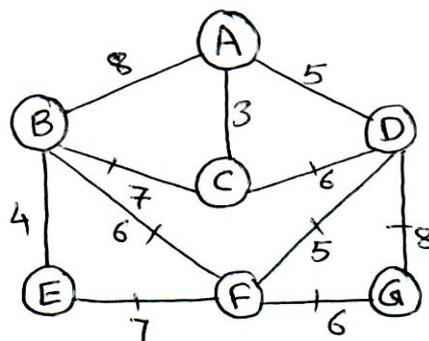
Q1) a) Write a selection sort algorithm and obtain its best & worst case running time. **[4]**

b) Explain Longest common subsequence problem and string editing problem. Give the recurrence relation for the Longest common subsequence. **[4]**

c) Sort the following array of elements by merge sort 19, 7, 14, 10, 8, 7, 9, 16, 15. **[2]**

Q2) a) Show that the time complexity of Strassen's algorithm is $O(n^{2.81})$. **[4]**

b) What is minimum spanning tree? Using prim's algorithms Find the minimum spanning tree of following graph G. **[4]**



P.T.O.

c) Define Θ and Ω notation. [2]

Q3) a) Find an optimal solution to the knapsack problem instance $n=4$, $m=7$, & $p=(15,12, 10,6)$ $w=(5, 3, 3, 2)$ using greedy Method. [4]

b) Write a non-deterministic algorithm for sorting n elements. [4]

c) Write the condition for kill a node, update the u in LCBB and what is the initial value of u . [2]

Q4) a) Draw the portion of the state space tree generated by LCBB For 0/1 knapsack problem instance given by $n=3$, $P=(8,5,5)$, $W=(6,5,5)$, $m=10$. [4]

b) Devise a divide and conquer algorithm to determine the number of time a given number x appears in an array of n elements. What is the time complexity & space complexity of this algorithm? [4]

c) Define inter pollution problem. [2]

Q5) a) Consider the following instance for job sequencing with deadlines problem where $n=5$. [4]

$$(p_1, p_2 \dots p_5) = (6, 3, 4, 8, 5)$$

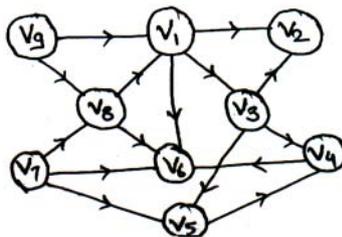
$$(d_1, d_2 \dots d_5) = (3, 1, 4, 2, 4)$$

Give solution obtained using greedy method that uses set representation.

b) Determine the polynomial of smallest degree that interpolate the point $(0,5)$ $(1,10)$ $(2,21)$ [4]

c) How many solution are there in the 8-queen problem and give implicit constraints. [2]

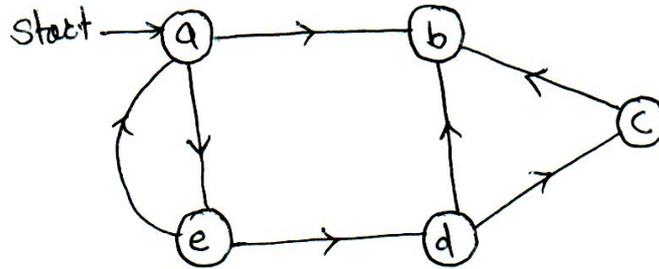
Q6) a) Find the topological sort of the given directed acyclic graph? What is its time complexity? [4]



[Start from vertex v_1]

- b) Order the following function in ascending order of the growth rate $4^n, e^n, n^n, \log_e n^n, n^2, n!, \log_e(\log_e n)$. [4]
- c) Explain optimal storage on Tapes. [2]

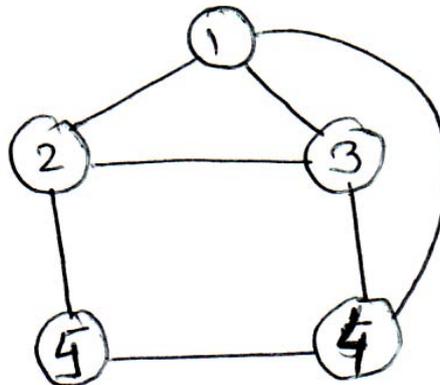
- Q7)** a) What are strongly connected components? Give the algorithm to compute strongly connected components using DFS find the strongly connected components of the following graph using the above algorithm. [5]



- b) What is the best way to multiply a chain of matrices with dimensions that are $10 \times 20, 20 \times 50, 50 \times 1, 1 \times 100$ using dynamic programming method. [5]

- Q8)** a) What is principle of optimality? Solve 0/1 knapsack problem with $n=4, m=34, P=(2,5,8,1), w=(10,15,6,9)$ using dynamic programming [use function method]. [5]

- b) What is m-colorability graph? Find out all possible solution with 3 color for following graph. [5]



✓ ✓ ✓

Total No. of Questions : 8]

SEAT No. :

P3215

[Total No. of Pages : 2

[4737] - 1005

M.Sc. - COMPUTER SCIENCE (Semester - I)

CS - 105 : Network Programming

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions from given eight questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data if necessary.*

- Q1)** a) write a Simple Daytime Server program. [4]
b) Explain Connection Termination in TCP. [4]
c) Distinguish between complete and incomplete connection queue. [2]
- Q2)** a) Write note on shutdown function. [4]
b) Explain Termination of Server Process in detail. [4]
c) Difference between State and Stateless Servers. [2]
- Q3)** a) Describe IPV4 and generic socket address structure. [4]
b) Explain getservbyname, getservbyport and gethostbyname. [4]
c) Write echo client function for TCP. [2]

P.T.O

- Q4)** a) Write a note on Client Server Architecture. [4]
b) Discuss Lack of Flow Control in UDP. [4]
c) Name some address Conversion functions supporting both IPV4 and IPV6 and define them. [2]
- Q5)** a) Explain server function for datagram socket. [4]
b) Write a note on select system call. [4]
c) Distinguish between close and shutdown. [2]
- Q6)** a) Write a code snippet for server which handles zombies. [4]
b) Write a client function that verifies returned socket address. [4]
c) Define poll function. State any three constants used to specify its event flag. [2]
- Q7)** a) Write a note on concurrent servers. [5]
b) State different Client command used in Chat Protocol with possible server response. [5]
- Q8)** a) Discuss Daemon Process in detail. [5]
b) Explain SO_LINGER socket option. [5]



Total No. of Questions : 5]

SEAT No. :

P3201

[Total No. of Pages : 3

[4737] - 101

**M.Sc. (Semester - I)
COMPUTER SCIENCE**

**CS - 101 : Principles of Programming Languages
(2011 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) Answer any Eight of the following:

- a) What are bound and free variables in Prolog? [2]
- b) What is bootstrapping? [2]
- c) "Code optimization is always machine dependent", Justify whether True or False. [2]
- d) What is l-value and r-value? [2]
- e) "C language does not support array operations". Justify true or false. [2]
- f) "Invocation of coroutine is called resume rather than a call". Justify true or false. [2]
- g) What is Disjoint task? [2]
- h) What are constructors and destructors? [2]
- i) List two common mechanisms for dynamic pool adjustment. [2]
- j) Evaluate the following Lisp code: [2]
*(first (rest (first '((a b) (c d))))).

Q2) Answer any Four of the following:

- a) Using a Java code explain the concept of boxing and unboxing. [4]
- b) Explain the concept of macros in 'C'. [4]

P.T.O.

- c) What is Vtable? Explain with example how Vtable is maintained in case of Single Inheritance? [4]
- d) Explain the layout of the run-time stack. [4]
- e) What is short circuited evaluation? Give advantages of short circuited evaluation. [4]

Q3) Answer any Four of the following:

- a) Consider the following pseudo code: [4]

```

X: integer := 1
    Y: integer :=2
    Procedure add
        X:= X+Y
    Procedure second (P :procedure)
        X: integer :=2
        P()
    Procedure first
        Y:integer :=3
        Second(add)
    first()
    write_integer(X)

```

With proper justification answer the following questions:

- i) What does it print if the language uses dynamic scoping with deep binding?
- ii) What does it print if the language uses dynamic scoping with shallow binding?
- b) What are the two solutions to dangling pointer problem? [4]
- c) Differentiate between value model and reference model with suitable example. [4]
- d) Explain how Programming languages are classified? [4]
- e) Explain any two parameter passing modes with suitable example. [4]

Q4) Answer any Four of the following:

- a) Name eight major categories of control-flow mechanisms. [4]
- b) Differentiate between virtual and nonvirtual method binding with suitable example. [4]
- c) What is Monitor? What advantage do monitors have over semaphores? [4]
- d) Describe the logical architecture of an MIMD computer. [4]
- e) What makes a language successful? [4]

Q5) Answer any Four of the following:

- a) Assume the following sentences: [4]

“John likes all kinds of food. Apples are food. Chicken is food.

Anything anyone eats and isn't killed by is food. Bob eats peanuts and is still alive. Sue eats everything Bob eats.

Write a Prolog program to answer the question “what food does Sue eat?”

- b) Define a Lisp function pal to check whether given list is palindrome or not. [4]

- c) Write a Prolog program for finding GCD of two numbers. [4]

- d) Consider the employee database [4]

Works_in(employee_name, department)

Earns(employee_name, salary)

Write Prolog program to list all employees not working in sales department.

List employees earning salary more than 10,000. (Use cut and Fail).

- e) Write your own Lisp function to check whether the given list is palindrome or not. [4]



Total No. of Questions : 5]

SEAT No. :

P3202

[Total No. of Pages : 3

[4737]-102

M.Sc. (Semester - I)

COMPUTER SCIENCE

CS-102: Advance Networking

(2011 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt all of the following :

[8 × 2 = 16]

- a) What is flow label field in IPv6 datagram? State its significance.
- b) What is Voice over IP? State two protocols used to handle it.
- c) An Ethernet MAC sub layer receives 1541 bytes of data from LLC layer. Can the data be encapsulated in one frame? If not, how many frames need to be sent? What is the size of data in each frame?
- d) Discuss problems associated with X.25 switched WAN.
- e) What is the use of IV in CBC mode?
- f) State and define types of multiplexing in transport layer.
- g) In a datagram, value of HLEN is 5. The value of total length is 200. What is the number of the first byte and the number of the last byte if the offset value is 100?
- h) A routing table has 15 entries, It did not receive information about 3 routes for about 220 sec. How many timers are running at this time?

P.T.O.

Q2) Attempt any four of the following : **[4 × 4 = 16]**

- a) What is 'Split Horizon' strategy that solves two node loop problem? State its drawback.
- b) How does certificate based authentication works?
- c) What is the use of option field in IPv4? Explain record route and loose source route options.
- d) What would be the transformation of the message 'INTELLIGENCE' using playfair cipher technique. (Key: WONDERFUL)
- e) Explain the concept of message digest. State the requirements of message digest?

Q3) Attempt any four of the following : **[4 × 4 = 16]**

- a) What is electronic money? Explain its types.
- b) What is the purpose of RTCP? Discuss its messages.
- c) Explain three protocol scenarios for connection establishment using three-way handshake.
- d) Write a note on 'Chain of Trust' and explain the concept of self-signed digital certificate.
- e) What are the techniques an attacker can try to break the security of a packet filter?

Q4) Attempt any four of the following : **[4 × 4 = 16]**

- a) Why IP datagram needs to be fragmented? What is MTU? Describe the fields related to the fragmentation in IPv4 datagram in brief.
- b) Explain ATM architecture with the help of neat and labeled diagram.
- c) What is 'Virus'? Explain different phases of virus. State the difference between virus and worm.

- d) Consider the following routing table for router R1.

Mask	Network Address	Next-Hop Address	Interface
/30	202.14. 17.224	---	m1
/28	198.15.18.240	---	m3
/26	145.23.12.192	130.40.12.4	m2
/26	145.23.12.0	130.40.12.4	m2
Default	Default	---	m0

Show the forwarding process if a packet arrives at R1 with destination address 145.23.12.200. Show the forwarding process if a packet arrives at R1 with destination address 198.15.18.14.

- e) What is DES? Explain broad level steps in DES.

Q5) Attempt any four of the following : [4 × 4 = 16]

- What would be the transformation of the message “BEAUTIFUL” using Vernam Cipher Technique? One time pad key is “NCQRSTVMN”.
- Discuss Hop-by-Hop and Fragmentation extension headers used in IPv6 datagram.
- Write a note on timers in RIP.
- Discuss Destination Unreachable and Source Quench error reporting messages in ICMPv4.
- Explain the working of SSL.



Total No. of Questions : 5]

SEAT No. :

P3203

[Total No. of Pages : 4

[4737] - 103

M.Sc. (Computer Science) (Semester - I)

CS 103 : Distributed Database concepts

(2011 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.*
- 2) Figures to the right side indicate full marks.*
- 3) Assume suitable data if necessary.*

Q1) Attempt any EIGHT :

[8 × 2 = 16]

- a) Give any 2 complicating factors which increases the complexity of distributed systems.
- b) Write a short note on heterogeneous federated DBMS.
- c) Discuss the need of fragmentation.
- d) List the characteristics of query processor that are particular in distributed environment.
- e) How is localization program written for horizontally & vertically fragmented query?
- f) Define: Linear tree & Bushy tree
- g) What do you mean by cyclic query & tree query?
- h) What happens if proper isolation of transactions is not maintained?
- i) ROWA protocol reduces availability of database in case of failures. Comment.
- j) List 2 fundamental approaches to construct a reliable system.

P.T.O.

Q2) Attempt any FOUR :

[4 × 4 = 16]

- Differentiate between in-place update recovery and out-place update recovery.
- Explain normalization phase of query decomposition.
- What are information requirements of vertical fragmentation?
- Write a short note on allocation problem.
- Differentiate between centralized databases & distributed databases.

Q3) Attempt any FOUR :

[4 × 4 = 16]

- Let $Q = \{q_1, q_2, q_3, q_4\}$ be the set of queries
 $A = \{A_1, A_2, A_3\}$ be the set of attributes, A_3 is a primary key and
 $S = \{S_1, S_2, S_3\}$ be the set of sites.

Use the attribute usage values and access frequencies and construct Attribute affinity & Clustered Affinity matrix.

	A_1	A_2	A_3		S_1	S_2	S_3
q_1	1	1	1	q_1	30	3	14
q_2	1	0	0	q_2	10	12	11
q_3	1	0	1	q_3	0	15	5
q_4	0	1	1	q_4	5	10	5

Usage Matrix

Access frequencies

- Select ename

from emp, proj, asg

where emp.eno=asg.eno and proj.pno=asg.pno

and budget >500000 and asg.pno = proj.pno

Compose the selection predicate corresponding to the where clause and transform it, using idempotency rules into its simplest form.

Further, compose an operator tree corresponding to query & transform it, using relational algebra transformation rules to a form that is optimal with respect to total execution time by considering only selectivity factors of operations.

Q4) Attempt any FOUR : **[4 × 4 = 16]**

- a) Explain any 4 transformation rules which can be applied to get reduced operator tree.
- b) Write a short note on “failures in a DDBMS”
- c) Discuss deadlock detection & resolution scheme in DDBMS.
- d) Discuss in detail - network partitioning
- e) Why Bond Energy algorithm is appropriate for grouping the attributes on attribute affinity values?

Q5) Attempt any FOUR : **[4 × 4 = 16]**

- a) How concurrency control algorithms are classified?
- b) What is meant by No-fix/Flush algorithm? Explain the behavior of abort, commit & recover operation under this strategy.
- c) Write a short note on R* algorithm.
- d) Explain the layers of query processing which are performed by central site & use global information.
- e) Write a short note on distributed catalog management.



Total No. of Questions : 5]

SEAT No. :

P3204

[Total No. of Pages :4

[4737]-104

M.Sc. COMPUTER SCIENCE (Semester - I)

CS - 104 : Design & Analysis of Algorithms

(2011 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Figures to the right indicate full marks.*
- 2) *Neat diagrams must be drawn wherever necessary.*

Q1) Answer any Eight of the following. **[16]**

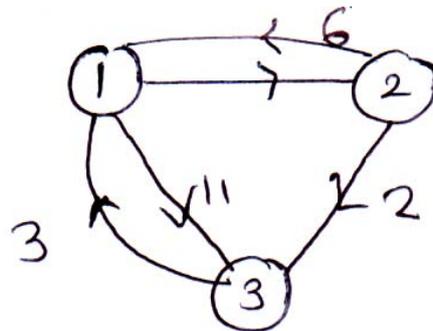
- a) What is the θ notation? **[2]**
- b) What is stable sorting algorithm? List sorting algorithm which are stable. **[2]**
- c) Merge sort is in-place algorithm. Justify. **[2]**
- d) Give the control abstraction of Greedy algorithm. **[2]**
- e) What is optimal substructure property? List any two problems which satisfy this property. **[2]**
- f) What is difference between back edge and forward edge in DFS spanning tree. **[2]**
- g) What is the implicit & explicit Constraints of graph color algorithm. **[2]**
- h) Why bounding functions are useful in the context of branch & bound strategy. **[2]**
- i) What is algebraic transformation **[2]**
- j) State cooks theorem. **[2]**

Q2) Answer any Four of the following: **[16]**

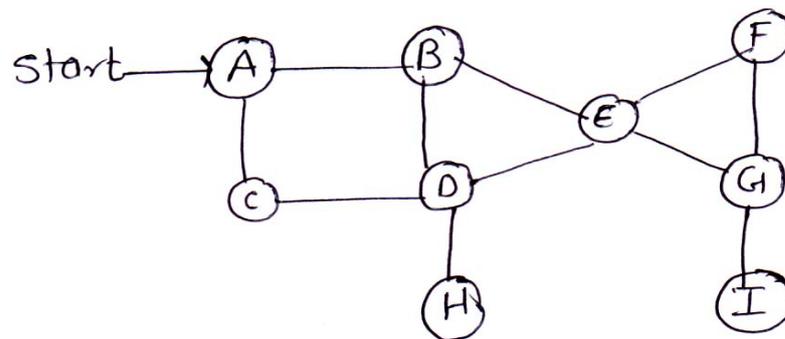
- a) If S is a set of n elements, the powers et of S is set of all possible subset of S. write recursive algorithm to compute power set of S. **[4]**

P.T.O.

- b) Devise a divide and conquer strategy to determine the total number of positive numbers in an array of n numbers. [4]
- c) Obtain a set of optimal Huffman codes for the message (m_1, \dots, m_7) with relative frequencies $(q_1, \dots, q_7) = (1, 1, 2, 3, 5, 8, 13)$. Draw the decode tree for this set of code. [4]
- d) Find all pair shortest path for the following graph using dynamic programming. [4]

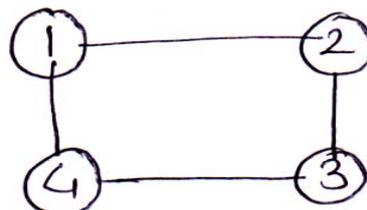


- e) Find BFS spanning tree for the following graph & List Tree edge, cross edge of the same. [4]



Q3) Answer any Four of the following : [16]

- a) Find out all possible solutions for the following graph coloring problem with $m=3$. Also show that only 12 solutions exist with exactly 3 colors. [4]



- b) Explain P class, NP class, NP hard & NP complete with example [4]
- c) Draw the portion of the state space tree generated by LCBB for 0/1 knapsack problem instance given by $n=4, m=15, p=(10,10,12,18)$
 $w=(2,4,6,9)$ [4]
- d) If $f(n)$ & $g(n)$ are asymptotic non negative function then prove that
 $\text{Max}(f(n),g(n))=O(f(n)+g(n))$ [4]
- e) Consider the problem of evaluating a polynomial at a point

$$p(x) = a_0x^n + a^1 x^{n-1} + \dots a_n$$

Write an algorithm to evaluate polynomial using Horner's rule. [4]

Q4) Answer any Two of the following : [16]

- a) Write control of abstraction for divide conquer strategy. Devise an algorithm to find X^n using divide & conquer method and discuss its time complexity. [8]
- b) A string X can be transformed into a solving Y by applying a sequence of edit operations such as insert, delete & interchange with associated cost of 1, 1&2 respectively. Give the recurrence relation for the value of the optional solution when the problem is to be solved using Dynamic programming. For $X= a,a,b,a,b$ & $Y= b,a,b,b$. Give the matrix of the values computed in bottom up manner. [8]
- c) What is knapsack problem? Justify that all optimal solutions will fill the knapsack capacity exactly. Find optimal solution to the knapsack insert using greedy method. $n=7, m=15$ [8]

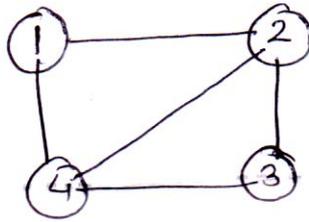
$$(p_1, p_2, \dots, p_7) = (10, 5, 15, 7, 6, 18, 3)$$

$$(w_1, w_2, \dots, w_7) = (2, 3, 5, 7, 1, 4, 1)$$

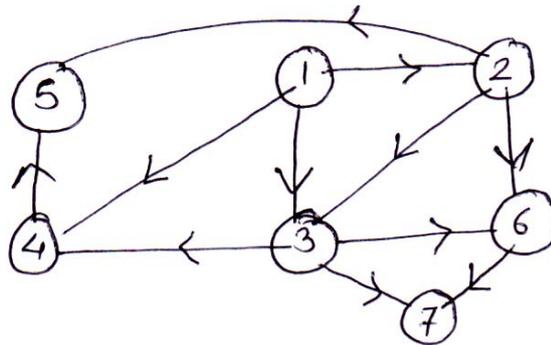
Q5) Answer any Two of the following: [16]

- a) What is the backtracking? Give the bounding function for the given set of weights $w = \{5, 7, 10, 12, 15, 17\}$ & $m = 22$. Draw the state space tree using variable type size & find all possible subsets that give sum of all elements as 22. [8]

- b) Explain backtracking strategy in detail. What is Hamiltonian cycle? Find the Hamiltonian cycle for the following graph. [8]



- c) Give an algorithm to test whether given digraph is directed acyclic graph (DAG). Test the following digraph is DAG? If yes, apply topological sort to produce ordering of vertices. [8]



✓ ✓ ✓

Total No. of Questions : 5]

SEAT No. :

P3191

[Total No. of Pages : 3

[4737] - 11

M.Sc. (Semester - I)
COMPUTER SCIENCE

CS - 101 : Principles of Programming Languages
(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

Q1) Attempt **ALL** of the following:

[8 x 2 = 16]

- a) What is just-in-time compiler?
- b) What are first class subroutines? What languages support them?
- c) What it is mean by expression to be referentially transparent?
- d) What is a type clash?
- e) Why Java does not support friend functions?
- f) What are the two types of multiprocessor architecture?
- g) Why Prolog variables are type less?
- h) Give memory representation for the following in LISP
((10 (20 30) 40))

Q2) Attempt **any Four** of the following:

[4 x 4 = 16]

- a) Name two languages in each of the following categories: Von Neumann, Logic, Functional and Concurrent.
- b) Indicate the binding time for the different elements of the following expression : if (a=b) then a=7.
- c) Explain the different types of data objects with regards to object lifetime. Give an example of each.

P.T.O.

- d) Describe three common uses of the goto statement and show how to avoid them using structured control flow alternatives.
- e) Consider the following pseudocode:

```

Procedure P (A, B : real)
    X : real
    Procedure Q (B, C : real)
        Y : real
        -----
    Procedure R (A, C : real)
        Z : real
        ----- (*)
    -----

```

Assuming static scope, what is the referencing environment at the location marked as (*)?

Q3) Attempt **any Four** of the following: **[4 x 4 = 16]**

- a) What is short circuit Boolean evaluation? Why is it useful?
- b) What is dangling reference? Explain how it handled using tombstones.
- c) Explain different categories of arrays with its advantages.
- d) Describe four common parameter passing modes with suitable example.
- e) What is display? How does it differ from the static chain?

Q4) Attempt **any Four** of the following: **[4 x 4 = 16]**

- a) What is vtable? How it is used?
- b) Explain implementation of multiple inheritance.
- c) Describe any four syntatic constructs commonly used to create new thread of control in a concurrent program.
- d) What is difference between data parallelism and task parallelism?
- e) Explain type equivalence with the help of suitable example.

Q5) Attempt **any Four** of the following:

[4 x 4 = 16]

- a) Explain how CASE from is different from COND from with suitable example.
- b) Define a Recursive LISP function to compute factorial of a given number.
- c) Write a Prolog program that accepts single character from user. Accept the character from user till user enters “y”. (Use fail and cut predicate).
- d) Give 4 differences between C & Prolog.
- e) Consider the following statements:
 - i) Marcus was a man.
 - ii) Marcus was a Pompeian.
 - iii) All Pompeian were roman.
 - iv) Caesar was a ruler.
 - v) All Romans hated all rulers.
 - vi) Marcus tried to assassinate Caesar.

Write a Prolog program to prove “Marcus hates Caesar”.



Total No. of Questions : 4]

SEAT No. :

P3192

[Total No. of Pages : 2

[4737]-12

M.Sc. (Part - I) (Semester - I)

COMPUTER SCIENCE

**CS-11-102: Object Oriented Software Engineering
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume data, wherever necessary.*

Q1) Attempt the following :

[16]

- a) Explain different types of actors.
- b) What is polymorphism?
- c) What is Unified Process?
- d) What is Action state and Activity state?
- e) What is Forward Engineering?
- f) What are the goals of UML?
- g) What is alpha Testing?
- h) What is a modeling?

Q2) Attempt any four :

[16]

- a) Explain different kinds of classifiers
- b) What is object oriented analysis?
- c) Explain the different phases of Unified Process
- d) Discuss qualified association and qualifiers by giving suitable examples
- e) Explain OO testing.

P.T.O.

Q3) Attempt any four :

[32]

- a) Prepare an object diagram showing at least 8 relationships among the following object classes include associations, aggregation and generalization. Show multiplicity. Add at least one attributes to each class window, shape, line, closed shape, scrolling window, canvas, panel, panel item, ellipse, polygon, event. Clearly mention the assumptions made.
- b) Draw a state transition diagram and activity diagram considering all the possible states/activities for tea/ coffee vending machine.
- c) Draw a component and deployment diagram for a LAN based system.
- d) Draw a Use Case diagram and class diagram for SUPER SHOPEE System. Clearly mention the assumptions made.
- e) People use elevators to move from one floor to another. Draw collaboration diagram and sequence diagram showing different events and event exchanges between objects.

Q4) Attempt any four :

[16]

- a) Write a short note on task management component.
- b) How use case model helps in analysis phase from inception to elaboration phase.
- c) Analysis is the first step of OMT methodology. Comment.
- d) Draw collaboration diagram for E-Purchase System.
- e) Draw class diagram for HOTEL MANAGEMENT SYSTEM. Clearly mention the assumptions made.



Total No. of Questions : 4]

SEAT No. :

P3193

[Total No. of Pages : 4

[4737] - 13

M.Sc. (Semester - I)

COMPUTER SCIENCE

**CS -103 : Distributed Database Concepts
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume suitable data if necessary.*

Q1) Attempt any EIGHT :

[8 × 2 = 16]

- a) To achieve the reliable system, it is usually desirable to be able to distribute the data in a replicated fashion. Comment.
- b) List any 2 areas of database system where autonomy may occur.
- c) Give any 2 reasons for the fragmentation.
- d) What is the objective of query processor in a distributed context?
- e) List any 4 idempotency rules used to simplify the query.
- f) Define & formulate-join selectivity factor.
- g) What is mean by write set and read set of a transaction?
- h) Write down 2 Sufficient conditions to ensure that 2 schedules are equivalent.
- i) Define the terms - MTBF & MTTR.
- j) What is mean by fix/no-fix decision in local recovery of database?

Q2) Attempt any FOUR :

[4 × 5 = 20]

- a) What is deadlock? How deadlock can be avoided?
- b) Write a note on - MDBS architecture with GCS.
- c) What are the correctness rules for the vertical fragmentation?
- d) Explain - layers of query processing.
- e) What are the complicating factors which increases the complexity of distributed systems?

P.T.O.

Q3) Attempt any FOUR :

[4 × 6 = 24]

a) Let $Q = \{q_1, q_2, q_3, q_4\}$ be the set of queries

$A = \{A_1, A_2, A_3\}$ be the set of attributes, A_3 is a primary key and

$S = \{S_1, S_2, S_3\}$ be the set of sites.

Use the attribute usage values and access frequencies and do the vertical fragmentation of set of attributes using BE and partitioning algorithms.

	A_1	A_2	A_3		S_1	S_2	S_3
q_1	1	1	1	q_1	30	3	14
q_2	1	0	0	q_2	10	12	11
q_3	1	0	1	q_3	0	15	5
q_4	0	1	1	q_4	5	10	5

Usage Matrix

Access frequencies

b) Relation Proj(pno, pname, budget, loc) is horizontally fragmented as follows,

$$Proj_1 = \sigma_{\text{budget} \leq 500000} (Proj)$$

$$Proj_2 = \sigma_{\text{budget} > 500000} (Proj)$$

Relation Emp(eno, ename, title) is vertically fragmented as follows,

$$Emp_1 = \pi_{\text{eno, ename}} (Emp)$$

$$Emp_2 = \pi_{\text{eno, title}} (Emp)$$

Relation Asg is indirectly fragmented with respect to Proj relation. Consider the following query, draw operator tree and transform it into reduced operator tree:

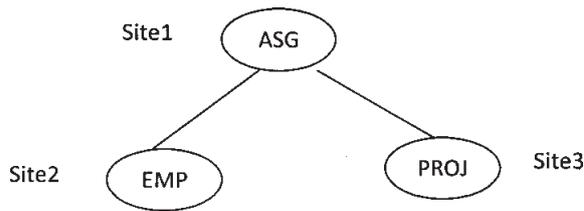
select eno

from emp, proj, asg

where emp.eno=asg.eno and proj.pno=asg.pno

and budget <= 500000 and title >= "programmer".

c) Consider the following join graph,



Let $\text{size}(\text{EMP}) = 100$, $\text{size}(\text{ASG}) = 300$, $\text{size}(\text{PROJ}) = 200$, $\text{size}(\text{EMP} \bowtie \text{ASG}) = 200$, $\text{Size}(\text{ASG} \bowtie \text{PROJ}) = 50$ and $\text{size}(\text{EMP} \times \text{PROJ}) = 2000$. Assume that a query needs to access all the relations. Write all possible ways, in which a query can be executed, along with total data transmission cost for every way.

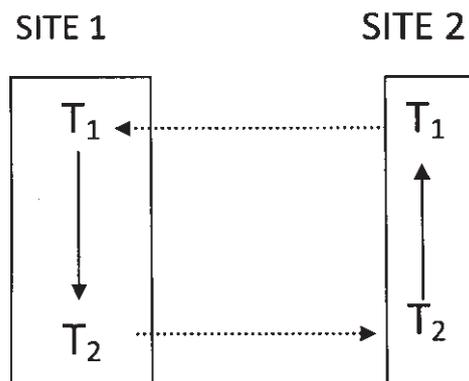
d) Select ename, pname

```

from emp, asg, proj, pay
where emp.eno=asg.eno
and asg.pno=proj.pno
and pay.title=emp.title
and ename < "James" and dur = 24
and budget < 200000 and pay.title ="Analyst"
  
```

Draw a query graph and join graph for the above query.

e) Consider the DWFG given below. Detect the deadlock using the distributed deadlock detection algorithm.



Q4) Attempt any FOUR :

[4 × 5 = 20]

- a) Given the relations Player(pid, pname, age) and Player_Record(recno, rank, game, pid)

Let P_1 and P_2 be the two predicates where,

$$P_1 : \text{age} \leq 25$$

$$P_2 : \text{age} > 35$$

Perform the horizontal fragmentation of Player with respect to P_1 and P_2 . Explain whether the resulting fragmentation of Player fulfills the correctness rules of fragmentation or not? Also perform indirect fragmentation of Player_Record relation with respect to Player.

- b) Explain centralized, distributed and primary copy 2PL algorithms.
- c) Write a note on Conservative TO algorithm.
- d) Write a short note on need & implementation of variations of 2PC protocol.
- e) Explain different components of a Distributed DBMS with diagram.



Total No. of Questions : 4]

SEAT No. :

P3194

[Total No. of Pages :3

[4737]-14

M.Sc. (Semester - I)

COMPUTER SCIENCE

CS 104 : Design and Analysis of Algorithms
(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All Questions are compulsory.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data if necessary.*

Q1) Attempt All.

[8 × 2 = 16]

- a) Asymptotic notation Ω is symmetric. Justify.
- b) Define: P & NP classes
- c) Give implicit & explicit constraints for 8-queen's problem.
- d) Discuss one advantage & one disadvantage of Merge sort.
- e) Why Least Cost branch & bound is preferred over FIFOBB & LIFOBB?
- f) Compare Dynamic programming with Greedy & Divide and Conquer.
- g) What is negative weighted edge? How does it affect shortest path calculation?
- h) Give control abstraction for Divide & Conquer strategy.

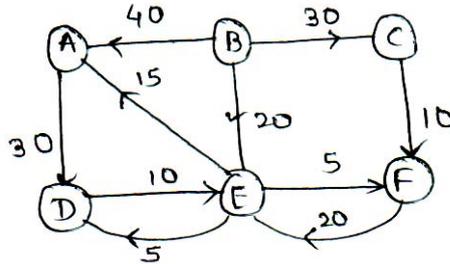
Q2) Attempt any FOUR:

[4 × 5 = 20]

- a) Write any sorting algorithm that uses divide & Conquer strategy. What is its time complexity?
- b) Arrange following functions in ascending order of their growth rates & justify. $n^2 \log n$, $30n^2$, $n \log n$, $\log n$, 2^n .

P.T.O.

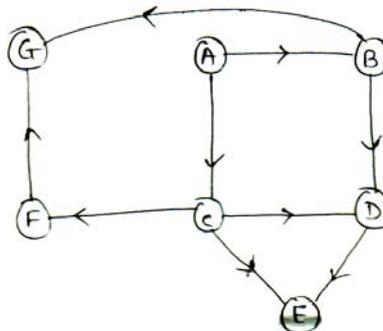
- c) What is optimal merge pattern problem? Find optimal merge pattern for 8 files whose lengths are 28,32,12,5,84,53,91 and 35.
- d) Consider the following knapsack instance and find optimal solution for 0/1 knapsack using merge & purge method. $n=4, c=19$, $(p_1, \dots, p_4) = (2, 5, 8, 1)$ & $(w_1, \dots, w_4) = (10, 15, 6, 9)$. Which design strategy is to be applied for above problem?
- e) Find shortest path from Vertex B to vertices D & F in the following graph:



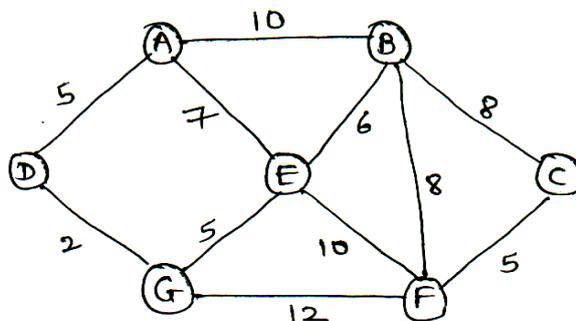
Q3) Attempt any FOUR.

[4 × 6 = 24]

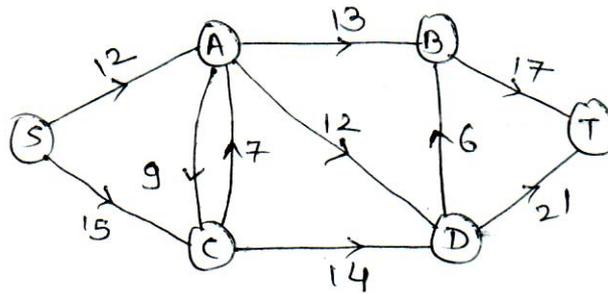
- a) What is topological sort? Show the ordering of vertices produced by topological sort on the following digraph. (Start at vertex A)



- b) Apply Prim's & Kruskal's algorithm to find minimum spanning tree for following graph:



- c) What is flow network? Find out maximum flow from following network where S is a source & T is a sink.

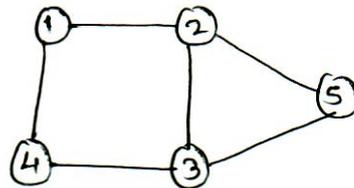


- d) Discuss the design strategy Banktracking. Define and analyse n-queen's problem for $n \geq 2$.
- e) Why Least Cost branch & bound is preferred over FIFOBB & LIFOBB? Solve the following instance of 0/1 knapsack problem using LCBB method. $N=4, m=7, P = (5,5,6,8) W = (1,2,3,4)$.

Q4) Attempt any FOUR :

[4 × 5 = 20]

- a) What is the best way to multiply a chain of matrices with dimensions $15 \times 3, 3 \times 10, 10 \times 2, 2 \times 30, \text{ and } 30 \times 5$ using dynamic programming method.
- b) Find all possible solutions when following graph is colored with exactly 3 vertices.



- c) What is satisfiability problem? Give non-deterministic algorithm for satisfiability problem.
- d) Write algorithm for ternary search method using divide & conquer. Also compute its time complexity.
- e) What do you mean by prefix code? What is optimal Huffman code for following set of frequencies?

a	b	c	d	e	f	g	h
35	10	7	9	15	6	2	25.



Total No. of Questions : 8]

SEAT No. :

P3216

[4737] - 2001

[Total No. of Pages : 2

M.Sc. (Semester - II)

COMPUTER SCIENCE

**CS - 201 : Digital Image Processing
(2013 Pattern)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*

- Q1)** a) Define 8 - adjacency and m - adjacency. What is the advantage of m - adjacency? [4]
- b) Explain the use of digital image processing by considering any two applications. [4]
- c) Define 'chess - board distance' between any two points of digital image. [2]
- Q2)** a) What is gamma correction? How is it implemented using power law transformation? [4]
- b) Explain the process of image acquisition using single sensor arrangement. [4]
- c) List any two sources used for image acquisition along with applications. [2]
- Q3)** a) Give any two noise models along with their probability density functions and the systems in which they are found. [4]
- b) Write the iterative algorithm for global thresholding. [4]
- c) What do you mean by normalization with respect to starting point? [2]
- Q4)** a) Give a mask to detect horizontal lines in an image. Explain its working. [4]
- b) Write a short note on shape numbers. [4]
- c) Mention two ways of estimating degradation function. [2]

P.T.O.

- Q5)** a) Illustrate the working of ideal low pass filter for digital image processing in frequency domain. [4]
 b) Write the equations for forward and inverse 2D - DFT. Give the significance of each variable. [4]
 c) Mention the two segmentation approaches. [2]

- Q6)** a) Define reflection and translation. Draw the results of these operations on any set A. [4]
 b) Write a short note on 'signatures'. [4]
 c) State convolution theorem. [2]

- Q7)** a) Use following table to find the transformation function that is obtained with histogram equalization. [5]

r_k	n_k
$r_0 = 0$	81
$r_1 = 1$	122
$r_2 = 2$	245
$r_3 = 3$	329
$r_4 = 4$	656
$r_5 = 5$	850
$r_6 = 6$	1023
$r_7 = 7$	790

- b) Explain the steps in processing image in frequency domain. [5]

- Q8)** a) Explain the fundamental steps in digital image processing with the help of a block diagram. [5]
 b) Define 'opening' and 'closing' operations. In what way do they differ from each other? [5]



Total No. of Questions : 8]

SEAT No. :

P3217

[Total No. of Pages : 3

[4737] - 2002

M.Sc. (Semester - II)

COMPUTER SCIENCE

CS - 202 : Advanced Operating System

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any 5 questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*

Q1) a) Explain in following program, how many times printf() will be executed?[4]

```
main()
{
    int i;
    for (i = 0; i < 4; i ++ )
        fork();
    pf("My pid = % d\n", getpid());
}
```

- b) Explain the types of files w.r.t. Linux O.S. [4]
- c) What is the difference between zombie and orphan process? [2]

Q2) a) Explain the system calls SIGSTOP and SIGTERM. [4]

- b) Write a short note on setjmp and longjmp. [4]
- c) What is environment variable? List out any two of them? [2]

Q3) a) Discuss the concept of pipes and write a 'C' program to create a file in which 'zero data' should be written at every 6th offset 10 times and 'a' at other locations [use lseek()] [4]

- b) What is the difference between wait(), waitpid(), waitid(), wait3() and wait4()? [4]
- c) Explain major & minor no. [2]

P.T.O.

- Q4)** a) Explain the working of readv() and write v() system calls? [4]
 b) In what situations window O.S. increases current priority value of threads.[4]
 c) What is the difference between _Exit(), _exit(), exit(), atexit(), on exit()? [2]

- Q5)** a) Write a 'C' program to illustrate use of getpid() and getppid() by creating as many child processes as possible? [4]
 b) Explain in detail demand paging a memory management technique. [4]
 c) Explain any 4 fields of disk inode. [2]

- Q6)** a) Write a 'C' program to change the owner of a file using chown(), fchown() and lchown()? [4]
 b) Explain the behaviour of following program? [4]

```
main(int argc, char * argv[])
{
int fd1, fd2;
fd1 = open (argv[1], O-RDONLY);
fd2 = open (argv[2], 0666);
if (fd1 == -1 || fd2 == - 1)
    exit (0);
if (fork () == 0)
    copy ();
else
    {
        wait(0);
        copy ( );
    }
}
void copy ( )
{
int i; char C ;
for (i = 0; i < 10; i ++)
```

```

    {
        read (fd1, & C, 1);
        write (fd2, & C, 1);
    }
}

```

Let argv(1) is passed as a.txt whose contents are :
Hello !!! welcome to unix world.

c) Explain Kill system call. [2]

Q7) a) Consider following 'C' program. [5]

```

#include <signal.h>
#include <unistd.h>
void sighandler1(), sighandler2();
void main()
{
    signal (SIGQUIT, sighandler1);
    signal (SIGINT, sighandler2);
    for (;;)
        pause ();
}
void sighandler1 (int signo)
{
    printf("QUIT signal caught");
}
void sighandler 2 (int signo)
{
    printf ("INT signal caught");
}

```

Rewrite above program using sigaction() instead of signal and use kill system call to send the signal to current process.

b) Write a note on atomic operations on files. [5]

Q8) a) Explain kill and raise functions. [5]

b) Windows is portable operating system. Discuss. [5]



Total No. of Questions : 8]

SEAT No. :

P3218

[4737] - 2003

[Total No. of Pages : 3

M.Sc. (Computer Science) (Semester - II)

**CS - 203 : DATA MINING AND DATA WAREHOUSING
(2013 Pattern)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions from each section.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data if necessary.*

- Q1)** a) Compare OLTP with OLAP systems. [4]
b) Explain accuracy and error measures for classifiers. [4]
c) How data mining is useful for business? [2]

- Q2)** a) Discuss major issues in data mining. [4]
b) Why Naive Baysein classifier is called Naive? Briefly outline the major idea of Bayesian classification. [4]
c) What is chi square test? [2]

- Q3)** a) Consider following transactional table and draw FP growth tree, where support count is 2. [4]

TID	List of Items
1	Bread, Butter, Sugar
2	Bread, Butter, Milk, Sugar
3	Bread, Butter, Milk
4	Bread, Butter, Sugar
5	Butter, Milk
6	Butter, Sugar
7	Bread, Milk
8	Butter, Milk
9	Bread, Milk

- b) Explain EM algorithm. [4]
c) What is Gini index? [2]

P.T.O.

- Q4) a)** The following table consists of training data. Construct a decision tree based on this data, using the basic algorithm of decision tree induction. Classify the records by “status” attribute. **[4]**

department	status	age	salary	count
sales	senior	31...35	46K...50K	30
sales	junior	26...30	26K... 30K	40
sales	junior	31...35	31K... 35K	40
systems	junior	21...25	46K... 50K	20
systems	senior	31...35	66K... 70K	5
systems	junior	26...30	46K... 50K	3
systems	senior	41...45	66K...70K	3
marketing	senior	36...40	46K...50K	10
marketing	junior	31...35	41K...45K	4
secretary	senior	46...50	36K...40K	4
secretary	junior	26...30	26K...30K	6

- b) What are data mining premitives? **[4]**
- c) What are the major challenges of mining a huge amount of data (such as billions of tuples) in comparison with mining a small amount of data (such as a few hundred tuple data set)? **[2]**

- Q5) a)** Explain algorithm for descision tree induction. **[4]**
- b) Compare & contrast enterprise data warehouse & data mart. **[4]**
- c) What is pattern discovery in web mining. **[4]**

- Q6) a)** What is overfitting? Explain with example. **[4]**
- b) Describe Text Mining with example. **[4]**
- c) Discuss need for data preprocessing. **[2]**

- Q7)** a) Write short note on mining frequent item sets using Vertical data format. **[5]**
b) Explain star schema with example. **[5]**
- Q8)** a) What is page rank? Explain how web structure mining is used to increase the effectiveness of search engines. **[5]**
b) Write short note on CART. **[5]**



Total No. of Questions : 8]

SEAT No. :

P3219

[4737] - 2004

[Total No. of Pages : 3

**M.Sc. (Semester - II)
COMPUTER SCIENCE**

**CS - 205 : Programming with DotNet
(2013 Pattern)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any FIVE out of EIGHT.*
- 2) *All questions carry equal marks.*

Q1) Attempt the following:

- a) Explain ASP. NET page life cycle with the help of diagram. **[4]**
- b) What do you mean by events and delegates in C#, explain with examples. **[4]**
- c) What are sealed classes? **[2]**

Q2) Attempt the following:

- a) List and explain types of dialog boxes. Also explain Open File Dialog Box. **[4]**
- b) Write a short note on SOAP. **[4]**
- c) What do you mean by clipping? **[2]**

Q3) Attempt the following:

- a) Differentiate between connected architecture and disconnected architecture in ADO.NET. Write the steps to implement disconnected architecture. **[4]**
- b) Write a note on: DOTNET Assemblies. **[4]**
- c) Explain how web controls are used as parameters in ASP.NET. **[2]**

P.T.O.

Q4) Attempt the following:

- a) Write a program in C# to sort and reverse an array of five elements. **[4]**
- b) Explain about enumerators and structures in C#. **[4]**
- c) Explain : TCPListner. **[2]**

Q5) Attempt the following:

- a) Write a program in C# (Windows/console) Which will read text files from mentioned file system location. Also list subdirectories from mentioned folder on the file system using system. IO name space and the available classes. **[4]**
- b) Briefly discuss the common Language Runtime and its components. **[4]**
- c) How one can use Data Gridview in windows application in C# to access the data. **[2]**

Q6) Attempt the following:

- a) What is the difference between ASP page and HTML page? Write a simple program to display the current time using ASP.NET. **[4]**
- b) List and explain FIVE access specifiers in C#. **[4]**
- c) Describe Boxing and Unboxing with short example. **[2]**

Q7) Attempt the following:

- a) Explain limitations and complexities found within the technologies prior to .NET. Briefly explain how does .NET attempt to simplify the same. **[5]**
- b) What is a web service? List the features of a web service. **[5]**

Q8) Attempt the following:

- a) Write a program in C# to throw and handle following exceptions in banking application.

Minimum Balance Exception: When balance is less than 1000/-

Daily Deposit Exception: In a day, only one lakh can be deposited.

Display details of each exception. Use required members and methods. **[5]**

- b) What do you mean by serialization? List types of serialization and explain any one in detail. **[5]**



Total No. of Questions : 8]

SEAT No. :

P3205

[Total No. of Pages : 3

[4737] - 201

M.Sc. (Semester - II)

COMPUTER SCIENCE

**CS - 201 : Digital Image Processing
(2011 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Question one is compulsory.*
- 2) *Attempt any four from the remaining.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt all.

[8 × 2 = 16]

- a) Define city - block distance between pixels p and q.
- b) State the use of Histogram in digital image processing.
- c) Why does impulse noise arise in images.
- d) Write correct equations for forward and inverse DFT (1 – D).
- e) Define linear & nonlinear operation in DIP.
- f) Differentiate between edge and boundary.
- g) Find the convolution of following two ID sequences -
{ 1, 3, -7, 2} and { 4, 6, 2, -9, 7}
- h) Why it is easy to remove periodic noise using frequency domain processing.

Q2) a) Consider the image f and filter w.

[8]

$$f = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad \text{and} \quad w = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

Show the result after correlation using filter w.

- b) Define morphological operations of reflection and translation. **[4]**
- c) State and explain any two properties of DFT. **[4]**

P.T.O.

- Q3)** a) Explain the components of an image processing system with block diagram. State any two application areas of DIP. [8]
 b) Explain the basic concepts of image sampling and quantization. [4]
 c) Give the expressions for thinning & thickening a set A by a structuring element B. [4]

- Q4)** a) Explain the ways to estimate the degradation function for use in image restoration. [8]
 b) Explain bit - plane slicing. [4]
 c) Write a short note on any two mean filters. [4]

- Q5)** a) What is selective filtering? Describe Bandreject and bandpass filters. [8]
 b) Describe the fundamental steps performed in edge detection. State the use of magnitude of the first derivative & sign of second derivative. [4]
 c) Write a note on chain code. [4]

- Q6)** a) Use the following table to find the transformation function that is obtained with histogram equalization technique. The image is a 3 - bit 64×64 digital image. [8]

r_k	n_k
$r_0 = 0$	790
$r_1 = 1$	1023
$r_2 = 2$	850
$r_3 = 3$	656
$r_4 = 4$	329
$r_5 = 5$	245
$r_6 = 6$	122
$r_7 = 7$	81

- b) Write a short note on 'signatures'. [4]
 c) Explain the basics of intensity thresholding. [4]
- Q7)** a) What is the use of 'Hit - or - miss' transformation? Explain the morphological operations involved in this transformation. [8]

- b) Illustrate the working of ideal 'Low pass filter' for a digital image in frequency domain. [4]
- c) Explain linear spatial filters. [4]
- Q8)** a) Give three different ways of acquiring image. Explain any one. [8]
- b) Write a short note on log transformation. [4]
- c) Explain power - law transformation. Why the gamma correction becomes important as the use of digital images for commercial purpose has increased. [4]



Total No. of Questions : 5]

SEAT No. :

P3206

[Total No. of Pages : 4

[4737] - 202

M.Sc. - I (Semester - II)

COMPUTER SCIENCE

**CS - 202 : Advanced Operating System
(2011 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions carry equal marks.*
- 2) *All questions are compulsory.*

Q1) Attempt all of the following :

[8 × 2 = 16]

- a) What do you mean by user level execution of a process?
- b) Where the read/write offset is stored in case of pipe files? Why?
- c) Write any two advantages of scatter/gather I/O.
- d) Which system call is used to synchronize execution of parent process with child process? Write its syntax.
- e) How many parameters main() function in C program can take? What is the use of last parameter?
- f) What do you mean by anonymous memory mapping?
- g) Write an equivalent of raise (SIGINT)
- h) Which processes usually get a priority boost in Windows?

Q2) State whether the following statements are true or false. Justify your answer.
(any eight) :

[8 × 2 = 16]

- a) The kernel must always prevent the occurrence of interrupts during critical activities.
- b) It is not possible to write any data beyond current end of file.
- c) Open system call takes three arguments.
- d) u-area of a process is accessible only in user mode.
- e) 'inetd' process is a daemon process.
- f) 'alloca' allocates memory on stack.
- g) If a process executes alarm (60), then it goes to sleep for 60 seconds.

P.T.O.

- h) If we call a non-reentrant function from a signal handles, then the results are unpredictable.
- i) Protected processes can be created by any application in Windows.
- j) In windows, one can find the address of the TEB with the kernel debugger/thread command.

Q3) Attempt the following (any four) : [4 × 4 = 16]

- a) Draw a neat labelled diagram of process state transitions.
- b) What are the contents of disk-inode? Which additional fields are present in incore-inode?
- c) How opportunistic allocation is done in Linux?
- d) A process executes a system call and while it is not in its critical region, it receives a software interrupt followed by disk interrupt How many context layers (at most) kernel needs to save on dynamic portion of system level context? Draw suitable diagram for the same.
- e) Explain Windows thread scheduling in detail.

Q4) Solve the following (any four) [4 × 4 = 16]

- a) Explain how the following program will be executed?

```
#include <fcntl.h>
main()
{
    int f, val;
    char C ;
    f = open ("Trial. dat", O-RDONLY);
    if (f == -1)
        exit ();
    while (Val = read (f, & c, 1)) == 1)
    {
        Printf ("char = % c\n",c);
        val = lseek (f, 1023 L, 1);
        Print f ("New seek value = % d\n", val);
    }
}
```

- b) #include <signal.h>
main()

```

{
    int i;
    setpgrp() ;
    for (i = 0; i < 10; i ++ )
    {
        if (fork() == 0)
        {
            if (i & 1)
                setpgrp();
            printf ("pid = %d, group = %d",
                getpid(), getpgrp());
            pause( );
        }
    }
    Kill (0, SIGINT);
}

```

Explain the behaviour of the program.

- c) Explain how the following program will work.

```

#include <signal.h>
main()
{
    int i, ret-val, ret-code;
    signal (SIGCLD, SIG-ING);
    for (i = 0; i < 15; i ++ )
        if (fork () == 0)
        {
            Printf ("Child process %x\n",
                getpid ())
            exit(i);
        }
    ret-val = wait (& ret-code);
    printf("return value = %x", ret-val);
}

```

- d) Explain the behaviour of the following program.

```

#include <signal.h>
char *C;
int callno;
main()
{
    char * sbrk ( );
    extern catcher ( );
    signal (SIG SEGV, catcher);
}

```

```

    cp = sbrk (0);
    printf("original brk value %u/n", cp);
    for (ii)
        * cp ++ = 1;
}
catcher (signo)
int signo;
{
    callno ++;
    printf("caught signal %d, %th call at
           address %u\n", signo, callno, cp);
    sbrk(256);
    signal (SIGSEGV, catcher);
}

```

Assume page size of 1024 bytes.

```

e)  main (argc, argv)
    int argc;
    char * argv; [];
    {
        if (argc != 2)
        {
            printf ("Directory name required\n");
            exit (0);
        }
        if (chdir (argv[1])) == - 1)
            Printf ("Not a directory name \n");
    }

```

Explain what will happen when this program is executed.

Q5) Attempt the following (any four) **[4 × 4 = 16]**

- a) Write a C program to create a daemon process.
- b) Write a C program which creates a hole in a file. The filename is provided as command line argument.
- c) Write a C program which takes multiple files as command line argument and print their file sizes.
- d) Write a C program to protect critical regions of code from signal handler using sigsuspend () function.
- e) Write a C program where parent writes into pipe file and child reads from the same pipe file. (use unnamed pipe).



Total No. of Questions : 5]

SEAT No. :

P3207

[4737] - 203

[Total No. of Pages : 4

**M.Sc. (Semester - II)
COMPUTER SCIENCE**

**CS - 203 : Data Mining and Data Warehousing
(2011 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All the questions are compulsory.*
- 2) *All the questions carry equal marks.*

Q1) Attempt any eight of the following.

[8 × 2 = 16]

- a) Define
 - i) Base cuboid
 - ii) Apex cuboid
- b) How access to Database in data mining differs from access to Database in relational database.
- c) Using 'global constant' for missing value can be misleading during mining operations. comment.
- d) What is predictive data mining.
- e) Explain the terms
 - i) Outliers
 - ii) Noisy data
- f) What are different types of OLAP serves?
- g) What are the techniques to improve quality of mining?
- h) What is a crawler? What are different types of crawlers?
- i) If the following data is present in the database, which is noisy. How these values will be replaced to remove the noise by using "smoothing by bin boundaries".

Data is

49, 57, 75, 79, 123, 178, 190, 12, 58, 67, 120, 78, 187, 150, 34, 48

Assume that the bin frequency is 4.
- j) List the subtasks of web mining task.

P.T.O.

Q2) Attempt the following (Any four)

[4 × 4 = 16]

- a) Which are different data warehousing models? Explain any one of them with its characteristics.
- b) What are the advantages of Decision tree method?
- c) Explain any one method of improving the efficiency of Apriori algorithm, in detail.
- d) What is heirarchical clustering? Explain both the strategies of hierarchical clustering.
- e) State and explain any four mining issues.

Q3) Answer any two of the following.

[2 × 8 = 16]

- a) The following table shows the attendance of the students in percentage and marks obtained by him/her. Use a method of least square to find out an equation for prediction of a students marks depending on percentage of his/her attendance. Predict the marks of the student having percentage attendance of 65.

% Attendance	Marks
70	75
40	34
69	70
25	30
55	67
42	45
80	82
94	89
50	65
18	25
76	80
85	90

- b) Consider the following set of transactions and generate candidate itemsets and frequent itemsets, with minimum support count of 3.

TID	List of Items
T ₁	I ₁ , I ₃ , I ₄ , I ₅
T ₂	I ₂ , I ₄ , I ₅ , I ₆
T ₃	I ₁ , I ₂ , I ₃
T ₄	I ₂ , I ₃ , I ₄ , I ₅ , I ₆
T ₅	I ₂ , I ₄ , I ₆
T ₆	I ₂ , I ₃ , I ₄ , I ₆
T ₇	I ₁ , I ₂ , I ₄ ,
T ₈	I ₁ , I ₂ , I ₄ , I ₅ , I ₆
T ₉	I ₁ , I ₂ ,
T ₁₀	I ₄ , I ₅

Apply Apriori algorithm to find out frequent item set.

- c) After studying the existing data a college has decided to classify the students according to the following rules.

If a student is “regular” and has secured “high” marks the class is “A”

If a student is “regular” and has secured “average” marks the class is “B”

If a student is “regular” and has secured “less” marks the class is “C”

If a student is “irregular” class is “C” Represent this set of rules using

- i) Decision tree.
- ii) Classification rules.

Q4) Attempt any four of the following.

[4 × 4 = 16]

- a) Which are commonly used attribute selection measures? Explain the drawback of each of the measure.
- b) Define:
 - i) Prior probability.
 - ii) Posterior probability.
- c) Define data warehouse by explaining each of its characteristic.
- d) Which are the basic componetns of multidimensional data model? Explain the categories of ‘summary measure’.
- e) Explain the normalization done during data transformation. what are the different methods of normalization?

Q5) Attempt any four of the following:

[4 × 4 = 16]

- a) What are the steps involved in knowledge discovery?
- b) Explain the following terms related with data processing.
 - i) Precision and recall.
 - ii) Boot strap.
- c) Explain over-fitting with an example.
- d) What are the problems encountered in “Rule based classification”? How are they handled?
- e) Explain “Inverted index” method of text indexing.



Total No. of Questions : 5]

SEAT No. :

P3195

[4737] - 21

[Total No. of Pages : 2

**M.Sc. (Semester - II)
COMPUTER SCIENCE
CS - 201 : Advance Networking
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to right indicate full marks.*

Q1) Attempt all.

[8 × 2 = 16]

- a) Give two examples of switched WAN.
- b) Define multiple unicasting.
- c) State two factors that measure the performance of network.
- d) What is the purpose of pseudoheader of TCP?
- e) List out message define by SIP.
- f) State any two differences between transport service and network service.
- g) State two shortcoming associate with RIP.
- h) Define physical and logical address.

Q2) Attempt any four

[4 × 4 = 16]

- a) Explain the checksum of UDP.
- b) How TCP can handle congestion?
- c) State socket primitives used in TCP.
- d) Explain three - node loop instability.
- e) Explain GIGA - Bit ethernet implementation.

P.T.O.

Q3) Attempt any four

[4 × 4 = 16]

- a) Compare OSPF and RIP routing protocols.
- b) Explain all types of BGP messages.
- c) Explain Nagle's algorithm.
- d) Explain client server mechanism of SNMP.
- e) Explain the terms:
 - i) ACK no.
 - ii) Push data
 - iii) Inverse domain
 - iv) MIME

Q4) Attempt any four

[4 × 4 = 16]

- a) State different types of OSPE packets and their purpose.
- b) Explain architecture of WWW.
- c) Explain the process of transferring a mail message by SMTP.
- d) Explain DHCP mechanism.
- e) Differentiate between IPv4 and IPv6.

Q5) Attempt any four

[4 × 4 = 16]

- a) Explain CSMA/CA.
- b) Explain fragmentation in IP datagram.
- c) Why does UDP exist? Would it not have been enough to just let user processes send raw IP packets?
- d) Explain sorcer's Apprentice bug in TFTP?
- e) Explain how the TELNET allows a user to log on to a remote machine.



Total No. of Questions : 5]

SEAT No. :

P3196

[Total No. of Pages : 3

[4737] - 22

M.Sc. - I (Semester - II)
COMPUTER SCIENCE
CS - 202 : Unix Internals
(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*

Q1) Answer in brief (any eight) :

[8 × 2 = 16]

- a) Which are the building block primitives provided by UNIX operating system?
- b) What are PID and PPID?
- c) Write any two advantages of using buffer cache.
- d) Why Kernel manipulates inode lock differently than reference count?
- e) If current byte offset is 467890, how Kernel will find out logical block number and offset within the block?
- f) What is the use of mknod() system call? What are the parameters required for the system call?
- g) Explain the use of chown() and chmod() system calls.
- h) What is the significance of real and effective user id?
- i) What is fair-share scheduler?
- j) What are the two types of page faults that may occur in demand paging?

P.T.O.

Q2) State whether following statements are true or false. Justify your answer (any four) : **[4 × 4 = 16]**

- a) Block device drivers interact with file subsystem through buffer cache.
- b) Separate file table entries will be allotted if a process opens a file in the same mode more than once.
- c) A process sleeping on an event wakes up only when the event takes place.
- d) A device driver never knows how many processes are using the device.
- e) Kernel never allocates the last slot in process table to a process initiated by ordinary user.

Q3) Attempt the following (any four) : **[4 × 4 = 16]**

- a) List different scenarios which can occur while allocating a buffer to load a disk block and explain any one of them with proper diagram.
- b) Explain the race conditions that can occur during execution of 'unlink' system call.
- c) Explain how Kernel handles sleeping of a process on certain event.
- d) What is validity fault? How Kernel handles it?
- e) How Kernel handles termination of a process?

Q4) Solve the following. (any four) : **[4 × 4 = 16]**

a)

```
#include <fcntl.h>
main()
{
    int fd1, fd2, fd3;
    char s [10];
    fd1= open ("/myfiles/temp.txt," O_RDONLY);
    fd2 = open ("/myfiles/temp.txt," O_RDONLY);
    fd3 = dup (fd1);
    read (fd1, s, sizeof (s));
    printf ("%s/n," s);
    read (fd2, s, sizeof(s));
    printf ("%s/n," s);
    read (fd3, s, sizeof(s));
    printf ("%s/n," s);
    close (fd1);
    close (fd2);
    close (fd3);
}
```

Describe the output generated by this program.

- b) Write a C program in which a process will create a child process. Parent process will write into unnamed pipe and child will read from unnamed pipe.
- c) Write a C program in which parent process will create 5 child processes. Every child process, when scheduled, will print its process id and then will wait for a signal. Parent process, after creating five child process, will send interrupt signal to all processes in its group.

d) `#include <fcntl.h>`
`main (int argc char *argv [])`
`{`
`int f;`
`char buff [256];`
`char str[] = "hello";`
`mknod ("sample.txt", 010777,0);`
`if (argc == 2)`
`f = open ("sample.txt", O_WRONLY);`
`else`
`f = open ("sample.txt", O_RDONLY);`
`for (;)`
`if (argc = 2)`
`write (f,str,6);`
`else`
`read (f, buff, 6);`
`}`

Explain the execution of the program.

- e) Three processes A, B and C are executing. There is no any other process currently executing. The threshold priority is 50. The number of clock ticks per second are 60. Initially all three processes have the same priority value. Show, how the scheduler will calculate the priorities of the processes after every second & how it will select the processes for execution. Show the execution trace of next 5 seconds.

Q5) Attempt the following (any four) : [4 × 4 = 16]

- How exceptions are different from interrupts?
- What is the context of a process? What are its contents?
- What are different types of pipe files? State the differences between the two.
- What are different types of signals a process may receive?
- How Kernel manages the memory on swap device?



Total No. of Questions : 5]

SEAT No. :

P3197

[4737] - 23

[Total No. of Pages : 2

M.Sc. (COMPUTER SCIENCE) (Semester - II)

CS - 203 : SOFTWARE ARCHITECTURE

(2008 Pattern)

Time : 3. Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*

Q1) Attempt following:

[8 × 2 = 16]

- a) What makes a pattern?
- b) State phases of unified process.
- c) What are doing responsibilities in GRASP?
- d) What are types of Architectural patterns?
- e) State types of UML diagrams with example.
- f) Give elements of Design patterns.
- g) Explain concept of component.
- h) Explain term module.

Q2) Attempt the following (Any Four):

[4 × 4 = 16]

- a) Explain validator in struts framework.
- b) Explain Interpreter Architectural Style.
- c) Explain Advantages of component based development.
- d) Explain pure fabrication GRASP with example.
- e) Explain How design patterns are classified?

P.T.O.

Q3) Write short note on (Any Four):

[4 × 4 = 16]

- a) Transition phase.
- b) Pipe & filter Architecture.
- c) Design patterns.
- d) Activity diagram.
- e) Cohesion.

Q4) Attempt following (Any Four):

[4 × 4 = 16]

- a) Give structure and collaborations of strategy design pattern.
- b) What are different characteristics of frame work.
- c) Explain intent & applicability of factory design pattern.
- d) Give structure of observer design pattern with example.
- e) Explain with example how low coupling can be achieved using design patterns.

Q5) Attempt following (Any Four):

[4 × 4 = 16]

- a) What are scopes of resources in structs frame work.
- b) Give participants of decorator design pattern.
- c) Write note on RM1.
- d) Explain information expert Design pattern with example.
- e) Give participants and collaborations in proxy design pattern.



Total No. of Questions : 8]

SEAT No. :

P3222

[Total No. of Pages : 2

[4737] - 3001

M.Sc. (Semester - III)

COMPUTER SCIENCE

**CS - 301 : Software Metrics and Project Management
(2013 Pattern)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five of the following.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt all of the following:

- a) Explain capability Maturity Model. [4]
- b) Explain any 2 organizational structure in project management. [4]
- c) List the tools and techniques used in Quality assurance. [2]

Q2) Attempt all of the following:

- a) Explain revising the plan. [4]
- b) Explain configuration management. [4]
- c) Define: [2]
 - i) MTBF.
 - ii) Availability in metrics.

Q3) Attempt all of the following:

- a) What are the different aspects of size? [4]
- b) Explain the tools and techniques used for quality control. [4]
- c) Define: [2]
 - i) Fault.
 - ii) Failure.

P.T.O.

Q4) Attempt all of the following:

- a) What is meant by resource loading and leveling? [4]
- b) Describe the project plan execution tools and techniques. [4]
- c) State the purpose of statement of work. [2]

Q5) Attempt all of the following:

- a) Explain the outputs of the administrative closure in project Communication Management. [4]
- b) What are the broad categories of risk. [4]
- c) What do you mean by change Control Board? [2]

Q6) Attempt all of the following:

- a) What do you mean by the make or Buy Analysis? [4]
- b) Explain in brief tools and methods used to improve productivity. [4]
- c) List the contents of risk register. [2]

Q7) Attempt all of the following:

- a) Draw the schedule using Gantt chart for the college admission system. [5]
- b) Explain Mc Call's software quality model used in metrics. [5]

Q8) Attempt all of the following:

- a) Explain types of complexity used in software measurement. [5]
- b) Solve the following using Cocomo model for a large project. Calculate the effort in person-methods and find the cost structure. [5]



Total No. of Questions : 8]

SEAT No. :

P3223

[Total No. of Pages : 2

[4737]-3002

M.Sc. (Computer Science) (Semester - III)

CS-302: MOBILE COMPUTING

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five of the following :*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt all of the following :

- a) Explain any five fragments of Android UI design with example. [4]
- b) How mobile communication is useful in [4]
 - i) Vehicle
 - ii) Stock information
- c) How does registration of mobile node occurs? [2]

Q2) Attempt all of the following:

- a) Explain cellular JP with its advantages & disadvantages. [4]
- b) Explain GPRS architecture reference model. [4]
- c) Define the functionality of node B used in UTRA. [2]

Q3) Attempt all of the following :

- a) Compare FDMA & TDMA. [4]
- b) Explain WAP gateway in details. [4]
- c) Give any two requirements of mobile J.P. [2]

P.T.O.

Q4) Attempt all of the following :

- a) “CDMA-CA” used in wireless LAN instead of “CDMA-CD” comment & justify. [4]
- b) Explain UMTS architecture in detail. [4]
- c) Define short term fading. [2]

Q5) Attempt all of the following :

- a) Explain UMTS Handover in detail. [4]
- b) What are the features of wireless session protocol/browsing (WSP/B). [4]
- c) What is variable timing advance in GSM. [2]

Q6) Attempt all of the following :

- a) Write short note on : [5]
 - i) Indirect TCP.
 - ii) Mobile TCP.
- b) What are supplementary services supported in GSM. [3]
- c) What disadvantages does OVSF have with respect to flexible data rates. [2]

Q7) Attempt all of the following:

- a) What is triangular routing behaviours? How it is avoided in mobile JP? [5]
- b) Describe protocol architecture of GSM. [5]

Q8) Attempt all of the following :

- a) Explain in detail working of M.TCP. [5]
- b) Which additional messages are required in optimized mobile JP? [5]



Total No. of Questions : 8]

SEAT No. :

P3224

[Total No. of Pages : 4

[4737] - 3003
M.Sc. (Semester - III)
COMPUTER SCIENCE
CS - 303 : Soft Computing
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt any five questions from given eight questions.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Use of simple calculator is allowed.*

Q1) Attempt the following :

a) What are the salient properties and applications of neural networks. [4]

b) Fuzzy set $\underline{A} = \left\{ \frac{1}{2} + \frac{0.5}{3} + \frac{0.3}{4} + \frac{0.2}{5} \right\}$ [4]

$$\underline{B} = \left\{ \frac{0.5}{2} + \frac{0.7}{3} + \frac{0.2}{4} + \frac{0.4}{5} \right\}$$

for the above fuzzy sets find

- i) $\underline{B} | \underline{A}$
- ii) $\overline{\underline{A} \cup \underline{B}}$
- c) State any two reasons how Genetic algorithms are different from traditional algorithms. [2]

P.T.O.

Q2) Attempt the following :

- a) Define artificial neural network. Explain the architectures of neural network. [4]
- b) For the following fuzzy relation matrix. [4]

$$R = \begin{bmatrix} 0.2 & 0.7 & 0.4 & 1 \\ 1 & 0.9 & 0.5 & 0.1 \\ 0 & 0.8 & 1 & 0.6 \\ 0.2 & 0.5 & 1 & 0.3 \end{bmatrix}$$

Determine the λ -cut relations for the following λ -values on R.

$$\lambda_1, \lambda_{0.7}, \lambda_{0.5}, \lambda_{0.2}$$

- c) Define boundaries of a membership function. [2]

Q3) Attempt the following :

- a) Using Genetic Algorithm maximize $f(x) = x^2$ Over $\{0, 1, 2, \dots, 31\}$ with initial x values of (13, 24, 8, 19). Show one crossover and one mutation operation. [4]
- b) Define defuzzification. Explain any two methods of defuzzification. [4]
- c) State the equation for sigmoidal signal function. [2]

Q4) Attempt the following :

- a) Consider the following fuzzy set, [4]

$$\text{Fuzzy set } W = \left\{ \frac{1}{0} + \frac{0.9}{50} + \frac{0.3}{100} + \frac{0}{150} + \frac{0}{200} \right\}$$

define on universe $X = [0, 50, 100, 150, 200]$ and

$$\text{fuzzy set } S = \left\{ \frac{0}{0} + \frac{0}{50} + \frac{0.5}{100} + \frac{0.9}{150} + \frac{1}{200} \right\} . \text{ Determine the implication}$$

relation "if W then not S".

- b) Write short note on pattern space and weight space. [4]
- c) What is dilation? [2]

Q5) Attempt the following :

- a) Given the following Fuzzy numbers A & B, using Zadeh's extension principle calculate fuzzy number "Approximately 12". Is the resulting set convex? [4]

$$A = \text{approximately } 2 = \left\{ \frac{0.6}{1} + \frac{1}{2} + \frac{0.8}{3} \right\}$$

$$B = \text{approximately } 6 = \left\{ \frac{0.8}{5} + \frac{1}{6} + \frac{0.7}{7} \right\}$$

- b) Explain any four properties of Genetic Algorithms. [4]
c) What is fuzzy equivalence relation. [2]

Q6) Attempt the following :

- a) Explain the differentiating characteristics of supervised & unsupervised learning. List any two networks of both supervised & unsupervised learning. [4]
b) Let $X = \{X_1, X_2, X_3\}$, $Y = \{Y_1, Y_2, Y_3\}$ and $Z = \{Z_1, Z_2, Z_3\}$ be the universe of discourse on which the following fuzzy sets be defined respectively. [4]

$$\tilde{A} = \left\{ \frac{1}{X_1} + \frac{0.5}{X_2} + \frac{0.2}{X_3} \right\}$$

$$\tilde{B} = \left\{ \frac{1}{Y_1} + \frac{0.5}{Y_2} + \frac{0.3}{Y_3} \right\}$$

$$\tilde{C} = \left\{ \frac{0.1}{Z_1} + \frac{0.6}{Z_2} + \frac{1}{Z_3} \right\}$$

Find

- i) $A \times B = R$
ii) $S = B \times C$
iii) $T = \text{RoS}$ using max-min composition.
iv) $U = \text{RoS}$ using max-product composition.
c) What is an epoch? [2]

Q7) Attempt the following :

- a) Differentiate between fuzzy sets & crisp sets. Explain properties & operations of both. [5]
- b) Implement the OR function with binary inputs and bipolar target using perceptron training algorithm. Assume initial weights & bias to be 0, learning rate : $\eta = 1$ and threshold = 0.2 and the activation function is given below. [5]

x_1	x_2	Target : t
1	1	1
1	0	1
0	1	1
0	0	-1

$$\text{Activation function } \delta(X_j) = \begin{cases} 0 & \text{if } -0.2 \leq x_j \leq 0.2 \\ 1 & \text{if } x_j > 0.2 \end{cases}$$

Q8) Attempt the following :

- a) Let us characterize hazard linguistically with two terms: "Low hazard" and "high hazard".

$$\text{"Low hazard"} = \left\{ \frac{1}{1} + \frac{0.8}{2} + \frac{0.5}{3} + \frac{0.1}{4} + \frac{0}{5} \right\}$$

$$\text{"High hazard"} = \left\{ \frac{0}{1} + \frac{0.2}{2} + \frac{0.4}{3} + \frac{0.9}{4} + \frac{1}{5} \right\}$$

Find the membership functions for the following linguistic expressions. [5]

- i) Low hazard and not high hazard.
 - ii) Very high hazard and not low hazard.
- b) Write a note on α - least mean square learning. [5]



Total No. of Questions : 8]

SEAT No. :

P3225

[Total No. of Pages :3

[4737]-3004

M.Sc. COMPUTER SCIENCE (Semester - III)

305 : Web Services

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any Five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*

- Q1)** a) Give the anatomy of WSDL document, describe definitions and import elements with an example. [4]
- b) "Interoperability" is primary goal of web services. Explain. [4]
- c) State T/F with justification: "Cloud computing eliminates the need for large capital outlays." [2]
- Q2)** a) Draw the structure of SOAP with attachment message, how attachment is added in XML file of SOAP message, give an example. [4]
- b) What are web services? State and describe core building blocks of web services. [4]
- c) QOS is selling and differentiating point between web service providers, comment on it. [2]
- Q3)** a) What is cloud computing? Describe various cloud deployment models. [4]
- b) Explain with Fig. SOAP communication model. [4]
- c) Define UDDI? State and Explain two types of API's in UDDI. [2]

P.T.O.

- Q4)** a) Define: [4]
- i) Web service Interface.
 - ii) Web service Implementation.
- b) What are UDDI data structures? Show the relationship of UDDI data structures with help of neat labeled diagram. [4]
- c) Differentiate between web services versus web based applications. [2]
- Q5)** a) What is Virtualization? Give the role of virtualization in cloud computing paradigm. [4]
- b) How errors are handled using SOAP faults, give an example for adding fault in XML of SOAP message. [4]
- c) What is XML and ebXML? [2]
- Q6)** a) Write a code in java for web server and web client for addition and subtraction of two integer numbers. (Assume tomcat as a default server). [4]
- b) Explain in brief : [4]
- i) Multitenancy
 - ii) Hypervisor
- c) What is WSDL? Specify the need of WSDL. [2]
- Q7)** a) Which are the three types of services provided in cloud? Explain any two by giving example. [5]
- b) Write in brief on web services life cycle with neat labeled diagram.[5]

- Q8)** a) Give the description of any five UDDI publisher API messages. [5]
- b) Write a note on : [5]
- i) SOAP intermediaries
 - ii) URI
 - iii) Must Understand Attribute
 - iv) XML namespaces
 - v) URL



Total No. of Questions : 8]

SEAT No. :

P3226

[Total No. of Pages : 2

[4737] - 3005

M.Sc. (Semester - III)

COMPUTER SCIENCE

CS - 306 : Database and System Administrator

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt any five of the following.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Attempt all of the following :-

- a) Explain different types of file system in Linux operating system. [4]
- b) Define communication protocol. Explain all the communication protocols in MYSQL. [4]
- c) What is locking ? Give two examples or types. [2]

Q2) Attempt all of the following :-

- a) Explain MYSQL Architecture with diagram. [4]
- b) Write a short note on I/O redirection. [4]
- c) Write the command for dump and reload data. using mysqldump. [2]

Q3) Attempt all of the following :-

- a) Explain storage engine Inno DB. [4]
- b) Give reasons using MYSQL cluster. [4]
- c) What is NIS and NFS in Linux Operating System. [2]

P.T.O

Q4) Attempt all of the following :-

- a) What are disk checking commands in linux operating system ? [4]
- b) What is MYSQL tier system. [4]
- c) How to set transaction isolation level for all cases. [2]

Q5) Attempt all of the following :-

- a) How MYSQL uses memory ? [4]
- b) What is advisory lock and explain its all functions. [4]
- c) How to change ownership of the directory in linux operating system. [2]

Q6) Attempt all the following :-

- a) Explain MERGE storage engine. Create one merge table. [4]
- b) What are the names and contents of important file directory in UNIX/ LINUX. [4]
- c) What is multiversioning and concurrent insert. [2]

Q7) Attempt all the following :-

- a) Explain any five client program with any 2 commands. [5]
- b) What is storage engine. Explain any 5 storage engine. [5]

Q8) Attempt all the following :-

- a) Explain extended file system in linux operating system. [5]
- b) What are the usage of ping, telnet and FTP program in linux operating system. [5]



Total No. of Questions : 8]

SEAT No. :

P3227

[Total No. of Pages : 3

[4737] - 3006
M.Sc. - II (Computer Science)
CS - 307 : FUNCTIONAL PROGRAMMING
(2013 Pattern) (Semester - III)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*

- Q1)** a) Explain the indexing and slicing operations on sequences with the help of examples. [4]
- b) What are higher order functions or functional forms? Explain the functional forms : function composition and apply - to - all with the help of examples. [4]
- c) What is the purpose of compiling a regular expression using re. compile ('pattern') [2]
- Q2)** a) What are anonymous functions? How can they be defined & used in python? [4]
- b) Reduce the following expressions using Applicative order & Normal order.[4]
- i) $((\lambda(x) (+ 1x)) ((\lambda(z) (+1z))3))$
- ii) $((\lambda(x) (+ xx)) ((\lambda(y) (+3y))2))$
- c) Write python statements to create & initialize a dictionary to 1 key - value pair & find the length of the dictionary. [2]
- Q3)** a) Write a program using python to create a file, write some text into the file and displays a count of the number of characters written to the file. [4]
- b) Write a short note on currying. What is a bound & free variable in a λ -

P.T.O.

- expression? Define parametric polymorphism with the help of an example. [4]
- c) Predict the output for the following python code. [2]
- ```
List = [0] * 3
for i in range (3) :
 list [i] = [0] * 2
for i in range (3) :
 for j in range (2) :
 list [i] [j] = i + j
print list
```

- Q4)** a) Describe any four principles of functional programming. State the drawbacks of functional programming. [4]
- b) What is redex? Differentiate between lazy and eager reductions. Briefly describe the principle of naming. [4]
- c) Predict the output of the following python statements. [2]
- ```
a = list (range (10, - 1, -1))
print (a)
a = list (range (0, 100, 10))
print (a)
lst = list (range (- 5, 6))
print (list [2 : 5])
```

- Q5)** a) Write a python script that defines a class called 'Time' with attributes/hh, min, sec. Define a member function that takes 2 'time' objects as parameters and adds the 2 times returning the result. [4]
- b) Define tail Recursion. How can a non - tail recursive function be converted to a recursive one? What is tail call optimization? [4]
- c) What is 'self'? [2]

- Q6)** a) A string is an anagram of another string if they both have the same characters but they do not appear in exactly the same order. Define a python function -
- ```
anagrams (str 1, str 2)
```
- that takes 2 strings and returns true if they are anagrams, false otherwise. Use in & not in operators. [4]
- b) State the scenarios in which you would use a dynamic language. [4]
- c) Explain the syntax of try/except/else statement in python. [2]

- Q7) a)** What are the benefits of lambda notation? [5]
- b)** Reduce the following  $\lambda$  - expressions using  $\beta$  - reductions. [5]
- i)  $\lambda x. \lambda y. + x((\lambda x. - x 3)y) 5 6$
- ii)  $(\lambda x. \lambda y. y 5x)(\lambda m. \text{add } m 2) 6 \text{ mul}$

- Q8) a)** In python, what is a Lambda form? State the use of Lambda forms. What will be the output for the following python script. [5]

```
>>> action = (lambda x : (lambda y : x + y))
```

```
>>> act = action (99)
```

```
>>> act (3)
```

- b)** Write a python function that finds distance between two points  $(x_1, y_1)$  &  $(x_2, y_2)$  using the equation

$$\text{dist} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

write another function to compute area of a circle that takes 4 parameters -  $(x_c, y_c)$  - the centre of the circle &  $(x_p, y_p)$  - a point on the perimeter of the circle. Use the distance formula to find the radius and calculate the area.

(Function : calc - area  $(x_c, y_c, x_p, y_p)$  uses dist  $(x_1, y_1, x_2, y_2)$ ) [5]



Total No. of Questions : 8]

SEAT No. :

**P3228**

[Total No. of Pages : 2

[4737] - 3007

**M.Sc. (Semester - III)**

**COMPUTER SCIENCE**

**CS - 308 : Business Intelligence**

**(2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *Answer any five questions.*
- 2) *Figures to the right side indicate full marks.*

- Q1)** a) List the components of and explain the Business Pressures - Responses - Support Model. [4]  
b) Describe the need for BI integration. [4]  
c) Define Business Performance Management. [2]
- Q2)** a) What is a KPI, and what are its distinguishing characteristics? [4]  
b) List the datamining tasks in BI. Explain any 1 task with its learning method. [4]  
c) Give any 2 applications of BI. [2]
- Q3)** a) What are some of the benefits and challenges of Natural language Processing? [4]  
b) What are the limitations of on-demand systems? [4]  
c) List the benefits of Real-time datawarehouse? [2]
- Q4)** a) "A data mart can replace a data warehouse" Comment. [4]  
b) What is the major difference between cluster analysis and classification. [4]  
c) Define textmining. [2]
- Q5)** a) Define web structure mining. Give the difference between structure mining and web content mining. [4]  
b) Explain six sigma in performance management methodology. [4]  
c) List the phase in the CRISP-DM process. [2]

**P.T.O.**

- Q6)** a) What are the major Data warehouse implementation tasks that can be performed in parallel? [4]  
b) Explain the elements of Artificial Neural Networks. [4]  
c) Give any 2 benefits of Collaborative Decision Making. [2]
- Q7)** a) Explain in detail the alternative Dataware house Architectures. [5]  
b) List the ways in which a Management Support System (MSS) application can be connected to back-end databases and other transaction processing systems. [5]
- Q8)** a) Consider the casestudy of a leading company which delivers globally consistent and transparent management information. The company provides detailed consistent views of performance across functions such as finance, marketing, sales and supply logistics. The company is undergoing transformation to become more effective and agile and to seize opportunities for rapid growth. The architecture should give a solution for strategic initiative in MIS and business intelligence. The benefits should include consistency, flexibility, accomodation and adaptability.  
Design and analyse the alternative datawarehouse architecture for the above casestudy and justify your answer. [5]
- b) For the past couple of years, starbucks have been operating in number of stores. The management wanted to monitor the prospective growth of the company by increasing the number of stores outlet and perform the variance analysis for the same. Assume the factors for monitoring framework and decide the variance that has to be a part of Act and Adjust parameter. The solution should lead to the decision of increasing the stores and whether the action will benefit or not. So, Apply Monitoring framework for the above casestudy and Analyse the same. [5]



Total No. of Questions : 5]

SEAT No. :

P3208

[Total No. of Pages : 2

[4737] - 301

**M.Sc. (Semester - III)**

**COMPUTER SCIENCE**

**CS - 301 : Software Metrics and Project Management  
(2011 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt the following:

**[8 x 2 = 16]**

- a) What are different categories of risk?
- b) Define initiation process.
- c) Define project stakeholders and list the stakeholders.
- d) Define:
  - i) Hazard rate.
  - ii) Availability.
- e) What are the different levels of process Maturity?
- f) Define:
  - i) Measurement.
  - ii) Failure.
- g) Give any two basic principles of cost management.
- h) What is project and state triple constraint on project.

**Q2)** Attempt any four of the following:

**[4 x 4 = 16]**

- a) Write a note on Functional Organizational structure.
- b) Explain main processes involved in project integration management.
- c) State any four major cost categories related to quality management.
- d) Explain tools and techniques used for activity sequencing in project time management.
- e) Discuss different types of contracts used in procurement planning.

**P.T.O.**

**Q3)** Attempt any four of the following:

**[4 × 4 = 16]**

- a) Write a note on conflict management.
- b) Explain in brief tools and methods used to improve productivity.
- c) What are the important considerations in storing and extracting data?
- d) Explain any 4 methods for project selection process.
- e) Explain the tools and techniques used for project plan execution.

**Q4)** Attempt any four of the following:

**[4 × 4 = 16]**

- a) Explain in detail PSP.
- b) What are the basic components of a metric plan?
- c) Explain project plan development process.
- d) List the external attributes used in software metrics? Explain any one in detail.
- e) Explain the processes involved in Project Risk Management?

**Q5)** Attempt any four of the following:

**[4 × 4 = 16]**

- a) Differentiate between software reliability and hardware reliability.
- b) Explain scope verification and change control process of project scope management.
- c) Explain the outputs of quality control process.
- d) Explain the qualities of the project manager.
- e) Explain the 'where and when' of metrics plan?



Total No. of Questions : 5]

SEAT No. :

P3209

[Total No. of Pages : 2

[4737]-302

M.Sc. (Computer Science) (Semester - III)

CS-302: MOBILE COMPUTING

(2011 Pattern)

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to right indicate full marks.*
- 3) *Neat diagram must be drawn whenever necessary.*

**Q1)** Attempt all of the following :

**[16]**

- a) Define user mobility & device portability.
- b) Give the disadvantages of spread spectrum system.
- c) Explain the hidden & exposed terminals.
- d) List the problems related with reverse tunneling.
- e) Write any two disadvantages of J.TCP.
- f) Explain the broadcast control channel.
- g) List four J2ME profile.
- h) Define the functionality of node B used in UTRA.

**Q2)** Attempt any four of the following :

**[16]**

- a) How wireless transport layer establishes a secure session?
- b) What is the reaction of standard TCP in case of packet loss? Why it is quite often problematic in case of wireless network & mobility?
- c) Explain J2ME architecture.
- d) Explain different types of handover used in UMTS.
- e) What are the supplementary services supported in GSM?

**P.T.O.**

**Q3)** Attempt any four of the following : **[16]**

- a) Explain Les logical reference model.
- b) Explain the UTRAN architecture.
- c) What is transaction-oriented TCP?
- d) How does registration of mobile node occurs?
- e) Compare between TDMA & SDMA.

**Q4)** Attempt any four of the following : **[16]**

- a) What are the main benefits of spread spectrum system?What are the advantages of DSSS over FHSS?
- b) Discuss various applications of mobile communication.
- c) What is MMS? How is it different from short message service? Describe MMS architecture.
- d) Explain the mechanism of dynamic source routing.
- e) Explain any five fragments of Andriod UI design with example.

**Q5)** Attempt any four of the following : **[16]**

- a) Which are the components of GPRS & what is their purpose?
- b) Explain WAP push architecture.
- c) Explain the packet delivery to and from the mobile node.
- d) Explain the cellular IP with its advantages & disadvantages.
- e) How can MACA still fail in case of hidden and exposed terminals?



Total No. of Questions : 5]

SEAT No. :

P3210

[Total No. of Pages : 4

[4737] - 303

M.Sc. (Computer Science) (Semester - III)

CS 303 : Soft Computing

(2011 Pattern)

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of simple calculator is allowed.*

*Q1)* Attempt all of the following :

**[8 × 2 = 16]**

- a) Define a fuzzy set.
- b) Clustering is unsupervised learning. Comment.
- c) Define reproduction operator.
- d) Draw the diagram of an artificial neuron.
- e) Find  $\overline{\underset{\sim}{A} \cup \underset{\sim}{B}}$  for the following two fuzzy sets

$$\underset{\sim}{A} = \left\{ \frac{1}{2} + \frac{0.5}{3} + \frac{0.3}{4} + \frac{0.2}{5} \right\}$$

$$\underset{\sim}{B} = \left\{ \frac{0.5}{2} + \frac{0.7}{3} + \frac{0.2}{4} + \frac{0.4}{5} \right\}$$

- f) Define support of a membership function.
- g) What is intensification.
- h) State the equation for Gaussian signal function.

**P.T.O.**

**Q2)** Attempt any four :

**[4 × 4 = 16]**

- Define fuzzy relation -  $R(x, y)$  defined on the universe  $X$  &  $Y$ . Explain the concept of domain & range of binary fuzzy relation  $R(x, y)$ .
- Explain the selection operator in GA. Briefly describe any one method of selection.
- What is defuzzification? Describe in brief the center of sums & center of largest area methods of defuzzification.
- Discuss the various architectures of a neural network.
- What is associative recall? Explain the concept of crosstalk & pattern completion property.

**Q3)** Attempt any four :

**[4 × 4 = 16]**

- Consider the following two fuzzy sets

$$A = \left\{ \begin{array}{c} .3 \\ x_1 \end{array} + \begin{array}{c} .6 \\ x_2 \end{array} + \begin{array}{c} 1 \\ x_3 \end{array} + \begin{array}{c} .9 \\ x_4 \end{array} + \begin{array}{c} .7 \\ x_5 \end{array} \right\}$$

$$B = \left\{ \begin{array}{c} .5 \\ x_2 \end{array} + \begin{array}{c} .8 \\ x_3 \end{array} + \begin{array}{c} 1 \\ x_4 \end{array} \right\}$$

Express the following  $\alpha$ -cut sets using zadeh's notation.

$$\left( \begin{array}{c} A \cup B \\ \sim \end{array} \right)_{0.6} \quad \left( \begin{array}{c} \bar{B} \cap B \\ \sim \end{array} \right)_{0.3}$$

- Consider the following two fuzzy sets defined on the universe  $U_1 = U_2 = \{4, 5, 6, 7, 8\}$

$$5 = \left\{ \begin{array}{c} .8 \\ 4 \end{array} + \begin{array}{c} 1 \\ 5 \end{array} + \begin{array}{c} .9 \\ 6 \end{array} + \begin{array}{c} .7 \\ 7 \end{array} + \begin{array}{c} .4 \\ 8 \end{array} \right\}$$

$$7 = \left\{ \begin{array}{c} .2 \\ 4 \end{array} + \begin{array}{c} .5 \\ 5 \end{array} + \begin{array}{c} .8 \\ 6 \end{array} + \begin{array}{c} 1 \\ 7 \end{array} + \begin{array}{c} .9 \\ 8 \end{array} \right\}$$

Using zadeh's extension principle determine the membership values for the algebraic product & difference.

- c) Consider the following two fuzzy sets.

$$\underset{\sim}{\text{Short}} = \left\{ \frac{1}{x_1} + \frac{.7}{x_2} + \frac{.4}{x_3} + \frac{0}{x_4} \right\}$$

$$\underset{\sim}{\text{tall}} = \left\{ \frac{0}{x_1} + \frac{.3}{x_2} + \frac{.8}{x_3} + \frac{1}{x_4} \right\}$$

find membership functions of

- i) not short and minus very tall  
 ii) short or not tall
- d) Consider the following fuzzy sets

$$\underset{\sim}{\text{P}} = \left\{ \frac{.4}{x_1} + \frac{1}{x_2} + \frac{.9}{x_3} + \frac{.7}{x_4} \right\}$$

$$\underset{\sim}{\text{Q}} = \left\{ \frac{.6}{y_1} + \frac{0.8}{y_2} + \frac{1}{y_3} \right\}$$

$$\underset{\sim}{\text{T}} = \left\{ \frac{.2}{z_1} + \frac{.4}{z_2} + \frac{.7}{z_3} + \frac{.9}{z_4} \right\}$$

Perform the operations  $R = PXQ$ ,  $S = QXT$  and  $T = ROS$  on the fuzzy sets.

- e) Using the inference approach obtain the membership values for the traingular shapes (I & T) for a traingle with angles  $70^\circ$ ,  $100^\circ$  &  $10^\circ$ .

**Q4)** Attempt any two :

**[2 × 8 = 16]**

- a) Explain the binary threshold signal function and the linear threshold signal function with proper diagrams.
- b) What is fuzzy equivalence relation? Describe its properties.
- c) Briefly outline the operational summary of the BP algorithm.

Q5) Attempt any two :

[2 × 8 = 16]

- a) Let  $X = \{4, 5, 6, 7, 8\}$  &  $Y = \{a, b, c, d, e\}$  be the universe of discourse. Consider the following three fuzzy sets defined on the above universe. A defined on universe on X, B, C or Y

$$\tilde{A} = \left\{ \frac{0.8}{4} + \frac{0.4}{5} + \frac{0.1}{6} + \frac{0}{8} \right\}$$

$$\tilde{B} = \left\{ \frac{.4}{a} + \frac{.6}{b} + \frac{1}{c} + \frac{.4}{d} + \frac{.3}{e} \right\}$$

$$\tilde{C} = \left\{ \frac{.7}{a} + \frac{1}{b} + \frac{.4}{c} + \frac{.3}{d} + \frac{.2}{e} \right\}$$

Determine the implication relations.

- i) if x is in  $\tilde{A}$  then y is in  $\tilde{B}$
- ii) if x is in  $\tilde{A}$  then y is in  $\tilde{B}$  else y is in  $\tilde{C}$
- b) Maximize the following function where x is permitted to vary between 0 and 31 with initial population randomly selected is (12, 25, 17, 8). Show one crossover operation and one mutation operation. Use the Roulette wheel selection method to select individuals that will participate in the crossover : function  $f(x) = x^2$ .
- c) Develop a perceptron for the AND function with binary inputs & bipolar targets without bias upto zepochs. Initial weigh = 0 and learning rate  $\eta = 1$

| Input |       | target |
|-------|-------|--------|
| $x_1$ | $x_2$ | t      |
| 1     | 1     | 1      |
| -1    | 1     | -1     |
| 1     | -1    | -1     |
| -1    | -1    | -1     |

Use the following activation  $f^n$

$$y = f(y_{-in}) = \begin{cases} 0 & \text{if } 0 \leq y_{-in} \leq 0 \\ 1 & \text{if } y_{-in} > 0 \\ -1 & \text{if } y_{-in} < -0 \end{cases}$$



Total No. of Questions : 5]

SEAT No. :

P3198

[Total No. of Pages : 3

[4737] - 31

M.Sc. (Semester - III)

COMPUTER SCIENCE

CS - 301 : Software Metrics and Project Management  
(2008 Pattern)

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt the following:

**[8 x 2 = 16]**

- a) What are the different processes of Project Risk Management.
- b) Define strategic planning.
- c) What do you mean by stakeholder analysis?
- d) Define:
  - i) Survival Function.
  - ii) MTTF.
- e) What do you mean by PSP?
- f) Define:
  - i) Fault.
  - ii) Bug.
- g) Define any 2 basic principles of project cost management.
- h) What is project and state the attributes of project.

**P.T.O.**

**Q2)** Attempt any four of the following: **[4 × 4 = 16]**

- a) Write a short note on Project Organizational Structure.
- b) Explain the elements of project plan in project integration management.
- c) State any four major cost categories related to quality.
- d) Explain the processes involved in project time management.
- e) Explain the make or buy process with example of project procurement management.

**Q3)** Attempt any four of the following: **[4 × 4 = 16]**

- a) State and explain the outputs of the administrative closure process.
- b) Explain in brief tools and methods used to improve productivity.
- c) Explain the importance of overall change control process.
- d) What are the important considerations in storing and extracting data?
- e) Explain any 4 methods used for project selection process.

**Q4)** Attempt any four of the following: **[4 × 4 = 16]**

- a) What are the key success factors for implementing any S/W model in the organization?
- b) Write a short note on 'Roles and Responsibilities'.
- c) Explain project plan development process.
- d) List the internal attributes used in software metrics. Explain any one in detail.
- e) Explain the tools and techniques used for Project Risk Management (Any 4).

**Q5)** Attempt any four of the following:

**[4 x 4 = 16]**

- a) Explain in brief reliability growth problem.
- b) Explain scope statement in detail.
- c) Explain the processes used in Project Quality Management.
- d) Discuss the reasons of failure of IT projects.
- e) Explain the 'where and when' of metrics plan?



Total No. of Questions : 5]

SEAT No. :

P3199

[Total No. of Pages : 2

[4737]-32

M.Sc. (Computer Science) (Semester - III)

CS-302: MOBILE COMPUTING

(2008 Pattern)

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt all of the following :

**[16]**

- a) How mobile communication is useful in vehicle?
- b) What are the main benefits of spread spectrum system?
- c) Explain the problems related with reverse tunneling.
- d) Explain hidden & exposed terminals.
- e) Write any two advantages of M-TCP.
- f) What is meant by roaming in GM.
- g) Define the functionality of node B used in UTRA.
- h) What are the different messages used in wireless control message protocol.

**Q2)** Attempt any four of the following :

**[16]**

- a) Discuss various applications of mobile communication.
- b) Explain in short different schemes of multiplexing.
- c) What is direct sequence spread spectrum technology? Explain how it works in the CDMA technology.
- d) What are the differences between AODV and standard distance vector algorithm? Why are extensions needed?
- e) Explain the working of J-TCP.

**P.T.O.**

**Q3) Attempt any four of the following : [16]**

- a) Which type of different services does GSM offers? Explain in detail.
- b) Discuss UMTS architecture in detail.
- c) Explain the function of each layer in WAP Architecture.
- d) What are advantages & disadvantages of CDMA?
- e) Explain Mobile routing.

**Q4) Attempt any four of the following : [16]**

- a) What advantages does the use of IPv6 offer for mobility?
- b) Compare the different types of transmission errors that occur in wireless & wired networks. What additional role does mobility play?
- c) Explain GPRS architecture reference model.
- d) Write a short note on WAP devices.
- e) Explain the task of Radio Network controller in UMTS.

**Q5) Attempt any four of the following : [16]**

- a) Write a short note on core network.
- b) Explain WAP gateway in details.
- c) What are the various strengths of SMS? Explain all of them.
- d) How & Why TCP isolate problems on the wireless link? What are main drawbacks of two solution?
- e) Name the main elements of Mobile I.P. & describe their functions.



Total No. of Questions : 5]

SEAT No. :

**P3200**

[Total No. of Pages : 2

**[4737] - 33**  
**M.Sc. (Semester - III)**  
**COMPUTER SCIENCE**  
**CS - 303 : Information Systems Security**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) All questions carry equal marks.*
- 3) Neat diagrams must be drawn wherever necessary.*

*Q1) Attempt all of the following :*

**[8 × 2 = 16]**

- a) List the various authentication techniques for network security.
- b) What is mean by confidentiality in case of security?
- c) Explain DNS spoofing.
- d) What is mean by VPN?
- e) Give the advantages of IP Sec.
- f) Define the term firewall.
- g) What is mean by steganography?
- h) How does SSL is different from SET?

*Q2) Attempt any four of the following :*

**[4 × 4 = 16]**

- a) Write a note on secure electronic transaction.
- b) Explain the working of RSA algorithm.
- c) How does subkeys are generated in blowfish algorithm?
- d) Highlight the concept of Electronic money with its type.
- e) Discuss steps of MD5 message Integration techniques.

***P.T.O.***

**Q3)** Attempt any four of the following : **[4 × 4 = 16]**

- a) Highlight one time initialization process of advanced encryption standard.
- b) Explain various approaches of security handshake pitfalls.
- c) Alice and Bob want to establish a secret key using the Diffie - Hellman key exchange protocol.

Assume following values :  $n = 11$ ,  $g = 9$ ,  $x = 2$ ,  $y = 3$ . Find out A, B and secret key  $k_1$  and  $k_2$ .

- d) Explain handshake protocol in brief for SSL.
- e) How does PGP is working explain in brief?

**Q4)** Attempt any four of the following : **[4 × 4 = 16]**

- a) What is mean by cipher block chaining?
- b) Explain the broad level steps of DES (Data Encryption Standard).
- c) Write down various steps for working of time stamping protocol.
- d) Explain the SMIME overview and functionality.
- e) Find cipher text using play-fair cipher. Consider key "ROBERT".  
Plane text = "HAPPY BIRTHDAY".

**Q5)** Attempt any four of the following : **[4 × 4 = 16]**

- a) How the subkey are generated in International Data Encryption Algorithm?
- b) Explain SET process in detail.
- c) Explain the overview of 3D-secure protocol.
- d) Write a note on Network viruses. Describe WORM in detail.
- e) Explain the concept of Instruction Detection System.



Total No. of Questions : 8]

SEAT No. :

**P3229**

**[4737] - 4001**

[Total No. of Pages : 3

**M.Sc. (Semester - IV)  
COMPUTER SCIENCE  
CS - 402 : Parallel Computing  
(2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *Attempt any five questions out of eight.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) Define speedup and efficiency of a parallel program. [2]  
b) Explain in brief the PRAM model of parallel computation. [4]  
c) Describe in brief the Flynn's method of classification of parallel computers. [4]
- Q2)** a) What is divide-and-conquer strategy? [2]  
b) Write a short note on bulk synchronous parallel (BSP) model. [4]  
c) Distinguish between UMA and NUMA parallel computer architectures. Draw block diagrams of each architecture. [4]
- Q3)** a) What is cache coherency? [2]  
b) Write a short note on direct interconnection of computers. Illustrate with diagrams some popular interconnection networks used in parallel computer systems. [4]  
c) Explain the following with examples: MPI\_Scatter and MPI\_Gather. [4]
- Q4)** a) Explain MPI\_Test and MPI\_Wait routines. [2]  
b) What are the advantages and disadvantages of COWs in comparison with dedicated message passing parallel computers? [3]  
c) If each process calls MPI function MPI\_Comm\_split (...) using values of color and key as shown below, how many communicators will be created and what would be the rank of each process in each of these communicators? [5]

|         |   |   |   |   |   |   |   |   |   |
|---------|---|---|---|---|---|---|---|---|---|
| Process | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Color   | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 2 |
| Key     | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 0 | 1 |

*P.T.O.*

- Q5)** a) Explain the barrier directive in OpenMP. [2]  
 b) What is a virtual topology in MPI? What are the advantages of using a virtual topology? [3]  
 c) What is shared memory parallel programming paradigm? Describe with schematic the OpenMP shared parallel programming model. [5]

- Q6)** a) Explain the use of 'tag' and 'communicator' in MPI communications? [2]  
 b) Describe in detail any *two* scheduling strategies in a *for* directive (OpenMP). [3]  
 c) What is a thread? Describe different methods to create threads in OpenMP. [5]

- Q7)** a) Consider the following code: [5]  

```
#pragma omp parallel for private(j)
for (i = 0; i < 100; i++)
for (j = 0; j < 100; j++)
a [i] [j] = b [i] [j] + c[i] [j]
```

 i) What is a race condition?  
 ii) Explain why variable j needs to be defined as private.  
 iii) Enlist methods in openMP to avoid race conditions.  
 b) Explain in brief `cilk_spawn`, `cilk_for` and `cilk_sync` in `cilk++` programming. [5]

- Q8)** a) Give two potential disadvantages associated with increasing the amount of work done in each CUDA thread, such as loop unrolling techniques, using fewer threads in total. [5]  
 b) Consider following CUDA code (assume A, B, and C as having n = 1000 elements each) [5]

```
__global__
void vecAddKernel(float* A_d, float* B_d, float* C_d int n)
{
 int i = threadIdx.x + blockDim.x * blockIdx.x;
 if(i<n) C_d[i] = A_d[i] + B_d[i];
}
int vectAdd(float* A, float* B, float* C, int n)
{
 //assume size to be actual length of arrays A, B, and C int size = n *
 sizeof(float);
```

```
cudaMalloc ((void **) &A_d, size);
cudaMalloc ((void **) &B_d, size);
cudaMalloc ((void **) &C_d, size);
cudaMemcpy(A_d, A, size, cudaMemcpyHostToDevice);
cudaMemcpy(B_d, B, size, cudaMemcpyHostToDevice);
vecAddKernel<<<ceil(n/256), 256>>>(A_d, B_d, C_d, n);
cudaMemcpy(C, C_d, size, cudaMemcpyDeviceToHost);
}
```

- i) How many thread blocks will be generated?
- ii) How many warps are there in each block?
- iii) How many threads will be created in the grid?



Total No. of Questions : 8]

SEAT No. :

**P3230**

[Total No. of Pages : 2

[4737] - 4002

**M.Sc. (Semester - IV)**

**COMPUTER SCIENCE**

**CS - 403 : Embedded System**

**(2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *Answer any five questions.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

- Q1)** a) Draw DRAM cell and explain read and write cycle. [4]  
b) How a real time performance can be derive from a non real time system?[4]  
c) Define maskable and non maskable interrupts. [2]
- Q2)** a) Discuss the different methods of saving and optimizing the memory space.[4]  
b) Explain the data sampling in real time data logger system. [4]  
c) Define page and segment. [2]
- Q3)** a) Explain on board debugger. [4]  
b) Which are the different methods of saving and optimizing the power need of embedded system? [4]  
c) List advantages of buffer exchange technique. [2]
- Q4)** a) Write short notes on Run-time libraries. [4]  
b) Define simulation. Explain low level language simulation. [4]  
c) List different software tools required for designing an embedded system.[2]

**P.T.O.**



Total No. of Questions : 8]

SEAT No. :

**P3231**

**[4737] - 4003**

[Total No. of Pages : 2

**M.Sc. (Computer Science ) (Semester - IV)**

**CS - 404 : SOFTWARE QUALITY ASSURANCE**

**(2013 Pattern)**

*Time : 3.00 Hours]*

*[Max. Marks : 50*

**Instructions to the candidates:**

- 1) *Attempt any Five questions.*
- 2) *Neat diagrams & must be drawn wherever necessary.*
- 3) *Figures to the right side indicates full marks.*

**Q1)** Answer the following.

- a) Explain the objectives of proposal draft review. [4]
- b) Explain the features of ISO 9001. [4]
- c) What is verification? [2]

**Q2)** Answer the following.

- a) What are the objectives of software quality assurance? Explain it. [4]
- b) What is the contribution of checklists in software quality? List out the sources for updating checklists. [4]
- c) Explain the term version control. [2]

**Q3)** Answer the following.

- a) Define the term Review. What are the types of review? Explain in detail. [5]
- b) What are the sources of corrective and preventive actions? [5]

**Q4)** Attempt the following.

- a) Write a note on project metrics. [4]
- b) Explain brain storming in Pareto Analysis. [4]
- c) Explain the term Quality control. [2]

**P.T.O.**

**Q5)** Attempt the following.

- a) Write a note on blackbox testing. [4]
- b) List and explain the four major categories of quality cost. [4]
- c) What is the main purpose of SEI-CMM? [2]

**Q6)** Attempt the following.

- a) Write a note on Inspections and walkthrough. [4]
- b) What are the MC Call's Quality factors? Explain. [4]
- c) List out the class of s|w development risks. [2]

**Q7)** Attempt the following.

- a) Write a note on templates. [4]
- b) Explain Scatter diagram with example. [4]
- c) Explain the term testing. [2]

**Q8)** Attempt the following.

- a) Write a note on software configuration management audit. [5]
- b) Explain Utilization of Quality cost for decision making. [5]



Total No. of Questions : 8]

SEAT No. :

**P3232**

[4737] - 4004

[Total No. of Pages : 2

**M.Sc. (Semester - IV)  
COMPUTER SCIENCE**

**CS - 405 : Modeling and Simulation  
(2013 Pattern) (New)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *Attempt any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

**Q1)** Attempt the following:

- a) Explain the two approaches to carry out model verification. [4]
- b) Explain the types of system with examples of each. [4]
- c) What is validation at the behavioral level. [2]

**Q2)** Attempt the following:

- a) Discuss the pros and cons of Simulation. [4]
- b) Discuss the importance of Output analysis. [3]
- c) Explain hybrid simulations. [3]

**Q3)** Attempt the following:

- a) Discuss Steady state behavior of stochastic systems. [4]
- b) List the entities of Framework for Modeling & Simulation. [2]
- c) Write a note on probability distributions and estimation. [4]

**Q4)** Attempt the following:

- a) Explain graph or network transition based simulations. [4]
- b) Discuss the application areas of simulation. [4]
- c) State relevance of Modeling and Simulation. [2]

*P.T.O.*

**Q5)** Attempt the following:

- a) Write a note on hybrid systems and their simulators. [4]
- b) Discuss the concept of probability in modeling. [4]
- c) What is stepped and event based time. [2]

**Q6)** Attempt the following:

- a) Discuss Mesh based simulations. [5]
- b) What is a generator and transducer. [3]
- c) What is a discrete event. [2]

**Q7)** Write a note on the following:

- a) Write a note on process based simulators. [5]
- b) Write a note on Analyzing models. [5]

**Q8)** Attempt any one Case Study and answer the following questions:

Banking Application.

OR

Single Server queuing system.

Questions →

- a) Define Discrete and Continuous system. Identify whether the system is Discrete or Continuous system and justify your answer. [5]
- b) Identify the following components for the system:- [5]  
System state, Simulation Clock, Event List,  
Initialization routine and Report Generation.



Total No. of Questions : 8]

SEAT No. :

P2203

[Total No. of Pages : 3

[4739] - 1001

M.Sc. Tech. - I (Semester - I)

MATHEMATICS

Industrial Mathematics With Computer Applications

MIM - 101 : Real Analysis

(2013 Pattern)

*Time :3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) *Attempt any five questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Unless specified,  $\mathbb{R}^n$  is assumed to have usual metric for all  $n \geq 1$ .*

**Q1)** a) Prove that for any collection  $\{G_\alpha\}$  of open sets,  $\bigcup_\alpha G_\alpha$  is open. [4]

b) In any metric space X, prove that every convergent sequence is a Cauchy sequence. [3]

c) Prove that if  $p > 0$ , then  $\lim_{n \rightarrow \infty} \sqrt[n]{p} = 1$ . [3]

**Q2)** a) If X is a metric space and  $E \subseteq X$ , then prove that  $\bar{E}$  is closed. [4]

b) Define a metric space X. For  $x \in \mathbb{R}$  and  $y \in \mathbb{R}$ , define  $d(x, y) = |x - 5y|$ . Determine whether  $d(x, y)$  is a metric or not. [3]

c) Investigate the convergence or divergence of  $\sum_{n=1}^{\infty} a_n$ , if  $a_n = \frac{\sqrt{n+1} - \sqrt{n}}{n}$ . [3]

**P.T.O.**

- Q3)** a) Prove that closed subsets of compact sets are compact. [4]
- b) If  $\bar{E}$  is the closure of a set  $E$  in a metric space  $X$ , then prove that  $\text{diam } \bar{E} = \text{diam } E$ . [4]
- c) Give an example of a subset of  $\mathbb{R}$  which is neither open nor closed. [2]
- Q4)** a) Suppose  $a_1 \geq a_2 \geq a_3 \geq \dots \geq 0$ . Then prove that the series  $\sum_{n=1}^{\infty} a_n$  converges if and only if the series  $\sum_{k=0}^{\infty} 2^k a_{2^k} = a_1 + 2a_2 + 4a_4 + 8a_8 + \dots$  converges. [4]
- b) Let  $f(x) = |x|^3$ . Compute  $f'(0)$  if it exists. [4]
- c) If  $f(x) = x^3$  and  $\alpha(x) = x^2 + 10$ , then evaluate  $\int_0^1 f d\alpha$ . [2]
- Q5)** a) Suppose  $f$  is a continuous mapping of a compact metric space  $X$  into a metric space  $Y$ . Then prove that  $f(X)$  is compact. [5]
- b) Let  $f_n(x) = \frac{\sin nx}{\sqrt{n}}$  where  $x$  is real and  $n \in \mathbb{N}$ . Show that  $\{f_n\}_{n=1}^{\infty}$  does not converge to  $f'$ . [3]
- c) Let  $f$  be a function defined on (a b). Define discontinuity of the first kind. [2]
- Q6)** a) If  $P^*$  is a refinement of  $P$ , then prove that  $L(P, f, \alpha) \leq L(P^*, f, \alpha)$ . [5]
- b) Prove that if  $\sum_{n=1}^{\infty} a_n$  converges absolutely, then  $\sum_{n=1}^{\infty} a_n$  converges. [3]
- c) Find the radius of convergence of the following power series  $\sum_{n=1}^{\infty} n^2 Z^n$ . [2]

**Q7) a)** State and prove the fundamental theorem of calculus. [5]

b) Let  $f$  be defined on  $[a, b]$ . If  $f$  has a local maximum at a point  $x \in (a, b)$  and if  $f'(x)$  exists, then prove that  $f'(x) = 0$ . [5]

**Q8) a)** Prove that a mapping  $f$  of a metric space  $X$  into a metric space  $Y$  is continuous on  $X$  if and only if  $f^{-1}(V)$  is open in  $X$  for every open set  $V$  in  $Y$ . [5]

b) Let  $f_n(x) = \frac{x^2}{(1+x^2)^n}$  where  $x \in \mathbb{R}$  and  $n \in \mathbb{N} \cup \{0\}$ . Find

$f(x) = \sum_{n=0}^{\infty} f_n(x)$ . Discuss the continuity of  $f(x)$ . [5]



Total No. of Questions : 8]

SEAT No. :

P2204

[Total No. of Pages : 3

[4739] - 1002

M.Sc. Tech. - I (Semester - I)

MATHEMATICS

INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS

MIM - 102 : Linear Algebra and Computational Geometry

(2013 Pattern)

*Time :3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) *Attempt any five questions.*
- 2) *Figures to the right indicate full marks.*

**Q1)** a) If a vector space  $V$  has a basis of  $n$  vectors, then prove that every basis of  $V$  must consist of exactly  $n$  vectors. [4]

b) Let  $V = \mathbb{R}^3$  and  $w$  be the subset of  $V$  given by

$$w = \{(x, y, z) \in V \mid x = 0 \text{ or } y = 0\}$$

Is  $w$  a subspace of  $V$ ? Justify. [3]

c) Show that  $S = \{(1, 1, 1), (1, 1, 0), (1, 0, 0)\}$  is linearly independent in  $\mathbb{R}^3$ . [3]

**Q2)** a) State and prove the Rank Nullity Theorem. [5]

b) Prove that the intersection of any two subspaces  $w_1$  and  $w_2$  of a vector space  $V$  is also a subspace of  $V$ . [3]

c) Let  $\bar{V}_1 = (1, 2, 3)$  and  $\bar{V}_2 = (0, -1, 2)$  be vectors in  $\mathbb{R}^3$ . Show that  $(-1, -4, 1)$  is a linear combination of  $\bar{V}_1$  and  $\bar{V}_2$ . [2]

**P.T.O.**



- b) State any two properties of perspective projection. [2]
- c) Obtain the concatenated representation of the following transformations in order [5]
- i) Rotation about y axis by  $\phi = -30^\circ$ .
  - ii) Rotation about x axis by  $\theta = 45^\circ$ .
  - iii) Projection on to  $Z = 0$  plane  
From a centre of projection  $Z = Z_c = 2.5$ .

**Q7)** a) State and prove the Cayley Hamilton Theorem. [5]

- b) Show that the vectors  $\bar{V}_1 = \left( \frac{-3}{5}, \frac{4}{5}, 0 \right), \bar{V}_2 = \left( \frac{4}{5}, \frac{3}{5}, 0 \right), \bar{V}_3 = (0, 0, 1)$  for an orthonormal basis for  $R^3$ , with Euclidean inner product. [5]

**Q8)** a) Describe an algorithm to generate uniformly spaced n points on the circle with centre (h, k) and radius r. [5]

- b) Find the parametric equation of the Bezier curve for the control points  $B_0[2, 1], B_1[4, 4], B_2[5, 3]$  and  $B_3[5, 1]$ . Calculate the position vector of the points on the curve for parameter values  $t = 0.5$ . [5]



Total No. of Questions : 8]

SEAT No. :

P2205

[Total No. of Pages : 3

[4739] - 1003

**M.Sc. Tech. (Semester - I)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 103 : Discrete Mathematics**

**(2013 Pattern)**

*Time :3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) *Attempt any five questions.*
- 2) *Figures to the right indicate full marks.*

**Q1)** a) Let  $Q(x, y)$  denote “ $x + y = 0$ .” What are the truth values of the quantifications  $\exists y \forall x Q(x, y)$  and  $\forall x \exists y Q(x, y)$ ? [5]

b) Write down all possible adjacency matrices and incidence matrices for a 3-vertex path. [5]

**Q2)** a) Let  $n$  and  $k$  be positive integers with  $n \geq k$ . Prove that [5]  
 $C(n + 1, k) = C(n, k - 1) + C(n, k)$ .

b) Use the product rule to show that the number of different subsets of a finite set  $S$  is  $2^{|S|}$ . [5]

**Q3)** a) Prove that in any graph  $G$  there is an even number of odd vertices. [4]

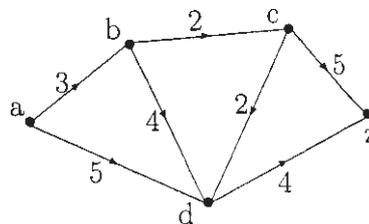
b) Show that the ordered pair  $(a, b)$  defined in terms of sets as  $\{\{a\}, \{a, b\}\}$ . [4]

c) How many different bit strings are there of length seven? [2]

**P.T.O.**

- Q4)** a) During a month with 30 days a baseball team plays at least one game a day, but not more than 45 games. Show that there must be a period of some number of consecutive days during which the team must play exactly 14 games. [4]
- b) Prove that the number of  $r$ -permutations of a set with  $n$  distinct elements is  $P(n, r) = n(n - 1)(n - 2) \dots (n - r + 1)$ . [4]
- c) State and prove the first theorem of graph theory. [2]

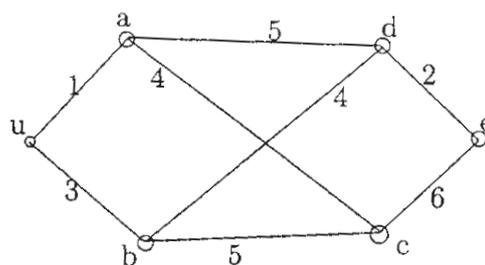
- Q5)** a) Using Ford and Fulkerson algorithm determine the maximal flow in the network given below. The numbers assigned to the edges give their capacities. [5]



- b) Let  $u$  and  $v$  be distinct vertices of a tree  $T$ . Prove that there is precisely one path from  $u$  to  $v$ . [3]
- c) Explain the term fusion of two vertices in a graph. [2]

- Q6)** a) Prove that a simple graph with  $n$ -vertices and  $k$ -components can have atmost  $\frac{(n - k)(n - k + 1)}{2}$  edges. [5]

- b) Using Dijkstras algorithm find the shortest distance from  $u$  to every other vertex in the following graph. [3]



- c) Define : (i) Arborescence, (ii) Complete symmetric digraph. [2]

- Q7)** a) Let  $G$  be a connected graph. Prove that  $G$  is a tree if and only if every edge of  $G$  is a bridge. [4]
- b) Explain the Fleury's algorithm for an Euler graph  $G$ . [4]
- c) Define a flow in network. [2]
- Q8)** a) Let  $G$  be a connected graph with  $n$  vertices,  $e$  edges and one face. Prove that  $n - e = 1$ . [4]
- b) Write a short note on the Chinese Postman Problem. [4]
- c) Let  $G$  be a graph with  $n$  vertices,  $t$  out of which have degree  $k$  and the others have degree  $k + 1$ . Prove that  $t = (k + 1)n - 2e$ . [2]



Total No. of Questions : 8]

SEAT No. :

P2206

[Total No. of Pages : 3

[4739] - 1004

**M.Sc. Tech. (Mathematics) (Semester - I)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 104 : C Programming**

**(2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *Attempt any five questions.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt the following :

- a) Explain 'while' loop with suitable example. [4]
- b) Write a program which reads contents of a text file "a.txt" and displays it on screen. [4]
- c) Give function declarations for function f which: [2]
  - i) Accepts integer array as parameter and returns a float.
  - ii) Accepts a string as parameter and does not return a value.

**Q2)** Attempt the following :

- a) Explain dynamic memory allocation in 'C' with suitable examples. [4]
- b) Write a function in 'C' which checks if a number is prime. [4]
- c) Write the 'C' expression for the following mathematical equation. [2]

$$x = \frac{a^2}{5} - \frac{4ab}{b^2}$$

**P.T.O.**

**Q3)** Attempt the following :

- a) Write a short note on structures in 'C'. [4]
- b) Write a recursive function to calculate sum of digits of a number. [4]
- c) Give the output of the following 'C' code : [2]

```
Void main ()
{ int a = 0, b = 1, c = 0, d;
 d = a++ && ++ b // ++ c;
 printf ("%d %d %d %d", a, b, c, d);
}
```

**Q4)** Attempt the following :

- a) Explain break and continue with suitable examples. [4]
- b) Write a program to accept an integer array and find the largest number. [4]
- c) Give the output of the following 'C' code : [2]

```
Void main ()
{ char *p = "a b c d e";
 printf ("%c", ++*p);
 p++;
 printf ("%c", *++p);
}
```

**Q5)** Attempt the following :

- a) Explain the forms of increment and decrement operators in 'C'. [4]
- b) Write a function which accepts a string and returns the reversed string using pointers. [4]
- c) 'C' is a middle level language. Comment. [2]

**Q6)** Attempt the following :

- a) Explain the various file opening modes. [4]
- b) Give the differences between structures and unions. [4]
- c) Find errors in the following 'C' code : [2]

```
Void main ()
{ float x = 2.0;
 switch (x)
 { case 1 : printf ("A");
 case 2.0 : printf ("B");
 case default : printf("C");
 }
}
```

**Q7)** Attempt the following :

- a) Write a program to accept a matrix and find its transpose. [5]
- b) Write a short note on 'C' preprocessor directives. [5]

**Q8)** Attempt the following :

- a) Write a menu driven program to perform the following string operations (Use standard library functions) [5]
  - i) Copy
  - ii) Concatenation
  - iii) Length
- b) Define a structure 'account' (id, name, balance). Accept details for 10 accounts and display them. [5]



Total No. of Questions : 8]

SEAT No. :

P2207

[Total No. of Pages : 2

[4739] - 1005

**M.Sc. Tech. (Semester - I)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 105 : Elements of Information Technology**

**(2013 Pattern)**

*Time :3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) *Attempt any five questions.*
- 2) *Figures to the right indicate full marks.*

- Q1)** a) What is a computer? [2]  
b) Draw a block diagram of a computer. Explain the function of each of the blocks. [4]  
c) What is unicode? What is the advantage of using unicode. [4]
- Q2)** a) What is the meaning of the terms “external representation” & “Internal representation” of data? [2]  
b) Explain characteristics of computer. [4]  
c) Convert following binary number into decimal number. [4]  
i)  $(111011.101)_2 = (?)_{10}$   
ii)  $(11000.0011)_2 = (?)_{10}$
- Q3)** a) Define : [2]  
i) Input Device                      ii) Output Device  
b) Write a note on optical character Recognition. [4]  
c) Explain VDU (Video Terminal). [4]

**P.T.O.**

- Q4)** a) What is memory cell? Explain its characteristics. [2]  
b) Explain Magnetic Surface Recording. [4]  
c) Explain use of any four registers used in CPU. [4]
- Q5)** a) What are the advantages of Flash memory? [2]  
b) Explain working of CDROM. [4]  
c) Write a note on Inkjet Printer. [4]
- Q6)** a) What is need of cache memory in CPU? [2]  
b) Explain CISC processors. [4]  
c) Give the detailed steps used in memory-processor communication. [4]
- Q7)** a) Explain construction of magnetic hard disk. [5]  
b) Write a note on RISC Processor. [5]
- Q8)** a) Write a note on Serial Access Memory. [5]  
b) Explain storage evaluation criteria for computer memory. [5]



Total No. of Questions : 5]

SEAT No. :

P2223

[Total No. of Pages : 4

[4739] - 101

**M.Sc.Tech. (Semester - I)**

**MATHEMATICS**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 101 : Real Analysis**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Attempt any eight of the following:

**[16]**

- a) For  $x, y \in \mathbb{R}$ , define  $d(x, y) = |x^2 - y^2|$ . Determine if 'd' is a metric or not.
- b) Is  $[0, 1]$  a compact subset of  $\mathbb{R}$ ? Justify.
- c) Find the closure of  $A = \left\{ \frac{1}{n} \mid n \in \mathbb{N} \right\}$  in  $\mathbb{R}$ .
- d) Let  $f$  be a function defined on  $(a, b)$ . Define discontinuity of the first kind.
- e) Prove that the convergence of a sequence  $\langle S_n \rangle$  implies convergence of the sequence  $\langle |S_n| \rangle$  of real numbers.
- f) Is  $\mathbb{Q}$ , the set of rational numbers a connected subset of  $\mathbb{R}$ ? Justify.
- g) Find the radius of convergence of the power series  $\sum_{n=1}^{\infty} \frac{z^n}{n!}$ .

**P.T.O.**

- h) If  $\lim_{n \rightarrow \infty} a_n = 0$ , then does it implies that  $\sum_{n=1}^{\infty} a_n$  is convergent? Justify.
- i) Is  $g(x) = |x|^2$  differentiable at 0? Justify.
- j) Let  $f$  be a continuous function on  $[a, b]$ . If  $\int_a^b f(x) dx = 0$ , then prove that  $f(c) = 0$  for atleast one  $C$  in  $[a, b]$ .

**Q2) a)** Attempt any one of the following: [6]

- i) Prove that if  $p$  is a limit point of a set  $E$ , then every neighborhood of  $p$  contains infinitely many points of  $E$ .
- ii) Let  $\langle S_n \rangle$  be a monotonic sequence. Prove that  $\langle S_n \rangle$  is convergent if and only if it is bounded.

**b)** Attempt any two of the following: [10]

- i) Show that  $\lim_{x \rightarrow 0} \frac{1}{x} \sin\left(\frac{1}{x}\right)$  does not exists.
- ii) Give an example of an open cover of  $(0, 1)$  which has no finite subcover.
- iii) Prove that  $\lim_{n \rightarrow \infty} \sqrt[n]{n} = 1$ .

**Q3) a)** Attempt any one of the following: [6]

- i) Suppose  $a_1 \geq a_2 \geq a_3 \geq \dots \geq 0$ . Then prove that the series  $\sum_{n=1}^{\infty} a_n$  converges if and only if the series  $\sum_{R=0}^{\infty} 2^R a_{2^R}$  converges.
- ii) Let  $f$  be a continuous mapping from a metric space  $X$  into a metric space  $Y$ . If  $E$  is a connected subset of  $X$ , then prove that  $f(E)$  is a connected subset of  $Y$ .

b) Attempt any two of the following: [10]

i) Verify the mean value theorem for  $f(x) = \log x$  on  $[1, e]$ .

ii) Prove that  $\int_a^b f dx \leq \int_a^{\bar{b}} f d\alpha$ .

iii) Discuss the convergence of the series  $\sum_{n=1}^{\infty} \frac{x^n}{n}, x \in \mathbb{R}, x > 0$ .

**Q4)** a) Attempt any one of the following: [6]

i) If  $f \in \mathcal{R}(\alpha)$  on  $[a, b]$  and  $F$  is a differentiable function on  $[a, b]$

such that  $F' = f$ , then prove that  $\int_a^b f(x) dx = F(b) - F(a)$ .

ii) Let  $f$  and  $g$  are continuous real valued functions on  $[a, b]$  which are differentiable in  $(a, b)$ , then prove that there exists  $C \in (a, b)$  such that  $[f(b) - f(a)]g'(c) = [g(b) - g(a)]f'(c)$ .

b) Attempt any two of the following: [10]

i) If  $P^*$  is a refinement of  $P$ , then prove that  $U(P, f, \alpha) \geq U(P^*, f, \alpha)$ .

ii) Let  $f$  be defined by  $f(x) = \begin{cases} x^2 \sin\left(\frac{1}{x}\right); & x \neq 0 \\ 0 & ; x = 0 \end{cases}$ .

Prove that  $f$  is differentiable at every real number  $x$ .

iii) Prove that if  $E$  is an infinite subset of a compact set  $K$ , then  $E$  has a limit point in  $K$ .

**Q5) a)** Attempt any one of the following: **[6]**

i) Prove that  $f \in R(\alpha)$  on  $[a, b]$  if and only if for every  $\epsilon > 0$ , there exists a partition  $P$  such that  $U(p, f, \alpha) - L(p, f, \alpha) < \epsilon$ .

ii) If  $\langle f_n \rangle$  is a sequence of continuous functions on  $E$  and if  $f_n \rightarrow f$  uniformly on  $E$ , then prove that  $f$  is continuous on  $E$ .

**b)** Attempt any two of the following: **[10]**

i) If  $f: [a, b] \rightarrow \mathbb{R}$  is differentiable  $C$  and  $f'(a) < \lambda < f'(b)$ , then prove that there exists  $C \in (a, b)$  such that  $f'(C) = \lambda$ .

ii) If  $f(x) = x$  and  $\alpha(x) = x^2$ , then evaluate  $\int_0^1 f d\alpha$ .

iii) Show that the sequence  $f_n(x) = \frac{\sin nx}{\sqrt{n}}$  is uniformly convergent on  $[0, 2\pi]$ .



Total No. of Questions : 5]

SEAT No. :

P2224

[Total No. of Pages : 3

[4739] - 102

**M.Sc. Tech. (Semester - I)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 102 : Algebra - I**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *Attempt all questions.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Attempt **any eight** of the following:

**[16]**

- a) Let  $G$  be an Abelian group under multiplication with the identity  $e$ . Prove that  $H = \{x^2 : x \in G\}$  is a subgroup of  $G$ .
- b) Consider the group  $G = SL(2, \mathbb{R})$  of  $2 \times 2$  matrices with determinant with entries from  $\mathbb{R}$  (reals). Let  $A = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ ,  $B = \begin{pmatrix} 0 & 1 \\ -1 & -1 \end{pmatrix}$ . Find  $o(AB)$ .
- c) Let  $G$  and  $H$  be groups. Prove that a homomorphism  $\phi: G \rightarrow H$  is injective if and only if  $\text{Ker } \phi = \{e\}$ .
- d) Prove that the center of a group  $G$  is a subgroup of  $G$ .
- e) Show that the group  $(\mathbb{Q}, +)$  is not cyclic and hence so is  $(\mathbb{R}, +)$ .
- f) Give an example of a commutative ring without unity. Justify your claim.
- g) Prove that a field  $F$  has no proper ideals.
- h) Find a prime element in the ring  $\mathbb{Z}_{10}$  which is not irreducible.
- i) Let  $F$  be a field and  $f(x) \in F[x]$  with  $\deg f(x) \geq 2$ . If  $f(x)$  is irreducible in  $F[x]$ , then show that  $f(x)$  has no root in  $F$ .
- j) Is the polynomial  $2x^4 + 6x^3 - 9x^2 + 15$  irreducible over  $\mathbb{Z}$ ? Justify your answer.

**P.T.O.**

- Q2) a)** Attempt **any one** of the following: [6]
- i) Prove that a non-abelian group of order 6 is isomorphic to  $S_3$ .
  - ii) Show that a group in which all the  $m^{\text{th}}$  powers commute with each other and all the  $n^{\text{th}}$  powers commutes with each other,  $m$  and  $n$  are relatively prime, is abelian.
- b) Attempt **any two** of the following: [10]
- i) Show that  $A_4$  has no subgroup of order 6.
  - ii) Show that every group of order  $p^2$  is abelian, where  $p$  is prime.
  - iii) Let  $G$  be a finite cyclic group of order  $n$ , and let  $d$  be a positive divisor of  $n$ . Prove that  $G$  has exactly one subgroup of order  $d$ .
- Q3) a)** Attempt **any one** of the following: [6]
- i) State and prove the Lagrange's Theorem.
  - ii) Find all subgroups of the group  $(\mathbb{Z}, +)$ .
- b) Attempt **any two** of the following: [10]
- i) State and prove Cayley's Theorem.
  - ii) Prove that the group  $4\mathbb{Z}/12\mathbb{Z}$  is isomorphic to  $\mathbb{Z}_3$ .
  - iii) Prove that there is no simple group of order 175.
- Q4) a)** Attempt **any one** of the following: [6]
- i) If  $R$  is a commutative ring with unity, then prove that every maximal ideal of  $R$  is prime. Is the converse true? Justify your answer.
  - ii) Prove that an irreducible element in a commutative principal ideal domain is prime.
- b) Attempt **any two** of the following: [10]
- i) Let  $p$  be an odd prime. Show that  $f(x) = 1 + x + \dots + x^{p-1}$  is irreducible over  $\mathbb{Q}$ .
  - ii) Show that  $\mathbf{R} = \{a + b\sqrt{2} : a, b \in \mathbb{Z}\}$  forms a commutative ring with unity with usual addition and multiplication in  $(\mathbf{R}, +, \cdot)$ . Further prove that the group of units of  $\mathbf{R}$  is infinite.
  - iii) Prove that every Euclidean domain is a principal ideal domain.

**Q5) a)** Attempt **any one** of the following: **[6]**

- i) State and prove Eisenstein irreducibility criterion.
- ii) Let  $F$  be a field and  $f(x) \in F[x]$  with  $\deg f(x) = 2$  or  $3$ . Prove that  $f(x)$  is irreducible over  $F$  if and only if  $f(x)$  has no root in  $F$ .

**b)** Attempt **any two** of the following: **[10]**

- i) Show that  $Z[x]$  is not a principal ideal domain.
- ii) Prove that  $2$  and  $1+i\sqrt{5}$  are relatively prime in the integral domain  $Z[i\sqrt{5}]$ .
- iii) Let  $F$  be a field. Show that every polynomial of degree 1 is an irreducible polynomial in  $F[x]$ .



Total No. of Questions : 5]

SEAT No. :

P2225

[Total No. of Pages : 3

[4739] - 103

**M.Sc.Tech. (Semester - I)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 103 : Discrete Mathematical Structures - I**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Attempt any eight of the following:

**[16]**

- a) Using the truth table show that  $\neg(p \rightarrow q)$  and  $p \wedge \neg p$  are logically equivalent.
- b) Show that  $(p \wedge q) \rightarrow (p \vee q)$  is a tautology.
- c) How many different bit strings of length 8 are there?
- d) Use a table to express the value of  $F(x, y) = x + xy$ .
- e) Construct a circuit that produces the output  $(x + y)\bar{x}$ .
- f) State the pigeonhole principle.
- g) Let  $A = \{a, b, c\}$  and consider the semigroup  $(A^*, \cdot)$  where  $\cdot$  is the operation of catenation. If  $\alpha = abac$ ,  $\beta = cba$ , and  $\gamma = babc$ , compute
  - i)  $(\alpha.\beta).\gamma$ .
  - ii)  $(\alpha.\alpha).\gamma$ .
- h) Let  $X = \{1, 2, 3\}$ . Draw the Hasse diagram of  $(P(X), \subseteq)$  where  $P(X)$  is the power set of  $X$  and  $\subseteq$  represents the subset relation.
  - i) Is the poset  $\{2, 3, 4, 6\}$  under divisibility a lattice? Justify!
  - j) Prove that every non-empty subset of a chain is a sublattice.

**P.T.O.**

- Q2) a)** Attempt any one of the following: [6]
- i) Give a direct proof that if  $m$  and  $n$  are both perfect squares, then  $mn$  is also a perfect square.
  - ii) Prove that two lattices  $A$  and  $B$  are relatively complemented if and only if  $A \times B$  is relatively complemented.
- b)** Attempt any two of the following: [10]
- i) Show that  $\neg \forall x(P(x) \rightarrow Q(x))$  and  $\exists x(P(x) \wedge \neg Q(x))$  are logically equivalent.
  - ii) How many cards must be selected from a standard deck of 52 cards to guarantee that at least three cards of the same suit are chosen?
  - iii) State any five rules of inferences.
- Q3) a)** Attempt any one of the following: [6]
- i) Show that the hypothesis “If you send me an e-mail message, then I will finish writing the program”, “If you do not send me an e-mail message, then I will go to sleep early,” and “If I go to sleep early, then I will wake up feeling refreshed” lead to the conclusion “If I do not finish writing the program then I will wake up feeling refreshed”.
  - ii) In any lattice  $(L)$  show that for all  $a, b, c \in L$  ;  

$$a \wedge (b \vee c) \geq (a \wedge b) \vee (a \wedge c).$$
- b)** Attempt any two of the following: [10]
- i) Prove that homomorphic image of a relatively complemented lattice is relatively complemented.
  - ii) Prove that distributive lattice is always modular. Is the converse true?
  - iii) Prove that  $\sqrt{2}$  is not a rational number.

**Q4) a)** Attempt any one of the following: [6]

- i) Prove that any two Boolean algebras having  $n$  elements each, are isomorphic.
- ii) Define a Boolean algebra. Show that in a Boolean algebra if  $x \wedge y = 1$  then  $x = 1$  and  $y = 1$ .

**b)** Attempt any two of the following: [10]

- i) Prove that if  $f$  is a homomorphism from a commutative semigroup  $(S, *)$  onto a semigroup  $(T, *')$  then  $(T, *')$  is also commutative.
- ii) Explain the Quine-McCluskey method to simplify the sum - of - products expansions.
- iii) Use K - maps to minimize the sum- of - products expansions:  
 $xy\bar{z} + x\bar{y}z + \bar{x}y\bar{z} + \bar{x}\bar{y}z$ .

**Q5) a)** Attempt any one of the following: [6]

- i) Let  $T$  be the set of all even integers. Show that the semigroups  $(Z, +)$  and  $(T, +)$  are isomorphic.
- ii) Let  $A = \{0, 1\}$  and consider the free semigroup  $(A^*, \cdot)$  generated by  $A$ . Define the relation on  $A$  by  $\alpha R \beta$  if and only if  $\alpha$  and  $\beta$  have the same number of 1's.  
Show that  $R$  is a congruence relation on  $(A^*, \cdot)$

**b)** Attempt any two of the following: [10]

- i) How many functions are there from a set with  $m$  elements to a set with  $n$  elements?
- ii) Prove that  $Z^+$ , the set of all positive integers together with binary operation  $*$ , defined by  $a * b = \min \{a, b\}$  is a semigroup.
- iii) A survey of households in the united States reveals that 96% have at least one television set, 98% have telephone service, and 95% have telephone service and at least one television set. What percent of households in the United States have neither telephone service nor a television set?



Total No. of Questions : 5]

SEAT No. :

P2226

[Total No. of Pages : 2

[4739] - 104

**M.Sc. Tech. (Semester - I)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 104 : 'C' Programming**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Attempt any eight of the following:

**[16]**

- a) Explain the use of typedef.
- b) Enlist any six data types used in C programming.
- c) What are the various bitwise operators?
- d) State and explain the various file opening modes.
- e) What is the use of the preprocessor directives?
- f) Explain the role of the compiler in program development life cycle.
- g) Describe the precedence and associativity rules.
- h) Describe the use of different escape sequences.
- i) What is the difference between while loop and do .... while loop?
- j) What is mean by pass by address mechanism?

**Q2)** Attempt any four of the following:

**[16]**

- a) Explain with an example the storage class specifiers in C.
- b) What is recursion? Give an example of recursive function.
- c) Explain the use of Logical operators in C.
- d) Write a C program to accept two strings from user. Check whether both are same or not.
- e) Write a C program to test whether a user entered character is alphabet or not.

**P.T.O.**

**Q3)** Attempt any four of the following: **[16]**

- a) Explain the use of *malloc()* and *calloc()* functions in dynamic memory allocation.
- b) With suitable example explain the use of *break* statement.
- c) What is a function? Explain the advantages of a function.
- d) Write a C program to decide whether user entered integer is prime or not.
- e) Write a C program to accept five digit integer and print it in reverse order.

**Q4)** Attempt any four of the following: **[16]**

- a) Explain the concept of enum with suitable example.
- b) Write a short note on Structures in C.
- c) What is a pointer? What are the disadvantages of a pointer?
- d) Write a C program to accept an integer array and find out minimum number of it.
- e) Write a C program that calculate the average of marks of all the subjects. The number of subjects '*n*' is accepted from user. Allocate memory dynamically for '*n*' integers. Free the memory when not in use.

**Q5)** Attempt any two of the following: **[16]**

- a) Write a short note on Switch ....case with example.
- b) Explain the use of *fscanf()* and *fprintf()* functions in file handling.
- c) State different string handling functions. Explain the use of any two with suitable example.
- d) Declare the structure Student (Roll\_No, Name, Marks). Write a C program to accept the information of five students and print it on the screen.



Total No. of Questions : 5]

SEAT No. :

P2227

[Total No. of Pages : 3

[4739] - 105

**M.Sc.Tech. (Semester - I)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 105 : Elements of Information Technology**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator/logarithmic table is allowed.*

**Q1)** Attempt any eight of the following:

**[8 × 2 = 16]**

- a) What is the advantage of a transistor over Vacuum tube?
- b) What is an input device? Give an example of a commonly used input device.
- c) State the difference between primary storage and secondary storage.
- d) What is binary system for data representation?
- e) State the different types of plotter.
- f) Explain the difference between ROM and RAM.
- g) What is the role of an operating system with respect to a function called "Memory Management"?
- h) Give octal representation of following binary numbers.
  - i) 101110.
  - ii) 1101010.
- i) What is a logical file? How it differs from physical file?
- j) What is the primary objective of a time-shared O.S.?

**P.T.O.**

**Q2)** Attempt any four of the following:

**[4 × 4 = 16]**

- a) Differentiate between drum printer and chain printer.
- b) Define flash memory. What are advantages of flash memory?
- c) Explain the basic structure of a computer system. Draw a diagram.
- d) Explain with suitable example the method of conversion of decimal number into binary number.
- e) Define following terms.
  - i) Throughput.
  - ii) Turnaround time.
  - iii) Swapping.
  - iv) Response time.

**Q3)** Attempt any four of the following:

**[4 × 4 = 16]**

- a) Define multiprogramming. Explain how multiprogramming ensures effective utilization of main memory & CPU?
- b) What is an OCR device? Write its advantages and limitations for inputting text documents.
- c) Write a short note on ASCII code.
- d) Explain the working of bus topology with a suitable diagram.
- e) What is a real time operating system? State its applications.

**Q4)** Attempt any four of the following:

**[4 × 4 = 16]**

- a) Differentiate between a sequential access, a direct access or a random access storage device. Write one example of each.
- b) State and explain different components of networks.
- c) Explain the difference between volatile and non-volatile memory. Write an example of each type of memory.

- d) Write a note on characteristic features of fifth-generation computers.
- e) Write full form of following abbreviations:
  - i) BCD.
  - ii) ASCII.
  - iii) EBCDIC.
  - iv) UTF.

**Q5)** Attempt any four of the following:

**[4 x 4 = 16]**

- a) Explain how an element is inserted in sparse index? Give suitable example.
- b) With a neat diagram explain the operation of VDU monitor.
- c) Explain secondary memory and its devices in brief.
- d) Write a short note on advantages and limitations of magnetic tapes.
- e) Explain the performance parameters of computer.



Total No. of Questions : 8]

SEAT No. :

P2208

[Total No. of Pages : 3

[4739] - 2001

M.Sc. Tech (Semester - II)

MATHEMATICS

Industrial Mathematics With Computer Applications

MIM - 201 : Complex Analysis

(2013 Pattern)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) Attempt any five questions.
- 2) Figures to the right indicate full marks.

Q1) a) Show that  $|\cos z|^2 = \cos^2 x + \sin^2 y$ . Hence find zeros of  $\cos z$ . [5]

b) Show that  $\log(i^2) = 2 \log i$

when  $\log z = \ln r + i \theta \left( r > 0, \frac{\pi}{4} < \theta < \frac{9\pi}{4} \right)$ . [3]

c) Sketch the following set and determine whether it is a domain in the complex plane  $S = \{z \in \mathbb{C} / |z - i| > 4\}$ . [2]

Q2) a) Prove that  $\lim_{z \rightarrow \infty} f(z) = \infty$  if and only if  $\lim_{z \rightarrow 0} \frac{1}{f(1/z)} = 0$ . [4]

b) Find the value of the integral  $\int_C \bar{z} dz$  where  $C$  is the right-hand half

$z = 2e^{i\theta} \left( \frac{-\pi}{2} \leq \theta \leq \frac{\pi}{2} \right)$ . [4]

c) Is  $f(z) = x^2 + i y^2$  a harmonic function? [2]

P.T.O.

**Q3)** a) Show that  $u(x, y) = \sin hx \sin y$  is harmonic in some domain and find a harmonic conjugate  $v(x, y)$ . [4]

b) Prove that when a limit of a function  $f(z)$  exists at a point  $Z_0$ , it is unique. [4]

c) State Cauchy - Goursat theorem. [2]

**Q4)** a) State and prove Taylor's theorem. [5]

b) State and prove Morera's theorem. [5]

**Q5)** a) State and prove Cauchy's residue theorem. [5]

b) State and prove the fundamental theorem of algebra. [5]

**Q6)** a) Use residues to evaluate the improper integral  $\int_0^{\infty} \frac{dx}{(x^2 + 1)^2}$ . [4]

b) Prove that  $f(z) = |z|^2$  is analytic only at  $z = 0$ . [4]

c) Evaluate  $\int_C f(z) dz$  where the contour  $C$  is the positively oriented circle

$$|z| = 2, \text{ and } f(z) = \frac{z^3 + 1}{z^2 - 9}. \quad [2]$$

**Q7)** a) Give two Laurent series expansions in powers of  $z$  for the function

$$f(z) = \frac{1}{z(1 + z^2)} \text{ in certain domains, and specify those domains. [4]}$$

- b) Evaluate  $\int_C f(z) dz$  where  $C$  is the polygonal line from 0 to  $i$  and then from  $i$  to  $1 + i$ , and  $f(z) = y - x - 3x^2 i$ , [4]
- c) Find the Maclaurin series expansion for  $\exp(z^2)$  in the domain  $|z| < \infty$ . [2]

- Q8)** a) Evaluate  $\int_C \frac{5z-2}{z(z-1)} dz$  where  $C$  is the circle  $|z| = 2$ , described counter clockwise. [4]
- b) Prove that if  $f$  is entire and bounded in the complex plane, then  $f(z)$  is constant throughout the plane. [4]
- c) Evaluate  $\int_C e^{1/z} dz$ , where  $C$  is the circle  $|z| = 1$  described in the positive sense. [2]



Total No. of Questions : 8]

SEAT No. :

P2209

[Total No. of Pages : 3

[4739] - 2002

**M.Sc. Tech (Semester - II)**

**Industrial Mathematics With Computer Applications**

**MIM - 202 : Algebra - I**

**(2013 Pattern)**

*Time :3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) *Attempt any five questions.*
- 2) *Figures to the right indicate full marks.*

**Q1) a)** State and prove cayley's theorem. **[5]**

b) Define divisors of zero in a ring R. **[5]**

solve the equation  $x^2 - 5x + 6 = 0$  in  $Z_{12}$ .

**Q2) a)** Let  $P \in Z$  be a prime. Let  $f(x) = a_n x^n + \dots + a_0 \in Z[x]$  and  $a_n \not\equiv 0 \pmod{p}$  but  $a_i \equiv 0 \pmod{p}$  for  $i < n$  with  $a_0 \not\equiv 0 \pmod{p^2}$ . Prove that  $f(x)$  is irreducible over  $Q$ . **[5]**

b) Define order of an element in a group. Find order of every element in  $(Z_6, +)$ . **[5]**

**Q3) a)** Prove that if  $H$  is a subgroup of a group  $G$  and  $a, b \in G$  then  $Ha = Hb$  if and only if  $a * b^{-1} \in H$ . **[5]**

b) Prove that no group of order 20 is simple. **[3]**

c) Define Field. Give one example. **[2]**

**P.T.O.**

- Q4)** a) Prove that every field is an integral domain. [4]
- b) If  $R$  is a ring with unity 1. Prove that the map  $\phi : Z \rightarrow R$  given by  $\phi(n) = n \cdot 1, n \in Z$  is a homomorphism of  $Z$  into  $R$ . [4]
- c) Find the number of elements in the cyclic subgroup of  $(Z_{30}, +)$  generated by  $\overline{25}$ . [2]
- Q5)** a) If  $S = \{\overline{2}, \overline{4}, \overline{6}, \overline{8}\}$  is a group under multiplication modulo 10. and  $G = \{1, -1, i, -i\}$  is a group under multiplication show that  $S$  and  $G$  are isomorphic. [4]
- b) Let  $G$  be the group of  $2 \times 2$  invertible matrices with matrix multiplication  $\begin{bmatrix} a & b \\ c & d \end{bmatrix} \in G$  if  $ad - bc \neq 0$ . Show that  $H = \left\{ \begin{bmatrix} a & 0 \\ 0 & a \end{bmatrix}, a \neq 0 \right\}$  is a normal subgroup of  $G$ . [4]
- c) Define Prime ideal. [2]
- Q6)** a) Prove that if  $F$  is a field then every ideal in  $F[x]$  is principal. [5]
- b) Define Transposition. Express  $f \in S_8$  as product of transpositions where  $f = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 8 & 5 & 7 & 6 & 2 & 4 & 1 & 3 \end{pmatrix}$ . [3]
- c) Define Simple group. Give one example. [2]
- Q7)** a) Prove that  $a \in Z(G)$  if and only if  $N(a) = G$ . [4]
- b) Prove that an element  $a \in F$  is a zero of  $f(x) \in F[x]$  if and only if  $x - a$  is a factor of  $f(x)$  in  $F[x]$  [4]
- c) Is union of 2 subgroups a subgroup? Justify. [2]

Q8) a) Prove that subgroup of a cyclic group is cyclic. [4]

b) Let  $G$  be the six element group  $\{e, a, b, c, d, f\}$  with composition table as follows. [4]

|     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|
| *   | $e$ | $a$ | $b$ | $c$ | $d$ | $f$ |
| $e$ | $e$ | $a$ | $b$ | $c$ | $d$ | $f$ |
| $a$ | $a$ | $b$ | $e$ | $d$ | $f$ | $c$ |
| $b$ | $b$ | $e$ | $a$ | $f$ | $c$ | $d$ |
| $c$ | $c$ | $f$ | $d$ | $e$ | $b$ | $a$ |
| $d$ | $d$ | $c$ | $f$ | $a$ | $e$ | $b$ |
| $f$ | $f$ | $d$ | $c$ | $b$ | $a$ | $e$ |

Find all subgroups of  $G$ ?

c) Let  $f: \mathbb{Q}[x] \rightarrow \mathbb{R}$  where  $f(a_0 + a_1x + \dots + a_n x^n) = a_0 + 2a_1 + \dots + 2^n a_n$   
Is  $x^2 + x - 6$  in  $\ker$  of  $f$ ? [2]



Total No. of Questions : 8]

SEAT No. :

P2210

[Total No. of Pages : 4

[4739] - 2003

M. Tech (Semester - II)

Industrial Mathematics With Computer Applications

MIM - 203 : Numerical Analysis

(2013 Pattern)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) Solve any Five questions out of Eight questions.
- 2) Figures to the right indicate full marks.
- 3) Use of log tables / calculators is allowed.

Q1) Attempt the following :

- a) Find absolute error and relative error in the approximation of

$$\begin{aligned}x &= 3.1428571 \\ \bar{x} &= 3.1415926\end{aligned}\quad [2]$$

- b) Find a real root of the equation  $x = e^{-x}$  using Newton - Raphson Method, correct upto 3- places of decimal by taking  $x_0 = 1$ . [4]
- c) Explain Geometrically Secant Method. [4]

Q2) Attempt the following :

- a) Find an interval  $[a, b]$  such that real root of the equation  $x e^x = 1$  lies in  $[a, b]$ . [2]
- b) Start with  $f(x) = x^3 - A$ , where A is any real number and derive the

recursive formula 
$$p_k = \frac{2p_{k-1} + \frac{A}{p_{k-1}^2}}{3}, K = 1, 2, \dots$$
 [4]

- c) Find the parabola  $y = A + B_x + Cx^2$  that passes through the three points (1, 1), (2, -1) and (3, 1). [4]

P.T.O.

**Q3)** Attempt the following :

- a) Solve  $LY = B$ ,  $UX = Y$  and verify that  $B = AX$  for  $B^T = (9, 6, 8)$ , and  $A = LU$  where , [4]

$$A = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 2 & 3 \\ 3 & 1 & 2 \end{bmatrix};$$

$$L = \begin{bmatrix} 1 & 0 & 0 \\ 1/2 & 1 & 0 \\ 3/2 & -7 & 1 \end{bmatrix}, U = \begin{bmatrix} 2 & 3 & 1 \\ 0 & 1/2 & 5/2 \\ 0 & 0 & 18 \end{bmatrix}.$$

- b) Consider the graph  $y = f(x) = \cos(x)$  over  $[0.0, 1.2]$ ; use the nodes  $x_0 = 0.0$ ,  $x_1 = 1.2$  to construct a linear interpolation polynomial  $p_1(x)$ . [4]
- c) Construct forward difference table for the following data : [2]

|   |     |     |      |      |      |      |      |
|---|-----|-----|------|------|------|------|------|
| X | 3   | 4   | 5    | 6    | 7    | 8    | 9    |
| Y | 2.7 | 6.4 | 12.5 | 21.6 | 34.3 | 51.2 | 72.9 |

**Q4)** Attempt the following :

- a) Define an ill conditioned system. [2]
- b) Assume that 'g' is continuous function and that  $\{P_n\}_{n=0}^{\infty}$  is a sequence generated by fixed point iteration. If  $\lim_{n \rightarrow \infty} P_n = p$ , then show that P is fixed point of  $g(x)$ . [4]
- c) Complete the following computations : [4]

$$\int_0^{1/4} e^{x^2} dx \approx \int_0^{1/4} \left( 1 + x^2 + \frac{x^2}{2!} + \frac{x^6}{6!} \right) = \hat{p}$$

and state the type of error is present in this situation. Compare the answer with the true value  $p = 0.2553074606$ .

**Q5)** Attempt the following :

- a) Use Gauss - Seidel iterative method to solve the system of linear equations [4]

$$4x - y + z = 7$$

$$4x - 8y + z = -21$$

$$-2x + y + 5z = 15$$

Perform two iterations with initial approximation

$$P_0 = (x_0, y_0, z_0) = (1, 2, 2).$$

- b) Show that : [4]

i)  $\Delta = E \nabla$

ii)  $E = 1 + \Delta$

Where  $E$  is shift operator

$\nabla$  is Backward operator

$\Delta$  is forward operator

- c) Define dominant eigen value and dominant eigen vector. [2]

**Q6)** Attempt the following :

- a) Evaluate  $I = \int_0^1 \frac{1}{1+x} dx$  correct upto three places of decimal, Considering step size  $h = 0.25$ . [4]

- b) Use Euler's Method to solve initial value problem  $y' = -y$  with the conditions  $y(0) = 1$  and by taking  $h = 0.01$ . [4]

- c) Let  $\lambda$  and  $v$  be an eigen pair of a matrix  $A$ . If ' $\alpha$ ' is any constant, show that  $\lambda - \alpha$ ,  $v$  is an eigen pair of matrix  $A - \alpha I$ . [2]

**Q7)** Attempt the following :

- a) Assume that [5]
- i)  $g, g' \in C[a, b]$
  - ii)  $k$  is positive constant
  - iii)  $P_0 \in (a, b)$  and
  - iv)  $g(x) \in [a, b], \forall x \in [a, b]$

If  $|g'(x)| \leq k < 1, \forall x \in [a, b]$  then show that the iterations  $p_n = g(p_{n-1})$  will converge to unique fixed point  $p \in [a, b]$ .

- b) Use Runge - Kutta method of order two to solve initial value problem.  $y' = y - x$  where  $y(0) = 2$ , Find  $y(0.1)$  and  $y(0.2)$  correct upto three places of decimal. [5]

**Q8)** Attempt the following :

- a) Assume that  $f \in C^3 [a, b]$  and that  $x - h, x, x + h \in [a, b]$  then show that

$$f'(x) \approx \frac{f(x+h) - f(x-h)}{2h} \quad [5]$$

further more show that there exists a number  $C = C(x) \in [a, b]$  such that,

$$f'(x) = \frac{f(x+h) - f(x-h)}{2h} + E_{trunc}(f, h)$$

$$\text{where, } E_{trunc}(f, h) = \frac{-h^2 f^3(c)}{6} = O(h^2).$$

- b) Use Newton's method to solve the following non-linear system. [5]

$$x^2 - 2x - y + 0.5 = 0$$

$$x^2 + 4y^2 - 4 = 0$$

with the starting value  $(p_0, q_0) = (2.00, 0.25)$  and compute  $(p_1, q_1)$  &  $(p_2, q_2)$ .



Total No. of Questions : 8]

SEAT No. :

P2211

[Total No. of Pages : 2

[4739] - 2004

**M.Sc. Tech (Semester - II)**

**Industrial Mathematics With Computer Applications**

**MIM - 204 : Object Oriented Programming with C++**

**(2013 Pattern)**

*Time :3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) *Attempt any five questions.*
- 2) *Figures to the right indicate full marks.*

- Q1)** a) What is class in C++? [2]  
b) What is an object? Explain the use of delete operator. [3]  
c) Explain data Abstraction and Encapsulation in object oriented programming. [5]
- Q2)** a) Explain reference variable in C++. [2]  
b) Write a note on inline function in C++. [4]  
c) Explain access specifier in C++. [4]
- Q3)** a) What is abstract class in C++? [2]  
b) Explain difference between function overloading and function overriding. [5]  
c) What is destructor? Explain need of destructor. [3]

**P.T.O.**

- Q4)** a) What is implicit and explicit type conversion? [2]  
b) Write a note on friend function. [4]  
c) Write a C++ program for creating file with constructor function. [4]
- Q5)** a) Define this pointer in C++ [2]  
b) Explain different types of constructor in C++ with suitable example. [4]  
c) Write a C++ program to overload unary operator ‘-’ to change sign of matrix elements. [4]
- Q6)** a) What is operator overloading? Enlist the C++ operator which cannot be overload. [2]  
b) Explain an exception handling in C++. [4]  
c) Explain getline ( ) and write ( ) functions with suitable example. [4]
- Q7)** a) Explain different types of inheritance in C++. [5]  
b) Write a C++ program to overload ‘==’ equality operator for class string to check equality of two string. [5]
- Q8)** a) Describe the various approaches by which we can detect the end-of-file condition successfully, with example. [5]  
b) What is templates? Write a function template to find the biggest of 3 number. [5]



Total No. of Questions : 8]

SEAT No. :

P2212

[Total No. of Pages : 3

[4739] - 2005

**M.Sc. Tech (Semester - II)**

**Industrial Mathematics With Computer Applications**

**MIM - 205 : Data Structures using C**

**(2013 Pattern)**

*Time :3 Hours]*

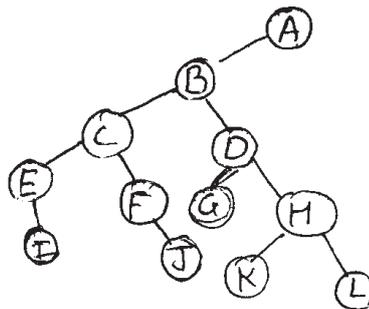
*[Max. Marks :50*

*Instructions to the candidates:*

- 1) *Attempt any five questions.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Attempt the following

- a) Write a functions for performing following operations on singly linked list. [5]
  - i) Delete by position.
  - ii) Display
- b) Consider the following BST and answer the following questions. [3]



- i) What is preorder traversal?
  - ii) What is Inorder traversal?
  - iii) What is Postorder traversal?
- c) Define Data Structures. [2]

**P.T.O.**

**Q2)** Attempt the following

- a) Write a note on linear and non-linear data structures. [4]
- b) Explain Array as an ADT. [4]
- c) Explain doubly linked list with node structure. [2]

**Q3)** Attempt the following

- a) Explain following Graph Representations with example [4]
  - i) Adjacency list
  - ii) Adjacency matrix
- b) Convert the following Infix expression to postfix expression. Show the contents of the stack at each point. [4]

$$((H)*\{([J+K])\})$$

- c) Evaluate the postfix expression [2]  
AB + CD - \*  
A = 1, B = 2, C = 3, D = 4

**Q4)** Attempt the following

- a) Explain counting sort algorithm with example. [4]
- b) What do you mean by priority queue. State two types of priority queue. [4]
- c) Define stack. [2]

**Q5)** Attempt the following

- a) Explain the working of a Quick sort on the following input string  
136, 487, 358, 469, 570, 247, 598, 639, 205 [5]
- b) Draw a tree structure whose array representation is given as  
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16  

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | . | C | . | . | . | D | . | . | . | . | . | . | . | E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

 [3]
- c) What is the meaning of [2]
  - i) Digraph
  - ii) Connected Graph

**Q6)** Attempt the following

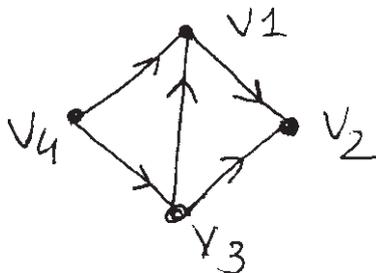
- a) Explain the mechanism of CPU scheduling algorithm using queue. [4]
- b) Write a note on binary search tree [4]
- c) Define ADT. [2]

**Q7)** Attempt the following

- a) Write a 'C' program to implement queue. [5]
- b) Write a 'C' program to add two polynomials. [5]

**Q8)** Attempt the following

- a) Consider the following graph and answer the questions below. [5]



- i) Is it a acyclic Graph?
  - ii) Wheather it is a Simple Graph or not?
  - iii) Is it a Weighted Graph or not?
  - iv) Check wheather  $V_1$  &  $V_2$  are adjacent?
  - v) List pendant vertices?
- b) Write a node to delete a node in a singly linked list. [5]



Total No. of Questions : 5]

SEAT No. :

P2228

[Total No. of Pages : 4

[4739] - 201

**M.Sc. Tech. (Semester - II)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 201 : Real and Complex Analysis**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of log tables/calculators is allowed.*

**Q1)** Attempt any EIGHT of the following:

**[8 × 2 = 16]**

- a) Prove that if  $m^*A=0$ , then  $m^*(A \cup B)=m^*B$ .
- b) Show that every countable set is measurable.
- c) If 'f' and 'g' are real valued functions on [0, 1] such that  $f(x)=x^3, 0 \leq x \leq 1$  and  $g(x)=f(x)$  almost every where on [0, 1].

$$\text{Find } \int_0^1 g.$$

- d) Define outer measure of a set  $A \subseteq \mathbb{R}$ .
- e) Let  $f$  be a real valued measurable function on the measurable set  $E \subseteq \mathbb{R}$  and let  $k \in \mathbb{R}$ , prove that  $k.f$  is measurable function on  $E$ .
- f) Discuss differentiability of the function  $f(z)=\bar{z}$  in  $\mathbb{C}$ .
- g) Determine whether the function  $f(z)=xy+iy$  is analytic every where?
- h) Define residue at a pole.

**P.T.O.**

i) Show that  $\int_C \frac{e^{2\pi z}}{z-a} dz = 2\pi i e^{2\pi a}$  where C is a circle  $|z-a|=2$ .

j) Find radius of convergence of the complex series  $\sum_{n=0}^{\infty} \frac{z^{2n}}{2^n}$ .

**Q2) a) Attempt any ONE of the following: [1 x 6 = 6]**

i) Let  $\{A_n\}$  be a countable collection of sets in  $\mathbb{R}$ . Prove that

$$m^* \left[ \bigcup_{n=1}^{\infty} A_n \right] \leq \sum_{n=1}^{\infty} m^* A_n.$$

ii) Show that a countable union of measurable sets is measurable.

**b) Attempt any TWO of the following: [2 x 5 = 10]**

i) Let 'f' be an extended real valued function whose domain is measurable. Show that for every  $\alpha \in \mathbb{R}$ , the set  $\{x / f(x) > \alpha\}$  is measurable if and only if the set  $\{x / f(x) \geq \alpha\}$  is measurable.

ii) Let 'f' be a measurable function and  $f = g$  almost every where, prove that 'g' is measurable.

iii) Let  $A, B \subseteq \mathbb{R}$  then show that

1)  $\chi_{A \cap B} = \chi_A \cdot \chi_B$ .

2)  $\chi_{A \cup B} = \chi_A + \chi_B - \chi_A \cdot \chi_B$ .

3)  $\chi_{A'} = 1 - \chi_A$ .

where  $A' = \mathbb{R} - A$

**Q3) a)** Attempt any ONE of the following: **[1 x 6 = 6]**

- i) Let  $\{E_n\}$  be an infinite decreasing sequence of measurable sets in  $\mathbb{R}$ . i.e.  $E_n \supseteq E_{n+1}, \forall n$ , let  $mE_1$  be finite. Prove that

$$m \left[ \bigcap_{n=1}^{\infty} E_n \right] = \lim_{n \rightarrow \infty} mE_n.$$

- ii) State and prove Fatou's Lemma.

**b)** Attempt any TWO of the following: **[2 x 5 = 10]**

- i) Let  $f$  be non negative measurable function defined on a measurable set  $E$ , such that  $f \equiv 0$  almost everywhere. Then show that  $\int_E f = 0$ .
- ii) Let  $E$  be a measurable set in  $\mathbb{R}$ . Let  $x \in \mathbb{R}$ , show that the set  $E + x$  is measurable and that  $m(E + x) = mE$ .
- iii) Let  $\phi$  and  $\psi$  be a simple function which vanishes outside a set of finite measure with  $\psi \leq \phi$  almost every where. Then prove that  $\int \psi \leq \int \phi$ .

**Q4) a)** Attempt any ONE of the following: **[1 x 6 = 6]**

- i) Suppose that a function  $f$  is analytic in a domain  $D$ . Then prove that if  $f'(z) = 0$  in domain  $D$ , then  $f$  is constant function.
- ii) Let  $f(z) = u + iv$  be a complex valued function defined on a domain  $D$ . Let  $z_0 = x_0 + iy_0 \in D$ . Let  $f(z)$  be differentiable at  $z_0$ . Show that the Cauchy - Riemann equations are satisfied at  $z_0 = x_0 + iy_0$ .

b) Attempt any TWO of the following: [2 × 5 = 10]

i) Show that  $u(x, y) = \frac{1}{2} \log(x^2 + y^2)$  is Harmonic function. Obtain its Harmonic conjugate.

ii) Evaluate  $\int_C \frac{z+6}{(z^2-4)} dz$ .

Where i) C is circle  $|z| = 1$ .

ii) C is circle  $|z + 2| = 1$

iii) Let  $f: C \rightarrow C$  be a continuous function at  $z_0 \in C$ . If  $g: C \rightarrow C$  is continuous at a point  $f(z_0) \in C$  then show that the composite function  $g \circ f: C \rightarrow C$  is continuous at  $(z_0) \in C$ .

**Q5)** a) Attempt any ONE of the following: [1 × 6 = 6]

i) Show that a bounded entire function is a constant.

ii) State and prove Cauchy's Residue theorem.

b) Attempt any TWO of the following: [2 × 5 = 10]

i) Obtain Laurent's series expansion for

$$f(z) = \frac{z^2 - 1}{(z+2)(z+3)} \text{ in } 2 < |z| < 3.$$

ii) Use Residue theorem to evaluate integral  $\int_0^{2\pi} \frac{d\theta}{5 + 4 \cos \theta}$ .

iii) Obtain  $\int_C e^z dz$  where C is the circle  $|z|=1$ . Hence or otherwise

$$\text{show that } \int_0^{2\pi} e^{\cos \theta} [\cos(\theta) + \sin(\theta)] d\theta = 0.$$



Total No. of Questions : 5]

SEAT No. :

P2229

[Total No. of Pages : 3

[4739] - 202

**M.Sc.Tech. (Semester - II)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 202 : Algebra - II**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Attempt any eight of the following: **[16]**

- a) Let  $W_1 = \{(x, y, z) \in \mathbb{R}^3 : 2x + y - z = 0\}$ ,  $W_2 = \{(x, y, z) \in \mathbb{R}^3 : x + 2y + 2z = 0\}$  are subspaces of  $\mathbb{R}^3$ . Find a basis of  $W_1 \cap W_2$ .
- b) Suppose  $U$  and  $V$  are vector spaces over same field. Show that a linear transformation  $T:U \rightarrow V$  is one-one if and only if  $T$  maps linearly independent subset of  $U$  into a linearly independent subset of  $V$ .
- c) Let  $A = \begin{pmatrix} 3 & -5 \\ 2 & -4 \end{pmatrix}$ . Is  $A$  diagonalizable? Justify your answer.
- d) Show that for any subspace  $W$  of an inner product space,  $V$ ,  $W^\perp$  is a subspace of  $V$  such that  $W \cap W^\perp = \{0\}$ .
- e) Let  $\{(1, 2, -1), (2, \lambda, 1), (1, 4, 3)\}$  be linearly independent subset of  $\mathbb{R}^3$ . Find value of  $\lambda$ .
- f) Determine the minimal polynomial of over  $\mathbb{Q}$  of  $(1+i)\sqrt{3}$ .
- g) Find the splitting field of the polynomial  $x^4 - 5x^2 + 6$  over  $\mathbb{Q}$ .
- h) Let  $K$  be a field of non-zero characteristic  $p$ . Show that the mapping  $\phi:K \rightarrow K$  given by  $\phi(a) = a^p$  is a monomorphism.
- i) Show that every field extension of degree 2 is normal.
- j) Define module over a ring. Give an example of a module.

**P.T.O.**

- Q2) a)** Attempt any one of the following: [6]
- i) Let  $U$  be a subspace of a finite dimensional vector space  $V$  then show that  $\dim(U) \leq \dim(V)$  and  $\dim \left( \frac{V}{U} \right) = \dim(V) - \dim(U)$ .
  - ii) If  $\lambda_1, \lambda_2, \dots, \lambda_n$  are distinct eigenvalues of a linear operator  $T$  corresponding to eigenvectors  $v_1, v_2, \dots, v_n$  in vector space  $V$  then show that  $\{v_1, v_2, \dots, v_n\}$  is linearly independent. Is converse true? Justify your answer.
- b)** Attempt any two of the following: [10]
- i) Let  $V$  be a vector space and  $U, W$  be subspaces of  $V$ . Show that  $V = U \oplus W$  if and only if every  $x \in V$  can be uniquely written as,  $u + w, u \in U, w \in W$  where  $U \oplus W$  denotes the direct sum of  $U$  and  $W$ .
  - ii) Find a linear transformation  $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$  such that
    - 1)  $T$  maps line  $y = mx$  onto origin.
    - 2)  $T$  maps line  $y = mx$  onto itself, where  $m \neq 0$ .
  - iii) Prove that a square matrix  $A$  of order  $n$  is diagonalizable if and only if it has  $n$  linearly independent eigen vectors.
- Q3) a)** Attempt any one of the following: [6]
- i) Prove that every inner product space has an orthonormal basis.
  - ii) Prove that for any vector space  $V, V \cong V^{**}$ , where  $V^{**}$  denotes the second dual of  $V$ .
- b)** Attempt any two of the following: [10]
- i) Consider the vector space  $P_2(x)$  of polynomials of degree  $\leq 2$  over  $\mathbb{R}$ . Let  $\phi_1, \phi_2, \phi_3: P_2(x) \rightarrow \mathbb{R}$  be given by
 
$$\phi_1(f(x)) = \int_0^1 f(x) dx, \phi_2(f(x)) = f'(1), \phi_3(f(x)) = f'(0)$$
 . Find a basis  $B$  of  $P_2(x)$  such that  $\{\phi_1, \phi_2, \phi_3\}$  is the dual basis of  $B$ .
  - ii) Let  $A = \begin{pmatrix} 1 & 0 & 0 \\ -3 & 2 & 0 \\ -1 & -2 & 4 \end{pmatrix}$ . Find eigenvalues and eigenvectors of  $A$ .
  - iii) State and the prove Cauchy-Schwartz Inequality.

**Q4) a)** Attempt any one of the following: [6]

- i) If  $E$  is a finite field extension of  $F$ , then prove that  $E$  is separable over  $F$  if and only if each  $\alpha$  in  $E$  is separable over  $F$ .
- ii) Let  $F$  be a field and  $\bar{F}$  be the algebraic closure of  $F$ . Let  $f(x)$  be irreducible in  $F[x]$ . Prove that all zeros of  $f(x)$  in  $\bar{F}$  have the same multiplicity.

**b)** Attempt any two of the following: [10]

- i) Find the Galois group of the polynomial  $f(x) = x^3 - 1$  over  $\mathbb{Q}$ .
- ii) Find the degree of the extension field
  - 1)  $\mathbb{Q}(\sqrt{2}, \sqrt[3]{5})$  over  $\mathbb{Q}$  and
  - 2)  $\mathbb{Q}(\sqrt[3]{2}, \sqrt[3]{6}, \sqrt[3]{24})$  over  $\mathbb{Q}$ .
- iii) Prove that a finite field  $K$  of  $p^n$  elements is the splitting field of  $x^{p^n} - x$  over its prime subfield  $Z_p$  (up to isomorphism)

**Q5) a)** Attempt any one of the following: [6]

- i) Let  $F$  be a finite field. Show that for any positive integer  $n$ , there is an irreducible polynomial in  $F[x]$  of degree  $n$ .
- ii) Suppose  $N$  is a submodule of an  $R$ -module  $M$ . Prove that there is a bijective correspondence between the set of all submodules of  $M/N$  and the set of all submodules of  $M$  containing  $N$ .

**b)** Attempt any two of the following: [10]

- i) Show that if  $\sqrt{a} + \sqrt{b} \neq 0$ , then  $\mathbb{Q}(\sqrt{a} + \sqrt{b}) = \mathbb{Q}(\sqrt{a}, \sqrt{b})$  for all  $a, b \in \mathbb{Q}$ .
- ii) Determine the normal closure of  $\mathbb{Q}(\sqrt[4]{2})$  over  $\mathbb{Q}$ .
- iii) Let  $K$  be an extension of a field  $F$ . If  $S$  is the set of all elements in  $K$  that are algebraic over  $F$  then show that  $S$  is a subfield of  $K$ .



Total No. of Questions : 5]

SEAT No. :

P2230

[Total No. of Pages : 4

[4739] - 203

M.Sc. Tech. (Semester - II)

MIM - 203 : Discrete Mathematical Structures - II

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

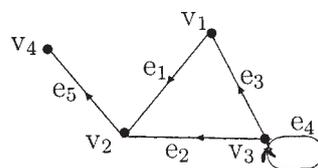
Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Attempt any eight of the following:

[16]

- a) Prove that the number of edges in  $K_n$ , complete graph on  $n$  vertices is  $\frac{n(n-1)}{2}$ .
- b) Prove that every tree is a bipartite graph.
- c) Find the edge connectivity of  $K_5$ .
- d) Define assymmetric digraphs.
- e) Prove that there is no simple graph with six vertices. One of which has degree 2, two have degree 3, three have degree four and remaining vertex has degree five.
- f) Define a complete bipartite graph with an example.
- g) For the following digraph.



Verify  $\sum_{u \in V} d^+(u) = \sum_{u \in V} d^-(u)$ .

- h) Is the chromatic number of any cycle with at least two vertices in two? Justify.

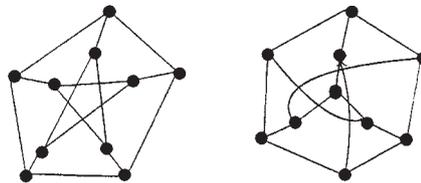
P.T.O.

**Q2) a)** Attempt any one of the following: **[6]**

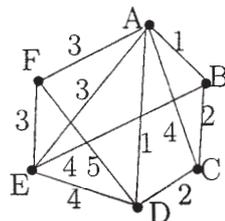
- i) Prove that a connected graph  $G$  is an Euler graph if and only if it can be decomposed into circuits.
- ii) Prove that edge ' $e$ ' of a connected graph  $G$  is not an isthmus if and only if ' $e$ ' is in some circuit of  $G$ .

**b)** Attempt any two of the following: **[10]**

- i) Find the maximum and minimum height of a binary tree with 11 vertices. Draw the two trees.
- ii) Are following two graphs isomorphic? Justify.



- iii) Find a minimal spanning tree in the following weighted graph using Kruskal's algorithm.

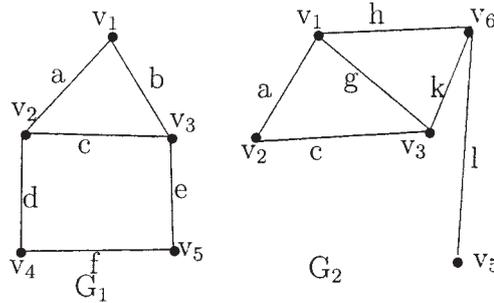


**Q3) a)** Attempt any one of the following: **[6]**

- i) Define a labeled graph. Draw all labeled trees on four vertices.
- ii) Prove that every tree has either one or two centers.

b) Attempt any two of the following: [10]

- i) Explain the Depth-First Search Algorithm.
- ii) Find  $G_1 \cup G_2, G_1 \cap G_2$  and  $G_1 \oplus G_2$  of the following graphs  $G_1$  and  $G_2$ .



- iii) Prove that a graph is bipartite if and only if all its circuits are even.

**Q4)** a) Attempt any one of the following: [6]

- i) Explain the Dijkstra's algorithm.
- ii) Write a short note on the Chinese Postman Problem.

b) Attempt any two of the following: [10]

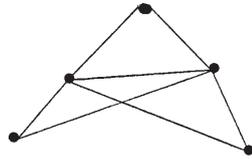
- i) Prove that the number of vertices in a self complementary graph must be of the form  $4k$  or  $4k + 1$  where  $k$  is an integer.
- ii) Prove that in any simple connected planar graph with  $f$  regions,  $n$  vertices and  $e$  edges ( $e > 2$ ), the following inequalities hold:

$$e \geq \frac{3}{2}f \text{ and } e \leq 3n - 6.$$

- iii) Define a rooted tree. Show that the number of vertices ' $n$ ' of a binary tree is always odd.

**Q5) a)** Attempt any one of the following: **[6]**

- i) Use Fleury's algorithm to produce an Euler line in the following graph.



- ii) Describe simple sequential colouring algorithm for a graph G.

**b)** Attempt any two of the following: **[10]**

- i) Define the following terms.
- 1) Complete symmetric digraph.
  - 2) Arborercence.
  - 3) Flow in a network.
  - 4) Edge colouring.
  - 5) Spanning tree.
- ii) Prove that the complete bipartite graph  $K_{3,3}$  is nonplanar.
- iii) Write down all possible adjacency matrices and incidence matrices for a 3-vertex path.



Total No. of Questions : 5]

SEAT No. :

P2231

[Total No. of Pages : 4

[4739] - 204

**M.Sc. Tech. (Semester - II)**

**COMPUTER SCIENCE**

**Industrial Mathematics With Computer Applications**

**MIM - 204 : Database Fundamentals**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Attempt any eight of the following:

**[16]**

- a) Define : Entity.
- b) Explain outer joins.
- c) What is referential integrity? Explain.
- d) What is Candidate Key?
- e) “Unique Constraint and Primary key have same meaning”. State true or false. Justify.
- f) What is degree of relationship? Explain.
- g) Define trigger.
- h) Explain difference between on attribute and a value set.
- i) State any two aggregate functions used in SQL.
- j) What is DBMS? Give two advantages of DBMS.

**P.T.O.**

**Q2)** Attempt any four of the following: [16]

- a) Differentiate between specialization and generalization.
- b) Write a note on : Decomposition.
- c) Explain the architecture of DBMS.
- d) Explain differences between file processing system & a DBMS.
- e) Write a note on : Hierarchical data model.

**Q3)** Attempt any four of the following: [16]

- a) Write a short note on : Data independence
- b) State any four functions of DBA.
- c) Explain different symbols used in E-R diagram.
- d) Explain concept of normalization and its forms in detail.
- e) Explain any two relational algebra operations with example.

**Q4)** Attempt any four of the following: [16]

- a) Consider relation

Item (i\_code, i\_name, price)

Order (O\_code, date, cust\_name)

Item\_Order (i\_code, O\_code, Qty)

Solve following algebraic queries.

- i) List all items that are ordered by customers.
- ii) Find most costly item.
- b) What is Cartesian Product? Explain with examples.

c) Consider following relationships.

Student (Sno, name, address, class)

Subject (Sub\_no, Sub\_name)

Stud\_sub (Sno, sub\_no, marks)

Solve following queries in relational algebra

i) Find the names of students who had opted for the course of 'Comp.Sci.'

ii) List student wise list of subjects.

d) Write a short note on: Cursors.

e) Explain aggregation and its application.

**Q5) a) Attempt any two of the following: [10]**

i) Design an E-R diagram for keeping track of the exploits of your favourite sports team. You should store the matches played, the scores in each match, the players in each match & individual player statistics for each match. Assume attributes to support the scenario if necessary.

1) Identify all entities.

2) Identify Relations.

3) Draw an E-R diagram.

ii) Design E-R diagram for banking Enterprise which records information about customers, employees of bank. A customer can be depositor as borrower. An employee of a bank can be customer of bank. There are two types of accounts, Savings account or current account.

1) Identify all entities.

2) Identify all relations.

3) Draw an E-R diagram.

iii) Write a short note on : tuple relational calculus.

b) Attempt any two of the following: [6]

i) What are insertion & deletion anomalies? Explain with example.

ii)  $F = \{A \rightarrow B, CD \rightarrow E, A \rightarrow C, B \rightarrow D, E \rightarrow A\}$

Compute closure of F i.e.  $F^+$

iii) Write a short note on : Functional dependency.



Total No. of Questions : 5]

SEAT No. :

P2232

[Total No. of Pages : 3

[4739] - 205

**M.Sc. Tech. (Semester - II)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 205 : Data Structures Using C**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

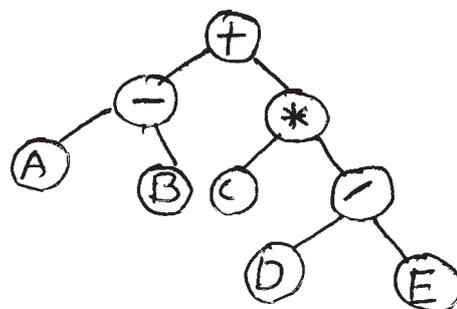
*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicates full marks.*
- 3) *Use of log table/calculator is allowed.*

**Q1)** Attempt any eight of the following:

**[8 × 2 = 16]**

- a) State four linear data structures.
- b) Which data structure can be used to store polynomial in the array term. Explain how  $P(x) = 2x^2 + x + 1$  will be stored in array term.
- c) Explain the node structure for doubly linked list with example.
- d) Convert the following Infix expression to Postfix expression  
 $A + (B * C) / D$ .
- e) What are Queuefull and Queueempty conditions for circular queue?
- f) What is the meaning of following terminologies in context of trees?
  - i) Degree of a node.
  - ii) Root.
- g) What is the array representation of the following binary tree?



**P.T.O.**

- h) Define Graph.
- i) Consider the following set of elements 25, 37, 12, 48, 57, 33. Show the list of elements after Pass-I of quicksort.
- j) What is Binary Search Tree?

**Q2)** Attempt any two of the following: **[2 x 8 = 16]**

- a) Write a menu driven 'C' program to implement following operations on singly linked list
  - i) Create
  - ii) Display
- b) Write a program to create binary tree and print its contents using Inorder and Preorder traversals.
- c) Write a C program to implement queue using array.

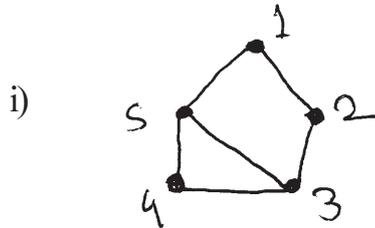
**Q3)** Attempt any four of the following: **[4 x 4 = 16]**

- a)
  - i) What is ADT?
  - ii) Explain Complex Number as an ADT.
- b) Discuss the mechanism to insert a node into a singly linked list.
- c) Explain Round Robin CPU scheduling algorithm as a application of queue.
- d) Explain stack and queue using examples.
- e) Apply bubble sort to sort the following  
99, 77, 66, 55, 44, 88.

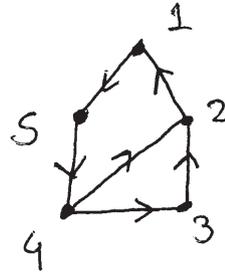
**Q4)** Attempt any four of the following:

**[4 x 4 = 16]**

- a) Write a note on array as an ADT.
- b) Write a note on array representation of stack.
- c) Write a note on adjacency matrix representation of Graph. What is the adjacency matrix representation of



ii)



- d) Write a note on BFS traversal of Graph.
- e) Write a function to delete a data from doubly linked list.

**Q5)** Attempt any four of the following:

**[4 x 4 = 16]**

- a) Construct a BST for the following  
30, 60, 50, 40, 10, 70, 20, 80, 90  
show each step.
- b) Explain Insertion Sort with example.
- c) Evaluate the following postfix exp.  
234 \* 6/+
- d) Write a note on circular linked list.
- e) Write a note on linear search and binary search.



P2213

[4739] - 3001

M.Sc. Tech. (Mathematics) (Semester - III)

INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS

MIM - 301 : General Topology  
(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) Answer any five questions out of Eight.
- 2) Figures to the right indicate full marks.

Q1) Attempt each of the following :

- a) Let  $X$  be a topological space and  $Y$  be a subspace of  $X$ . If  $A$  is a subset of  $Y$  and  $\bar{A}$  denotes the closure of  $A$  in  $X$ , then show that the closure of  $A$  in  $Y$  equals  $\bar{A} \cap Y$ . [4]
- b) If  $X$  is a Hausdorff space, then prove that a sequence of points of  $X$  converges to atmost one point of  $X$ . [4]
- c) Is the collection  $J_\infty = \left\{ U \mid \begin{array}{l} X-U \text{ is infinite} \\ \text{or all of } X \end{array} \right\}$  a topology on  $X$ ? Justify. [2]

Q2) Attempt each of the following :

- a) If  $\{\tau_\alpha\}$  is a family of topologies on  $X$ , then show that  $\bigcap_\alpha \tau_\alpha$  is a topology on  $X$ . [4]
- b) If  $A$  is a subspace of  $X$  and  $B$  is a subspace of  $Y$ , then prove that product topology on  $A \times B$  is the same as the topology  $A \times B$  inherits as a subspace of  $X \times Y$ . [4]
- c) Define interior and closure of a subset of a topological space. [2]

Q3) Attempt each of the following :

- a) State and prove pasting lemma. [4]
- b) Prove that for functions  $f: \mathbb{R} \rightarrow \mathbb{R}$ , the  $\epsilon - \delta$  definition of continuity implies the open set definition. [4]
- c) Show that  $(0, 1)$  and  $[0, 1]$  with usual topology are not homeomorphic. [2]

P.T.O.

**Q4)** Attempt each of the following :

- a) Let  $A$  be a connected subspace of  $X$ . If  $A \subset B \subset \bar{A}$ , then prove that  $B$  is also connected. [4]
- b) Prove that a closed subspace of a compact space is compact. [4]
- c) Give an example of a space which is not connected but locally connected. [2]

**Q5)** Attempt each of the following :

- a) Show that the set of rational numbers  $Q$  is not locally compact. [4]
- b) Prove that the continuous image of a connected space is connected. [4]
- c) Show that  $[0, \infty)$  is not a compact subspace of  $R$  with usual topology. [2]

**Q6)** Attempt each of the following :

- a) Let  $X$  be a first countable space. Then prove that  $f : X \rightarrow Y$  is continuous if and only if for every sequence  $\langle x_n \rangle$  in  $X$  converging to  $x$ , the sequence  $\langle f(x_n) \rangle$  converges to  $f(x)$ . [4]
- b) Prove that a subspace of a second countable space is second countable. [4]
- c) Define Lindelöf space. [2]

**Q7)** Attempt each of the following :

- a) Prove that every compact Hausdorff space is normal. [5]
- b) Prove that product of two Lindelöf space need not be Lindelöf. [5]

**Q8)** Attempt each of the following :

- a) Prove that every metrizable space is normal. [5]
- b) Prove that every second countable space is first countable but not conversly. [5]



**P2214**

**[4739] - 3002**

**M.Sc. Tech. (Semester - III)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 302 : Design & Analysis of Algorithm**

**(2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) *Attempt any five questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagram must be drawn whenever necessary.*

**Q1) a)** Order following functions in ascending order of their growth rates

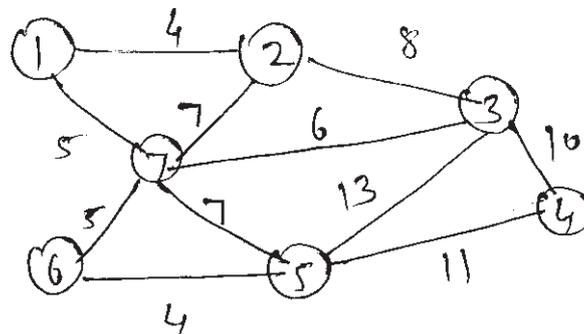
$$e^n \quad n^n \quad n^2 \quad 4^2 \log 3 \quad n! \quad \log n \quad [4]$$

b) Consider knapsack problem with  $n = 5$   $m = 12$ ,  $p = (10, 15, 6, 8, 4)$ ,  $w = (4, 6, 3, 4, 2)$ . Find an optimal solution for this problem using greedy method. [4]

c) Define greedy choice property and optimal substructure. [2]

**Q2) a)** Discuss time complexity of merge sort in best case and worst case. [4]

b) Using Kruskal's algorithm, find minimum spanning tree of following graph. [4]



c) Define 'O' & 'W' notation. [2]

**P.T.O.**

**Q3) a)** State Master's theorem. Solve following recurrence relation using Master's theorem.

$$T(n) = 7 T(n/2) + n^2 \quad [4]$$

b) Explain Depth first Traversal algorithm. [4]

c) Explain fractional knapsack problem. [2]

**Q4) a)** Find LCS of X & Y

$$X = \langle A, B, C, B, D, A, B \rangle \text{ \& } Y = \langle B, D, C, A, B, A \rangle. \quad [4]$$

b) What is on optimal Huffman coding for following set of frequencies.

$$f : 15 \quad e : 9 \quad c : 12 \quad b : 13 \quad d : 16 \quad a : 45 \quad [4]$$

c) "Quick sort is stable sorting algorithm" comment. [2]

**Q5) a)** Apply Floyd Warshall algorithm to find length of shortest paths from vertex u to vertex v,  $\forall u, v \in V(G)$ , where adjacency matrix of G is

$$\begin{bmatrix} 0 & 4 & 11 \\ 6 & 0 & 2 \\ 3 & \infty & 0 \end{bmatrix} \quad [4]$$

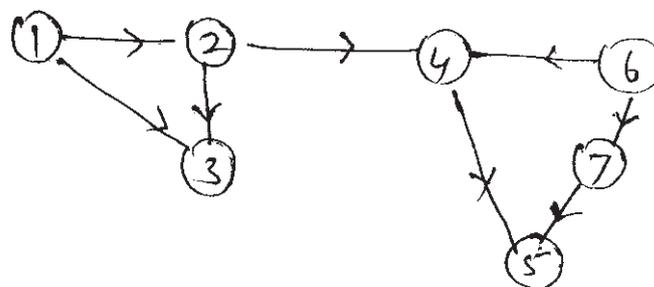
b) Explain count-sort algorithm. [4]

c) What is amortised analysis? [2]

**Q6) a)** Apply Merge sort algorithm on following array

$$45, 65, 23, 42, 21, 30, 38, 94, 19, 10. \quad [4]$$

b) Explain Topological sort. Illustrate it on following graph. [4]

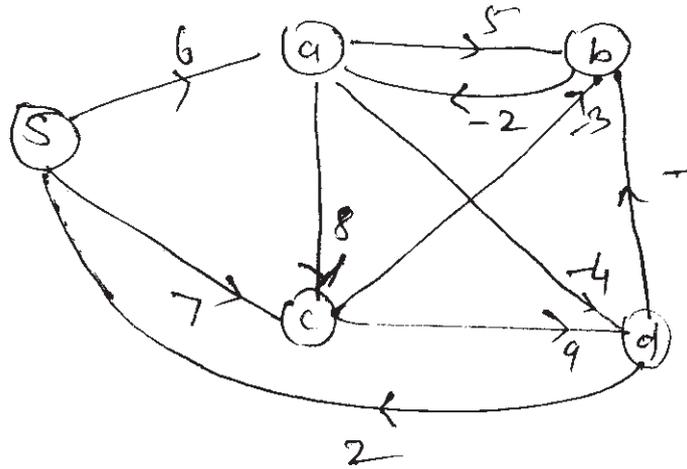


c) Define NP-Hard problem. [2]

**Q7) a)** What is the best way to multiply a chain of matrices ( $A_1, A_2, A_3, A_4$ ) with dimensions  $(10 \times 5, 5 \times 10, 10 \times 20, 20 \times 5)$ . [5]

b) Explain ‘divide and conquer’ strategy. Show how it is applied on quick sort. [5]

**Q8) a)** What is a negative weight cycle? Apply Bellman ford algorithm on following graph. [5]



b) What is a Heap? Explain how ‘Heapify’ algorithm is used to maintain Heap property. [5]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages :2

**P2215**

**[4739] - 3003**

**M.Sc. Tech. (Semester - III)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 303 : Object Oriented Software Engineering**

**(2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) Any five out of eight questions are compulsory.*
- 2) Draw neat diagrams wherever applicable.*
- 3) Figures to the right indicate full marks.*

**Q1)** Attempt all of the following :

- a) Explain the attributes of a good software. **[4]**
- b) Explain the spiral model of the software process. **[4]**
- c) What are critical systems? **[2]**

**Q2)** a) Explain the requirements elicitation and analysis process. **[4]**

b) Write a note on behavioural models. **[4]**

c) Define : i) Reliability ii) Availability **[2]**

**Q3)** a) An interactive diagram editor allows addition and deletion of items such as links and boxes. Prepare a state diagram for selecting and dragging items. A cursor on the diagram editor tracks a two button mouse. If the left button is pressed with the cursor on an item, the item is selected, otherwise previously selected items are deselected. Moving the mouse with the left button held down drags any selected item. **[4]**

b) Explain the distributed object architecture. **[4]**

c) What is unit testing in object oriented software context? **[2]**

**P.T.O.**

- Q4)** a) Write a note on software inspections. [4]  
 b) What are agile methods? Explain the principles of agile methods. [4]  
 c) “Generalization is called as ‘a-part of’ relationship. State true/false and justify. [2]
- Q5)** a) Explain how Integration testing is done in object oriented context. [4]  
 b) Explain the ‘waterfall model”. [4]  
 c) What are the challenges facing software engineering? [2]
- Q6)** a) Explain the Rapid application development environment. [4]  
 b) Write a note on non-functional requirements of a system. [4]  
 c) ‘Only concrete classes can be leaf classes in inheritance tree’. State true/false and justify. [2]
- Q7)** a) Draw a class diagram showing relationships amongst the following object classes. Include associations, aggregations and generalizations. Classroom, Gymkhana, Principal, College, Game, Course, Department, Teacher, Football, Student and Laboratory.  
 Show atleast one attribute for each class. [5]  
 b) Explain the client server architecture. [5]
- Q8)** a) In a personal computer, a disk controller is typically used to transfer a stream of bytes from a floppy disk drive to a memory buffer with the help of CPU. The controller signals the CPU each time a new byte is available. The data is then read and stored before another byte is ready. The disk controller senses that data is read and signals that data is not available. If any byte is not read before the next comes along, the disk controller goes into data lost error state. The host can then reset the disk controller back into data not available state to continue the process. Draw a sequence diagram for the data flow in the data controller. [5]  
 b) What are static analyzers? Explain the stages involved in static analysis.[5]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages :3

**P2216**

**[4739] - 3004**

**M.Sc. Tech (Computer Science) (Semester - III)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 304 : Operating Systems**

**(2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) *Attempt any five of the following.*
- 2) *Figures to the right indicate full marks.*

- Q1)** a) Explain any five functions provided by operating system services. [5]  
b) Discuss main advantages of multiprocessor systems. [3]  
c) Define the term : Dispatcher and dispatch latency. [2]
- Q2)** a) How many page faults occur using OPT page replacement algorithm and FIFO page replacement algorithm for the following page reference string with four page frames?  
1, 2, 3, 4, 1, 2, 5, 1, 2, 3, 4, 5 [5]  
b) Draw resource allocation graph for the following set P, R and E.  
 $P = \{P_1, P_2, P_3, P_4\}$   
 $R = \{R_1, R_2, R_3, R_4\}$   
 $E = \{P_1 \rightarrow R_1, P_2 \rightarrow R_3, P_4 \rightarrow R_1, R_1 \rightarrow P_2, R_2 \rightarrow P_4\}$   
Resource instances of  $R_1 = 2, R_2 = 3, R_3 = 1$  and  $R_4 = 2$ . [3]  
c) Define wait ( ) and signal ( ) atomic operations of semaphore access.[2]
- Q3)** a) What is file? Discuss several pieces of information associated with an open file. [5]  
b) Write a note on web-based computing. [3]  
c) Explain the working of SCAN algorithm. [2]

**P.T.O.**

**Q4) a)** Explain process state diagram. **[5]**

b) Consider the following snapshot of a system

| Job | Arrival Time | Burst Time |
|-----|--------------|------------|
| J1  | 2            | 4          |
| J2  | 0            | 5          |
| J3  | 1            | 3          |
| J4  | 3            | 2          |

Calculate Average turn around time and average waiting time using SJF (Preemptive) CPU Scheduling algorithm. **[3]**

c) Discuss the sequence in which process may utilize a resource under the normal mode of operations. **[2]**

**Q5) a)** Write a note on Bounded - Buffer problem. **[5]**

b) Explain the concept of dynamic relocation using a relocation register. **[3]**

c) Discuss the grouping approach of free space management. **[2]**

**Q6) a)** Suppose that a disk drive have 200 cylinders, numbered 0 to 199. The drive is currently serving at cylinder 67, and the pending request queue is : 86, 64, 14, 16, 122, 124, 180, 90. Starting from the current head position, what is the total distance that the disk arm moves to satisfy all the pending requests for each of the following disk scheduling algorithms

i) FCFS

ii) SCAN **[5]**

b) Write a note on caching. **[5]**

**Q7) a)** Consider the following snapshot of a system.

|                | Allocation |   |   |   | MAX |   |   |   | Available |   |   |   |
|----------------|------------|---|---|---|-----|---|---|---|-----------|---|---|---|
|                | A          | B | C | D | A   | B | C | D | A         | B | C | D |
| P <sub>0</sub> | 0          | 0 | 1 | 2 | 0   | 0 | 1 | 2 | 1         | 5 | 2 | 0 |
| P <sub>1</sub> | 1          | 0 | 0 | 0 | 1   | 7 | 5 | 0 |           |   |   |   |
| P <sub>2</sub> | 1          | 3 | 5 | 4 | 2   | 3 | 5 | 6 |           |   |   |   |
| P <sub>3</sub> | 0          | 6 | 3 | 2 | 0   | 6 | 5 | 2 |           |   |   |   |
| P <sub>4</sub> | 0          | 0 | 1 | 4 | 0   | 6 | 5 | 6 |           |   |   |   |

Answer the following :

i) What is the content of the matrix need?

ii) Is the system in a safe state? **[5]**

b) Write a note on multilevel feedback queue. **[5]**

- Q8)** a) Explain any five categories of system programs. [5]
- b) Discuss the concept of internal and external fragmentation with diagram.[3]
- c) What is race condition? How to guard race condition. [2]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 3

**P2217**

**[4739] - 3005**

**M.Sc. Tech. (Computer Science) (Semester - III)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 305 : DataBase Fundamentals**

**(2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) *Attempt any five questions out of eight.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Answer following questions :

- a) State any two advantages and any two disadvantages of DBMS. **[4]**
- b) Write a short note on : Database system users. **[4]**
- c) State syntax of SELECT statement of SQL. **[2]**

**Q2)** Answer following questions :

- a) An IT industry is developing several projects on various domains (banking, education, inventory etc.) for many of its clients. Many IT professionals are working on one project and an IT professional can work on many projects.
  - i) Identify the entity sets, their attributes and primary key for each entity set.
  - ii) Identify relationship sets and draw an E-R diagram. **[5]**
- b) Consider the following schema  
Suppliers (Sid, Sname, address)  
Parts (Pid, Pname, Color)  
Catalog (Sid, Pid, Cost)  
Write following queries in relational algebra.
  - i) Find the names of suppliers who supply some red port.
  - ii) Find sid's of suppliers who supply some red or green port. **[5]**

**P.T.O.**

**Q3)** Answer following questions :

- a) Explain any four aggregate functions used in SQL queries. [4]
- b) Write a short note on : Functional dependency. [4]
- c) Define : [2]
  - i) Primary key
  - ii) Foreign key

**Q4)** Answer following questions :

- a) What is group by clause? Explain with example. [4]
- b) What is lossless join decomposition? Explain its importance. [4]
- c) Define : [2]
  - i) Weak entity.
  - ii) Strong entity.

**Q5)** Answer following questions :

- a) Consider the following entities and relationships.  
Company ( Cid, Cproduct, Cname, region, state)  
Branches (b product, city)  
Company and Branches are related with one-to-many relationships. Create a RDB for above in 3NF and solve following queries. [4]
  - i) List all the cities having branch product 'TV' and 'AC'.
  - ii) List all the states whose branch product is 'washing machine'.
- b) Explain Thomas write rule. [4]
- c) State different types of locks. [2]

**Q6)** Answer following questions :

- a) Explain with suitable example types of schedules based on recoverability. [4]

- b) Given the following schedule, state whether it is serializable schedule using precedence graph. [4]

| T <sub>1</sub>          | T <sub>2</sub>                                     | T <sub>3</sub>           |
|-------------------------|----------------------------------------------------|--------------------------|
| Read (A);<br>Write (A); |                                                    | Read (C);<br>Read (B);   |
| Read (B);<br>Write (B); | Read (C);                                          | Write (B);<br>Write (C); |
|                         | Read (B);<br>Write (B);<br>Read (A);<br>Write (A); |                          |

- c) State the lost update problem. [2]

**Q7)** Answer following questions :

- a) What is deadlock state? Explain schemes for deadlock prevention. [4]  
 b) Compare the immediate update and deferred update methods for recovery in terms of case of implementation & overhead costs. [4]  
 c) What is derived attribute? Explain with example. [2]

**Q8)** Answer following questions :

- a) Explain different types of integrity constraints. [4]  
 b) What is logical data independence? Why is it important? [4]  
 c) Define : Referential Integrity. [2]



Total No. of Questions : 5]

SEAT No. :

**P2233**

**[4739] - 301**

[Total No. of Pages : 4

**M.Sc. Tech. (Semester - III)**

**MATHEMATICS**

**Industrial Mathematics with Computer Applications**

**MIM - 301 : Numerical Analysis**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Attempt any eight of the following :

**[16]**

- a) Find the root of the equation  $x^3 - 4x - 9 = 0$ , using bisection method which lies in  $[2,3]$ , correct upto two decimal places.
- b) Explain the concept of adaptive quadrature.
- c) State trapazoidal rule for numerical integration.
- d) What is the condition under which the Jacobian method has a unique solution?
- e) When the system of equations becomes ill-conditioned?
- f) Find the rank of the following matrix

$$\begin{bmatrix} 2 & 4 & 10 \\ 1 & 2 & 5 \\ 9 & -7 & 0 \end{bmatrix}$$

- g) Define (i) absolute error (ii) Relative error
- h) Let  $\lambda, \mu$  be an eigen pair of a matrix  $A$ . If  $\alpha$  is any constant, show that  $\lambda - \alpha, \mu$  is an eigen pair of matrix  $A - \alpha I$ .
- i) State the Runge-kutta formula of order  $n = 2$  to solve an initial value problem.
- j) Define dominant eigenvalue and dominant eigen vector.

**P.T.O.**

**Q2) a)** Attempt any one of the following : **[6]**

- i) Assume that  $f \in C[a, b]$  and that there exists a number  $r \in [a, b]$  such that  $f(r) = 0$ . If  $f(a)$  and  $f(b)$  have opposite signs, and  $\{C_n\}_{n=0}^{\infty}$  represents the sequence of midpoints generated by the bisection process then  $|r - C_n| \leq \frac{b-a}{2^{n+1}}$  for  $n = 0, 1, \dots$ . prove that the sequence  $\{C_n\}_{n=0}^{\infty}$  converges to  $x = r$ , a zero of  $f$ .
- ii) Obtain the Newton-Raphson formula to find the root of the equation  $f(x) = 0$ . show that this method has a quadratic convergence.

**b)** Attempt any two of the following : **[10]**

- i) If  $y(1) = 4, y(3) = 12, y(4) = 19$  and  $y(x) = 7$ , find  $x$  using lagrange interpolating polynomial.
- ii) Given tabulated values of  $\tan(x)$  for  $0.10 \leq x \leq 0.25$ , find  $\tan(0.12)$  using backward interpolation formula.

| x    | tan(x) |
|------|--------|
| 0.10 | 0.1003 |
| 0.15 | 0.1511 |
| 0.20 | 0.2027 |
| 0.25 | 0.2553 |

- iii) Given  $f(x) = \frac{1}{x^2}$ , find divided differences [1 2] and [1 2 3].

**Q3) a)** Attempt any one of the following : **[6]**

- i) Establish Newton's forward interpolation formula.
- ii) Assume that  $f \in C^2[a, b]$  and  $x_0, x_1$  are nodes in  $[a, b]$   $L_1(x)$  is the lagrangian polynomial approximation to  $f(x)$  on  $[a, b]$ , then show that the error term is  $E_1(x) = \frac{(x - x_0)(x - x_1)}{2!} \cdot f^{(2)}(C)$

b) Attempt any Two of the following : [10]

i) Find a real root of the equation  $x = e^{-1}$  with  $x_0 = 1$ , using the Newton-Raphson method.

ii) Evaluate  $I = \int_0^1 \frac{1}{1+x} dx$ , with  $h = 0.25$  using Simpson's 1/3 – rule.

iii) Solve the equations by the method of LU decomposition.

$$2x + 3y + z = 9$$

$$x + 2y + 3z = 6$$

$$3x + y + 2z = 8$$

**Q4)** a) Attempt any one of the following : [6]

i) Derive closed Newton-Cotes formulas for integration.

ii) Discuss Crout's method to find LU decomposition of a given matrix.

b) Attempt any Two of the following : [10]

i) Determine whether the following matrix is ill-conditioned or not.

$$\begin{bmatrix} 25 & 24 & 10 \\ 66 & 78 & 37 \\ 92 & -73 & -80 \end{bmatrix}$$

ii) Solve the system

$$2x + y + z = 10$$

$$3x + 2y + 3z = 18$$

$$x + 4y + 9z = 16$$

by the Gauss-Jordan method.

iii) Using Euler's modified method, find  $y(0.1)$ , given that

$$\frac{dy}{dx} = \frac{y-x}{y+x} \text{ and } y(0) = 1.$$

**Q5) a)** Attempt any one of the following : **[6]**

- i) Discuss the acceleration of convergence of iteration method by using Aitken's method.
- ii) Derive Simpson's 3/8 rule for numerical integration.

**b)** Attempt any Two of the following : **[10]**

- i) Using Householder's method, obtain the tridiagonal form of the matrix

$$\begin{bmatrix} 1 & 3 & 4 \\ 3 & 2 & -1 \\ 4 & -1 & 1 \end{bmatrix}$$

- ii) Use Runge-Kutta fourth order formula to find  $y(0.2)$  for a given equation.

$$y' = \frac{y^2 - x^2}{y^2 + x^2}, \quad y(0) = 1.$$

- iii) Determine the largest eigenvalue and the corresponding eigenvector of the following matrix.

$$\begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$$



Total No. of Questions : 5]

SEAT No. :

**P2235**

**[4739] - 303**

[Total No. of Pages : 2

**M.Sc. Tech. (Semester - III)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 303 : Object Oriented Programming in Java**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*

**Q1)** Attempt any eight of the following :

**[16]**

- a) What is event listener?
- b) Define wrapper class.
- c) What is final class?
- d) What is method overloading?
- e) What is the use of notify all () method?
- f) Comment and justify 'Java is a platform independent language'.
- g) What is byte code.
- h) What are different type of result sets?
- i) What is data hiding?
- j) Which class or package is required to execute SQL queries in Java?

**Q2)** Attempt any four of the following :

**[16]**

- i) Explain any two object oriented concepts in detail.
- ii) Write a note on exception handling.
- iii) Explain scope of variables in a program.
- iv) Explain different visibility modifiers of a class.
- v) What is a package? Explain with example.

**P.T.O.**

**Q3)** Attempt any two of the following : **[16]**

- i) Write a program to accept 'n' numbers from the user and display maximum of those numbers and addition of those numbers.
- ii) Write a program to accept a file name (txt) using command line arguments and display the contents of a file.
- iii) Write a program to accept 2 'm×n' matrices from the user. Generate the output of addition of corresponding elements of two matrices.

**Q4)** Attempt any two of the following : **[16]**

- i) Write a program to define an interface stack and perform the operations
  - a) Push
  - b) Pop
  - c) Isfull
  - d) Isempty on integer data
- ii) Write a program to accept 'n' strings from the user. The strings should not be repeated. Display the length of each string as output. Make use of appropriate collection.
- iii) Design a GUI application to show the names of countries and their capital names. Display the selected country name and its capital name.

**Q5)** Attempt any four of the following : **[16]**

- i) Write a note on delegation event model.
- ii) What is JDBC driver? Explain any two in detail.
- iii) Write different methods available in FILE class. Explain any two of them.
- iv) Write a note on inheritance.
- v) Explain the use of JFrame and JPanel containers with example.



Total No. of Questions : 5]

SEAT No. :

**P2236**

**[4739] - 304**

[Total No. of Pages : 3

**M.Sc. Tech. (Semester - III)**

**COMPUTER SCIENCE**

**Industrial Mathematics with Computer Applications**

**MIM - 304 : Operating Systems**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Attempt any eight of the following :

**[8 × 2 = 16]**

- a) State the activities performed by operating system in connection with memory management.
- b) Discuss the function of any four file types.
- c) What is dispatcher? Explain the functions of dispatcher.
- d) State the sequence of operations, a process may utilize a resource under normal mode of operation.
- e) Define the terms : User thread and kernel thread.
- f) What is race condition? How to guard against race condition?
- g) Discuss the role of page table and secondary memory to support demand paging.
- h) State the basic functions of hardware clocks and timers.
- i) Discuss the implementation of LRU using counter method.
- j) State the drawbacks of two-level directory structure.

**P.T.O.**

**Q2) a)** Attempt any one of the following : **[1 × 6 = 6]**

- i) Explain resource allocation, Accounting and protection services provided by operating system.
- ii) Write a note on linked list approach to free space management.

**b)** Attempt any two of the following : **[2 × 5 = 10]**

- i) Write a note on PCB.
- ii) What is resource allocation graph? How to convert resource allocation graph into wait - for - graph.
- iii) Write a note on thread cancellation.

**Q3)** Attempt any four of the following : **[4 × 4 = 16]**

- a) Write a note on Readers writers problem.
- b) Explain the concept of belady's anomaly with example.
- c) Write a note on caching.
- d) Explain file management, status information, file modification and communications categories of system programs.
- e) Write a note on sequential access method.

**Q4)** Attempt any four of the following : **[4 × 4 = 16]**

- a) Consider the following snapshot of a system

| Job            | Arrival Time | CPU Burst |
|----------------|--------------|-----------|
| J <sub>1</sub> | 1.5          | 5         |
| J <sub>2</sub> | 0            | 1         |
| J <sub>3</sub> | 3            | 4         |
| J <sub>4</sub> | 2            | 3         |

Compute average turn around time and waiting time using SJF (non-preemptive and FCFS method).

- b) Explain different data structures of banker's algorithm with example.
- c) Write a note on semaphores.
- d) Explain many - to - many and one - to one threading model.
- e) Write a note on protection in paging.

**Q5)** Attempt any four of the following :

**[4 × 4 = 16]**

- a) Explain different registers of an I/O port.
- b) What is file? Discuss classifications of users in connection with each file.
- c) Consider the following segment table

| Segment | Base | Length |
|---------|------|--------|
| 0       | 200  | 600    |
| 1       | 2300 | 14     |
| 2       | 90   | 100    |
| 3       | 1327 | 580    |

What are the physical addresses for the following logical addresses?

- i) 0,500                      ii) 1,20
- iii) 3,400                    iv) 2,112
- d) Explain queueing diagram representation of process scheduling.
- e) Discuss the different issues need to be addressed, if preemption is required to deal with deadlocks.



Total No. of Questions : 5]

SEAT No. :

P2237

[4739] - 305

[Total No. of Pages : 3

M.Sc. Tech. (Semester - III)

INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS

MIM - 305 : Theoretical Computer Science

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

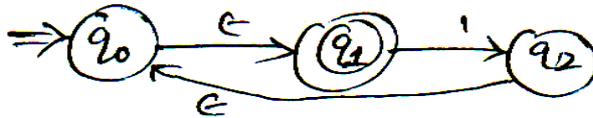
Instructions to the candidates:

- 1) All questions are compulsory and carry equal marks.
- 2) Write your assumptions clearly, if any.
- 3) Figures to right indicate full marks.

Q1) Attempt any eight of the following :

[16]

- a) State the relationship between  $a^+$  and  $a^*$ .
- b) Compare a DFA with NFA.
- c) Compute e - closure for each state of following NFA



- d) Write regular expression to accept all strings beginning with 1 and ending with 00 over alphabet  $\{0,1\}$ .
- e) If language  $L = \{E\}$  the  $L$  is empty language. State if this statement is true or false. Why?
- f) Compute set of nullable symbols  $N$  for the following grammar  
$$S \rightarrow AB|a|b \quad A \rightarrow aB/\epsilon \quad B \rightarrow bA/\epsilon$$
- g) Every context free grammar is regular. State if this statement is true or false. Why?
- h) Define a push down Automata.
- i) State the pumping lemma for context free languages.
- j) Define IDS of a turing machine.

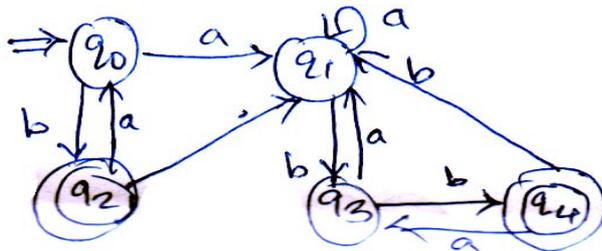
P.T.O.

**Q2)** Attempt any four of the following : **[16]**

- a) Construct a DFA to accept all strings with even number of 0's and even number of 1's over alphabet  $\{0,1\}$ .
- b) Define ambiguous grammar. Give one example of ambiguous grammar.
- c) Convert NFA  $M = (C, \{q_0, q_1\}, \{0,1\}, \delta, q_0, \{q_1\})$  to equivalent DFA where  $\delta(q_0,0) = \{q_0, q_1\}$   $\delta(q_0,1) = \{q_1\}$   $\delta(q_1,0) = \emptyset$   $\delta(q_1,1) = \{q_0, q_1\}$
- d) Prove that language  $L = \{a^n b^n c^n / n \geq 0\}$  is not regular using pumping lemma.
- e) Explain chomsky hierarchy with suitable diagram.

**Q3)** Attempt any four of the following : **[16]**

- a) Minimize following DFA



- b) Define universal turing machine.
- c) Construct a PDA to accept language  $L = \{0^n 1^n / n > 0\}$  over alphabet  $\{0,1\}$ .
- d) Construct a moore and mealy machine to obtain 1's complement of a binary number.
- e) Is  $(a+b)^* = a^* + b^*$ . Why?

**Q4)** Attempt any four of the following : **[16]**

- a) Construct a turing machine to accept all strings with odd number of a's over alphabet  $\{a,b\}$ .
- b) Simplify following grammar  
 $S \rightarrow AB$   $A \rightarrow a$   $B \rightarrow C/b$   $C \rightarrow D$   $D \rightarrow a$

- c) Construct a NFA for regular expression  $ab^*$ .
- d) State characteristics of a derivation tree.
- e) Write a note on multitape turing machine.

**Q5)** Attempt any four of the following :

**[16]**

- a) Convert following grammar to chomsky normal form.  
 $S \rightarrow aAD \quad A \rightarrow aB/bAB \quad B \rightarrow b \quad D \rightarrow d$
- b) Context free languages are closed under union. Is this statement true or false? Why?
- c) Construct a context free grammar to accept all strings with equal number of a's and b's.
- d) i) There is exactly one final state to accept the strings for a moore machine. Is this statement true? Why?  
 ii) There is no final state to accept the strings for a push down automata accepting strings with empty stack. Is this statement true? Why?
- e) Convent a context free grammar containing production  $S \rightarrow as/a$  to equivalent PDA.



**P2218**

**[4739] - 4001**

**M.Sc. Tech.**

**(Mathematics)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 401 : Ordinary Differential Equations**

**(2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) *Attempt any five questions.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Attempt each of the following :

- a) Find the solution of  $y'' - y' - 2y = 0$  that satisfies  $y(0) = 0$  and  $y'(0) = 1$ . [4]
- b) Find the orthogonal trajectories to the family of curves  $x^2 + y^2 = C$ . [4]
- c) Are the two solutions  $y_1(x) = e^x$  and  $y_2(x) = e^{-2x}$  of the equation  $y'' + y' - 2y = 0$  linearly independent? Justify. [2]

**Q2)** Attempt each of the following :

- a) If  $y_1(x) = x$  is one solution of the equation  $x^2y'' + xy' - y' = 0$ , then find the another solution  $y_2(x)$  and the general solution. [4]
- b) Show that the zeros of the function  $a \sin x + b \cos x$  and  $c \sin x + d \cos x$  are distinct and occur alternately whenever  $ad - bc \neq 0$ . [4]
- c) Solve  $x^2y'' + 2xy' - 2y = 0$ . [2]

**Q3)** Attempt each of the following :

- a) Verify that  $x = 0$  is an ordinary point of the differential equation  $y'' + xy' + y = 0$ . Also find power series solution about  $x = 0$ . [4]
- b) Find the regular singular points of the differential equation  $x^3(x-1)y'' - 2(x-1)y' + 3xy = 0$ . [4]
- c) Show that the series  $y = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$  satisfies  $y'' = -y$ . [2]

**P.T.O.**

**Q4)** Attempt each of the following :

- a) Find the general solution of the system :

$$\frac{dx}{dt} = 3x - 4y$$

$$\frac{dy}{dt} = x - y. \quad [4]$$

- b) Let  $y(x)$  be a non-trivial solution of the equation  $y'' + q^{(x)}y = 0$  on a closed interval  $[a, b]$ . Prove that  $y(x)$  has at most a finite number of zeros in this interval. [4]
- c) Write an equivalent system of first order equations for the equation  $y'' - x^2y' - xy = 0$ . [2]

**Q5)** Attempt each of the following :

- a) Find the normal form of Bessel's equation  $x^2y''' + xy' + (x^2 - p^2)y = 0$  and use it to show that every nontrivial solution has infinitely many positive zeros. [4]
- b) Find the indicial equation of the differential equation  $2x^2y''' + x(2x + 1)y' - y = 0$ . [4]
- c) Write Volterra's Prey - Predator equations. [2]

**Q6)** Attempt each of the following :

- a) Solve the differential equation  $y' = y$  with  $y(0) = 1$ , using Picard's method of successive approximation, starting with  $y_0(x) = 1$ . [4]
- b) Determine the nature and stability properties of the critical points  $(0, 0)$  for the linear autonomous system :

$$\frac{dx}{dt} = -x - 2y$$

$$\frac{dy}{dt} = 4x - 5y. \quad [4]$$

- c) State Picard's theorem. [2]

**Q7)** Attempt each of the following :

- a) Explain the method of variation of parameters to find a particular solution of the non-homogeneous equation  $y'' + P(x)y' + Q(x)y = R(x)$ . [5]
- b) State and prove Sturm's comparison theorem. [5]

**Q8)** Attempt each of the following :

- a) For the following system :

$$\begin{cases} \frac{dx}{dt} = -y \\ \frac{dy}{dt} = x \end{cases}$$

Find

- i) The critical point.
- ii) The differential equation of the paths.
- iii) Solve this equation to find the paths. [5]
- b) Find the general solution of the differential equation  $y'' - y' - 6y = 20e^{-2x}$ , using method of undetermined coefficients. [5]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 3

**P2219**

**[4739] - 4002**

**M.Sc. Tech. (Semester - IV)**

**MATHEMATICS**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 402 : Coding Theory**

**(2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) *Attempt any five questions.*
- 2) *Figures to the right indicate full marks.*

**Q1) a)** Find a generator matrix and a parity check matrix for the binary linear code

$C = \langle S \rangle$  where

$S = \{11101, 10110, 01011, 11010\}$  **[5]**

b) Let  $n, k, d$  be integers satisfying  $2 \leq d \leq n$  and  $1 \leq k \leq n$ .

If  $\sum_{i=0}^{n-2} \binom{n-1}{i} (q-1)^i < q^{n-k}$ , Prove that there exists an  $[n, k]$  linear code over  $Fq$  with minimum distance at least  $d$ . **[5]**

**Q2) a)** Let  $\pi$  be a linear map defined by

$\pi : Fq^n \rightarrow Fq[x] / (x^n - 1)$  as

$\pi(a_0, a_1, \dots, a_{n-1}) = a_0 + a_1x + \dots + a_{n-1}x^{n-1}$

Prove that a non empty subset  $C$  of  $Fq^n$  is a cyclic code if and only if  $\pi(c)$  is an ideal of  $Fq[x] / (x^n - 1)$ . **[5]**

b) Write down the standard array for the binary linear code  $C = \{0000, 1011, 0101, 1110\}$ . Decode the word  $W = 1101$  using nearest neighbour decoding principle. **[5]**

**Q3) a)** Define primitive BCH code. Write down the steps for determining the generator polynomial of a  $t$ -error correcting BCH code. **[5]**

b) What is maximum likelihood decoding? Explain. **[3]**

**P.T.O.**

- c) Define : Hamming distance  
 Let  $A = \{0, 1, 2, 3, 4\}$   
 Let  $x = 1234, y = 1423, z = 3214$   
 Find  $d(x, y), d(y, z), d(z, x)$ . [2]

**Q4) a)** Discuss concept of source coding and channel coding. What are goals of channel coding? [4]

b) Let  $C = \{000, 011\}$  be a binary code. Construct IMLD (in complete maximum likelihood decoding) table for C. [4]

c) Define : Distance of a code. Let  $C = \{00000, 00111, 11111\}$  be a binary code. What is distance of a code? [2]

**Q5) a)** Define q – ary Reed solomon code. (RS code) What is generator matrix G and parity check matrix H for 7 - ary RS code of length 6 with generator polynomial  $g(x) = 6 + x + 3x^2 + x^3$ . [5]

b) Let  $S = \{0100, 0101\}$  Find  $S^\perp$ , orthogonal complement of S. [3]

c) Define (1) Information rate of a code C. (2) an (n, m) code. [2]

**Q6) a)** Consider a Hamming code of length 7 with a parity check matrix

$$H = \begin{pmatrix} 0 & 0 & 0 & 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 1 & 0 & 1 \end{pmatrix}$$

Construct a syndrome look up table. Hence use it to decode  $W = 1001001$ . [4]

b) Discuss the main coding theory problem. [4]

c) Let C be an  $[n, k, d]$  linear code and H be a parity check matrix for C. Let  $u, v \in Fq^n$ . Prove that  $S(u + v) = S(u) + S(v)$ . [2]

- Q7)** a) Consider the binary  $[7, 4]$  cyclic code with generator polynomial  $g(x) = 1 + x^2 + x^3$ . Find the generator matrix  $G$ . Convert generator matrix  $G$  in standard form. [5]
- b) Prove that a linear code  $C$  is an  $l$  burst-error-Correcting code if and only if all the burst errors of length  $l$  or less lie in distinct cosets of  $C$ . [3]
- c) Define : Binary symmetric channel. [2]
- Q8)** a) Define equivalent codes show that code  $C = \{0000, 0101, 0010, 0111\}$  is equivalent to the code  $C' = \{0000, 1100, 0001, 1101\}$ . [4]
- b) Write down decoding procedure of  $q$  - ary Hamming code. [4]
- c) Define Reciprocal polynomial what is reciprocal of  $h(x) = 1 + 2x + 3x^5 + x^7$  in  $F_5[x]$ . [2]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages :2

**P2220**

**[4739] - 4003**

**M.Sc. Tech (Semester - IV)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 403 : Computer Networks**

**(2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) *Attempt any five questions.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Attempt the following :

- a) Explain the concepts piconet and scarnet. **[4]**
- b) Explain any two layers from OSI reference model. **[4]**
- c) Define the following : **[2]**
  - i) Bit rate
  - ii) Bit length

**Q2)** Attempt the following :

- a) Write a note on unguided media. **[4]**
- b) Explain the following controlled access methods for multiple channel access. **[4]**
  - i) Reservation
  - ii) Polling
- c) Find the class of the following addresses : **[2]**
  - i) 0000001 00001011 00001011 11101111
  - ii) 252.5.15.11

**Q3)** Attempt the following :

- a) Explain different fields from TCP header. **[4]**
- b) Write a note on stop-and-wait data link protocol. **[4]**
- c) State optimality principle for Routing algorithms. **[2]**

**P.T.O.**

**Q4)** Attempt the following :

- a) Explain Ethernet frame structure. [4]
- b) Write a note on persistent and non-persistent methods. [4]
- c) Consider a noiseless channel with a bandwidth of 3000 Hz transmitting a signal with two signal levels calculate maximum bit rate using Nyquist Bit rate formula. [2]

**Q5)** Attempt the following :

- a) Explain following line coding schemes [4]
  - i) Manchester.
  - ii) Differential Manchester.
- b) Explain shortest path Routing algorithm. [4]
- c) What do you mean by DC component? [2]

**Q6)** Attempt the following :

- a) Write a note on ARP. [4]
- b) Write a note on Firewalls. [4]
- c) Calculate Hamming Distance of following coding scheme. [2]  
00000,01011, 10101, 11110

**Q7)** Attempt the following :

- a) Explain CSMA/CD Random Access Method. [5]
- b) Write a note on Remote Procedure Call. [5]

**Q8)** Attempt the following :

- a) Explain TCP/IP Reference model. [5]
- b) Discuss different Network layer issues. [5]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages :2

**P2221**

**[4739] - 4004**

**M.Sc. Tech. (Semester - IV)**

**INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS**

**MIM - 404 : Programming in PHP**

**(2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) *Attempt any five questions of the following.*
- 2) *Figures to the right indicate full marks.*

- Q1)** a) How to define variable in PHP? Explain in detail scope of variables. [5]  
b) Write a short note on cookies. [5]
- Q2)** a) Write a short note on associative arrays. [5]  
b) Write a PHP script to read student Xml file (Roll, S\_Name, S\_class). Print the student details in tabular format. [5]
- Q3)** a) Write the syntax and example for following functions. Briefly explain its purpose. [4]  
i) Similar\_Text ()  
ii) Explode ()  
iii) Strpos ()  
iv) Strstr ()  
b) Write a PHP script to create class employee and its subclasses i) full time ii) Part time. Store the Employee details as (Ename, Working hours, Salary). Display the details of employee earning maximum salary. [4]  
c) State the uses of PHP. [2]
- Q4)** a) Explain the XML document structure. [4]  
b) Explain in detail regular expression. [4]  
c) Distinguish between array-slice and array-splice function. [2]

**P.T.O.**

- Q5)** a) Consider the following relational database.  
 Book (Id, Title, Price, Author)  
 Author (Author, Address Ph.no)  
 Write a PHP script to accept author name from the user and display book details of same author. [4]
- b) Explain different data types available in PHP. [4]
- c) What is response header? [2]
- Q6)** a) Write a PHP script to read the contents of a text file and print the contents of a file. [4]
- b) Write a PHP script to select a color from the list of colors and set the selected color to the same page. [4]
- c) State the difference between GET and POST method. [2]
- Q7)** a) Explain different ways to print strings in PHP. [4]
- b) Write the output of following code and explain. [2]
- ```
< ? PhP
    $ str 1 = 100;
    $ str 2 = "100";
    if ($ str 1 == $ str2)
        echo ("== both equal");
    if ($ str 1 === $ str2)
        echo ("=== both equal in type also");
?>
```
- c) Write any two functions used to work with a directory. [4]
- Q8)** a) Explain any five sorting functions in array. [4]
- b) Explain what \$_REQUEST array contains? [4]
- c) How to get the number of affected rows in the last MYSQL operation as update, delete etc. [2]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages :2

P2222

[4739] - 4005

M.Sc. Tech. (Semester - IV)

INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS

MIM - 405 : Java Programming

(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Attempt any five questions out of the eight questions.*
- 2) *Figures to the right indicate full marks.*

- Q1)** a) Explain Inheritance in Java with suitable examples. [4]
b) Write a note on Garbage collection. [4]
c) What is Encapsulation? [2]
- Q2)** a) Explain method overloading and method overriding with suitable examples. [4]
b) Explain the various access specifiers used in Java. [4]
c) What are command line arguments? [2]
- Q3)** a) Write a note on Interfaces in Java. [4]
b) What is a package? State its use. Explain how to create a package and access classes from it with the help of an example. [4]
c) Define Polymorphism. [2]
- Q4)** a) Write a program to generate a user defined 'NoMatchException' if the string read is not equal to "Mathematics". [4]
b) What is a stream? Explain briefly the different types of streams. [4]
c) Define : [2]
i) event listener.
ii) event source

P.T.O.

- Q5)** a) Explain JDBC (Java Database connectivity) architecture. [4]
b) Write a note on Collections framework in Java. [4]
c) What is the use of keyword 'super'? [2]
- Q6)** a) Explain Exception handling in Java. [4]
b) Create a GUI based program containing List Box, TextBox and Label. List any five book's names in the Listbox. When any name is selected in the Listbox, show it in the TextBox. [4]
c) What is the use of 'final' keyword when used with a class and a method. [2]
- Q7)** a) Read two 2D arrays A and B from the user and store them in ascending order. Write a program to merge them into single array C that contains every item from array A and B, in ascending order. [5]
b) Explain the characteristics of a Constructor and state its type. [5]
- Q8)** a) What is the use of control statements? Explain iteration statements with suitable examples. [5]
b) Write a note on Java Virtual Machine (JVM). [5]



Total No. of Questions : 5]

SEAT No. :

P2238

[Total No. of Pages : 3

[4739] - 401

M.Sc. Tech. (Mathematics) (Semester - IV)
Industrial Mathematics with Computer Applications
MIM - 401 : Topology
(2008 Pattern)

Time : 3 Hours]

[Maximum Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt any eight of the following : **[16]**

- a) Write all the topologies on two element set.
- b) Prove that $(0, 1)$ and $[0, 1]$ are not homeomorphic topological spaces.
- c) Define basis for a topology.
- d) Is the space R_l connected. Justify.
- e) Find the interior of the set
$$A = (0,1) \cup [2,3] \text{ in } R.$$
- f) Define first countable space.
- g) Give an example of a non - Hausdorff space.
- h) State the Tychonoffs Theorem.
- i) Show that arbitrary intersection of open sets need not be open.
- j) Let X be a Hausdorff space and $x \in X$. Show that $\{x\}$ is a closed set in X .

Q2) a) Attempt any one of the following : **[6]**

- i) Show that subspace and product of Hausdorff spaces is Hausdorff.
- ii) Let Y be a subspace of a topological space X and $A \subset Y$. Prove that A is closed in Y if and only if it equals the intersection of a closed set of X with Y .

P.T.O.

- b) Attempt any two of the following : [10]
- i) Show that the function $f : \mathbb{R} \rightarrow \mathbb{R}$ given by $f(x) = 3x + 1$ is a homeomorphism.
 - ii) Prove that the continuous image of a compact space is compact.
 - iii) Let A and B denote subsets of a topological space X . Then prove the following :
 - 1) If $A \subset B$ then $\bar{A} \subset \bar{B}$.
 - 2) $\overline{A \cup B} = \bar{A} \cup \bar{B}$

Q3) a) Attempt any one of the following : [6]

- i) Show that every compact subset of a Hausdorff space is closed.
- ii) State and prove Intermediate value theorem.

b) Attempt any two of the following : [10]

- i) Show by an example that the intersection of two compact spaces need not be compact.
- ii) Show that a topological space X is Hausdorff if and only if $\Delta = \{x \times x \mid x \in X\}$ is closed in $X \times X$
- iii) Let $\{A_n\}$ be a sequence of connected subsets of a topological space X such that $A_n \cap A_{n+1} \neq \emptyset, \forall n \in \mathbb{N}$. Show that $\bigcup_{n=1}^{\infty} A_n$ is connected.

Q4) a) Attempt any one of the following : [6]

- i) Prove that every compact topological space is limit point compact.
- ii) Prove that a subspace of a first countable space is first countable and product of two first countable spaces is first countable.

b) Attempt any two of the following : [10]

- i) Give an example of a connected space which is not locally connected. Justify.
- ii) Suppose that X has a countable basis. Then prove that every open covering of X contains a countable subcollection covering X .
- iii) Show that every second countable space is first countable.

- Q5) a)** Attempt any one of the following **[6]**
- i) Prove that every metrizable space is normal.
 - ii) Prove that every compact Hausdorff space is normal.
- b)** Attempt any two of the following : **[10]**
- i) show that in the finite complement topology of \mathbb{R} , every subset is compact.
 - ii) Show that the set of rationals \mathbb{Q} is not locally compact.
 - iii) Prove that a subspace of a regular space is regular.



Total No. of Questions : 5]

SEAT No. :

P2239

[Total No. of Pages : 2

[4739] - 402

M.Sc. Tech. (Semester - IV)

INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS

MIM - 402 : Computer Networks

(2008 Pattern)

[Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Use of calculator/logarithmic table is allowed.*

Q1) Attempt any eight of the following :

[8 × 2 = 16]

- a) "HTTP is a stateless protocol". Justify.
- b) Define : Data rate and signal rate.
- c) Explain the function of transport layer.
- d) Define Piggybacking. Give its advantage.
- e) Explain single bit error and burst error with suitable example.
- f) State any two characteristics of a sine wave.
- g) What is the Nyquist theorem?
- h) Define Multiplexing.
- i) Explain the fields of UDP packet header.
- j) Give the examples of any two guided media.

Q2) Attempt any four of the following :

[4 × 4 = 16]

- a) Explain channelization with suitable example.
- b) Describe any two methods of framing with example of each.
- c) Write a note on RPC.
- d) What are the different characteristics of line coding?
- e) Write a note on classful addressing.

P.T.O.

Q3) Attempt any four of the following : **[4 × 4 = 16]**

- a) Explain TCP/IP reference model.
- b) Explain with suitable example physical, logical and port addresses.
- c) Describe traditional Ethernet.
- d) Write a note on pole and select method.
- e) What are guided and unguided transmission medium? Explain any one guided transmission medium in brief.

Q4) Attempt any four of the following : **[4 × 4 = 16]**

- a) Differentiate between FDMA and TDMA.
- b) Briefly describe the services provided by the data link layer.
- c) What is congestion control? List out two broad categories of it.
- d) Differentiate between static routing table and dynamic routing table.
- e) What do you mean by pipelining? Explain selective repeat protocol.

Q5) Attempt any four of the following : **[4 × 4 = 16]**

- a) Write a note on distance - Vector routing.
- b) Why Packet-Switching is better than circuit switching? Justify.
- c) Explain in short CSMA/CD protocol. How it is differ from CSMA/CA?
- d) Consider a channel with a 1 MHz bandwidth. The SNR for this channel is 63 ; what is the appropriate bit rate and signal level?
- e) Write a short note on virtual LANs.



Total No. of Questions : 5]

SEAT No. :

P2240

[4739] - 403

[Total No. of Pages : 3

M.Sc. (Tech.) (Semester - IV)

COMPUTER SCIENCE

INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS

MIM - 403 : Web Technology

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) Attempt any eight of the following :

[16]

- a) What is HTML?
- b) Give two advantages of XML.
- c) What is pattern matching in JavaScript?
- d) Define IP address.
- e) What is query string?
- f) State data types in JavaScript.
- g) What is the purpose of % operator in perl.
- h) What is web server?
- i) Give format of comment in HTML.
- j) Define DTD in XML.

Q2) Solve any four of the following :

[16]

- a) Explain concept of hashes with suitable example in perl.
- b) Explain HTTP protocol.
- c) Explain any two string functions in PHP with suitable example.

P.T.O.

- d) What are advantages of servlet over CGI.
- e) Explain various predefined character classes in javascript.

Q3) Attempt any four of the following : **[16]**

- a) Write a program in javascript to read a number and print factorial of it.
- b) Write note on CGI - pm module.
- c) Write short note on servlet life cycle
- d) Explain concept of associative array in pHP.
- e) Write short note on XML processor.

Q4) Attempt any four of the following : **[16]**

- a) Write short note on cookies.
- b) Write program in HTML to create a form with two text box and two button for username and password.
- c) Explain different sorting functions in PHP.
- d) Explain do - while loop of javaScript with suitable example.
- e) What are the meanings of modifiers (+ , * , and ?) that can be used in element declarations.

Q5) Attempt any four of the following : **[16]**

- a) Explain implode and explode functions in PHP.
- b) Write program in perl to implement stack operations.
- c) Explain for - each loop in perl with suitable example.

- d) What is XML - schema? What are the advantages of it over DTD?
- e) Write HTML program to divide a browser window in following ways.

Top - html.	
left-html	right-html
bottom - html	

Create appropriate supporting files.



Total No. of Questions : 5]

SEAT No. :

P2241

[Total No. of Pages : 3

[4739]-404

M.Sc. Tech. (Semester - IV)

INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATION

MIM - 404 : Design & Analysis of Algorithms - 1

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Answer the following :

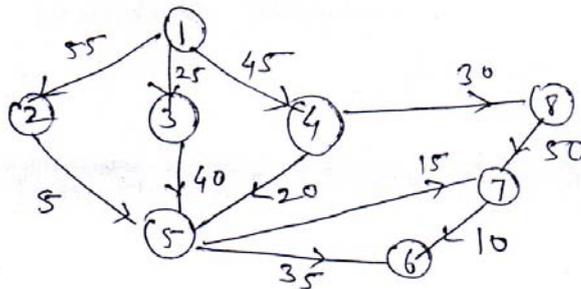
[16]

- a) What do you mean by stable sorting algorithm? Is quick sort a stable sorting algorithm.
- b) Explain term articulation point & bridge.
- c) Define NP complete problem.
- d) Define Ω notation. Is matrix addition $\Omega(n)$.
- e) Define back edge and cross edge.
- f) What is minimum spanning tree?
- g) Write a greedy method control abstraction for subset paradigm.
- h) What is a flow network?

Q2) Attempt any two of the following :

[2 × 8 = 16]

- a) Discuss Floyd-Warshall algorithm for all pairs shortest path for a given weighted directed graph $G = (V, E)$ with n , vertices.
- b) What is the best way to multiply a chain of matrices with dimensions that are 20×10 , 10×30 , 30×40 , 40×5 , 5×15 using dynamic programming.
- c) Explain Dijkstra's algorithm on following graph.

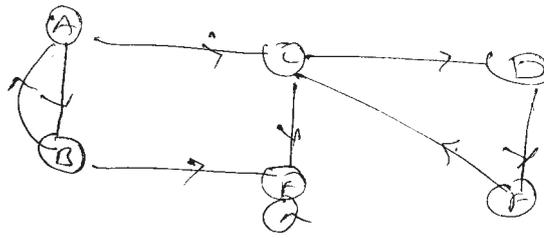


P.T.O.

Q3) Attempt any two of the following :

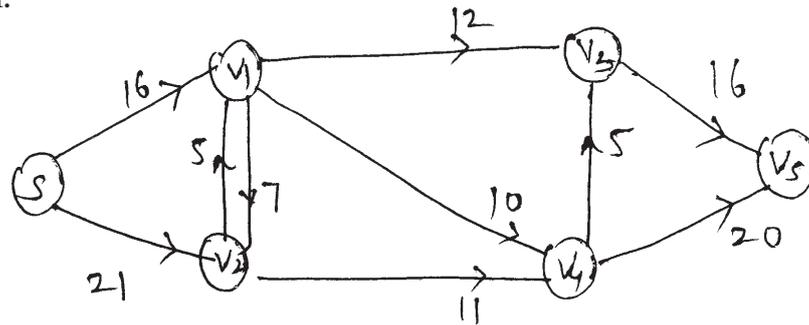
[2 × 8 = 16]

- a) Compute discovery & finish time for depth first traversal of following graph.

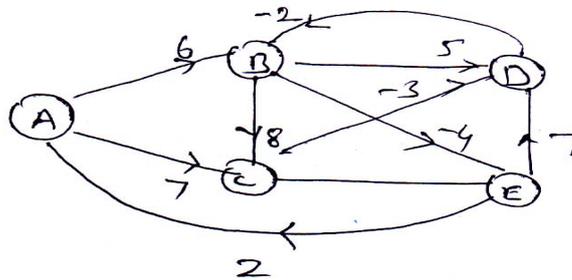


Explain topological sort algorithm.

- b) Calculate maximum flow in the following network using Ford Fulkersons algorithm.



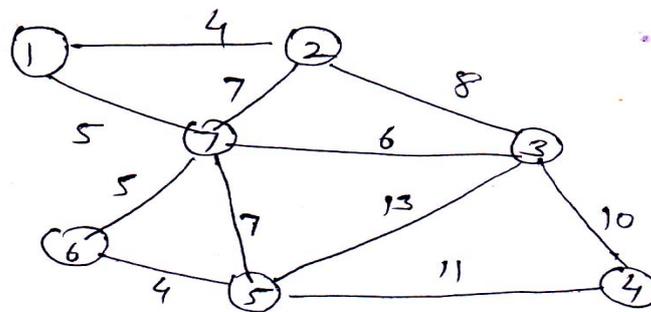
- c) What is a negative weight cycle? Explain Bellman Ford algorithm for calculating shortest path. Apply it on following graph to compute length of shortest path from 'A' to all vertices.



Q4) Attempt any four of the following :

[16]

- a) Find minimum spanning tree for following graph using Kriskal's algorithm.



- b) Merge sort the array
a [1 : 10] =(45, 65, 23, 42, 21, 30, 38, 94, 19, 10)
- c) Find LCS (longest common subsequence) of X & Y.
X = ⟨ A, B, C, B, D, A, B ⟩
Y = ⟨ B, D, C, A, B, A ⟩
- d) What is an optimal Huffman coding for following set of frequencies.
f : 15 e : 9 c : 12 b : 13 d : 16 a : 45
- e) Write note on NP-completeness.

Q5) Attempt any four of the following : [16]

- a) Illustrate the operation of count-sort on the array (2, 5, 3, 0, 2, 3, 0, 3)
- b) Draw the recursion tree for the recurrence $T(n) = T(n/3) + T(2n/3) + cn$.
- c) Write note on activity selection problem.
- d) Explain Radix sort algorithm. What is its time complexity?
- e) Use the substitution method to prove that recurrence $T(n) = T(n - 1) + \theta n$ has solution $T(n) = \theta(n^2)$



Total No. of Questions : 5]

SEAT No. :

P2243

[Total No. of Pages : 4

[4739] - 502

M.Sc.Tech. (Semester - V)

INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS

MIM - 502 : Numerical and Statistical Methods

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of non-programmable, scientific calculator is allowed.*
- 4) *Statistical tables will be provided on request.*

Q1) Attempt any eight of the following:

[8 × 2 = 16]

- a) List the elements of each of the following sample spaces:
 - i) The set of integers between 1 and 50 divisible by 8.
 - ii) A committee of two is selected from a group consisting of 5 people A, B, C, D and E.
- b) Give classical definition of probability.
- c) A coin is tossed twice. What is the probability that at least one head occurs?
- d) Define conditional probability $P(A|B)$.
- e) The probability density function of a continuous random variable X is

$$\text{given by, } f(x) = \frac{x^2}{3}, \quad -1 < x < 2$$
$$= 0, \quad \text{O.W}$$

Calculate $P(X > 1)$

- f) Define Mathematical expectation of a discrete random variable X.
- g) A discrete random variable $X \rightarrow B(n=10, p=0.5)$. State the values of mean and variance of X.
- h) State the pdf of exponential distribution with mean θ .
- i) A discrete random variable X follows Poisson distribution with $\lambda=2$. Find $P(X = 0)$.
- j) State any two properties of regression Co-efficients.

P.T.O.

Q2) Attempt any four of the following:

[4 × 4 = 16]

- a) Define the following terms:
 - i) Sample space.
 - ii) Event.
 - iii) Complement of an event.
 - iv) Mutually exclusive events.
- b) A fair die is rolled once. Let A be the event that even number turns up and let B be the event that a number divisible by 3 occurs. Find,
 - i) $P(A)$.
 - ii) $P(B)$.
 - iii) $P(A \cap B)$.
 - iv) $P(A \cup B)$.
- c) Define independence of two events. If A and B are two independent events on Ω , show that
 - i) A and B^c are independent.
 - ii) A^c and B are independent.
- d) The probability that a regularly scheduled flight departs on time is 0.83, the probability that it arrives on time is 0.82 and the probability that it departs and arrives on time is 0.78. Find the probability that a plane
 - i) arrives on time given that it departed on time.
 - ii) departed on time given that it has arrived on time.
- e) Determine the value of C so that the following function can be treated as a probability distribution of a discrete random variable X:

$$f(x) = C(x^2 + 4), \quad x = 0, 1, 2, 3.$$

Hence find $P(X \leq 2)$.

Q3) Attempt any four of the following:

[4 × 4 = 16]

- a) Define the following for a discrete random variable X:
 - i) Probability mass function.
 - ii) Distribution function.
- b) Probability density function of a continuous random variable X is given by,

$$f(x) = \begin{cases} \frac{1}{2}, & 0 \leq x \leq 2 \\ 0, & \text{o.w} \end{cases}$$

Identify the distribution of X. Also find distribution function of X.

- c) State the pmf of Poisson distribution with parameter λ . State its mean and variance. Also state its additive property.
- d) Let $X_1 \rightarrow B\left(7, \frac{1}{2}\right)$ and $X_2 \rightarrow B\left(8, \frac{1}{2}\right)$. If X_1 and X_2 are independent random variables, find
- $P[(X_1 + X_2) \geq 10]$.
 - $P[X_1 = 5 / (X_1 + X_2 = 10)]$.
- e) Define normal distribution. State any two properties of normal distribution.

Q4) Attempt any four of the following:

[4 x 4 = 16]

- Explain the following terms with suitable examples.
 - Positive correlation.
 - Negative correlation.
- For a bivariate data the equations of two lines of regression are given by, $X - 4Y = 8$ and $X - 16Y = -64$.
Find,
 - \bar{x}, \bar{y} .
 - Correlation co-efficient between X and Y.
- Describe the procedure of fitting a line of regression of Y on X for a bivariate data $\{(x_i, y_i), i=1, 2, \dots, n\}$.
- Given $\bar{x}_1 = \bar{x}_2 = \bar{x}_3 = 0$, $\sigma_1 = 2, \sigma_2 = 3, \sigma_3 = 3$, $\gamma_{12} = 0.7, \gamma_{13} = 0.5$, $\gamma_{23} = 0.5$ obtain the equation of regression plane of X_1 on X_2 and X_3 .
- For a trivariate data, define
 - Partial correlation co-efficient $\gamma_{12.3}$.
 - Multiple correlation Co-efficient $R_{1.23}$.

Q5) Attempt any four of the following:

[4 × 4 = 16]

- a) Describe the test procedure for testing $H_0 : P = P_0$ against $H_1 : P \neq P_0$ for a large sample at α % level of significance.
- b) Explain the following terms:
 - i) Statistic.
 - ii) Critical Region.
 - iii) Null hypothesis.
 - iv) Type I error.

c) Following results were obtained when a die was rolled 180 times:

X	1	2	3	4	5	6
f	28	36	36	30	27	23

Is this a balanced die? (Use $\alpha = 0.01$)

d) To study the influence of attending the classes on the performance of the students in examination, a data was collected on a class of 54 students. The results obtained were summarized in a table given below:

	Pass	Fail
Attended	25	6
Skipped	8	15

At 5% level of significance test whether performance in the class is dependent on attendance.

e) Explain the use of ANOVA technique in one way classification of the data.



Total No. of Questions : 5]

SEAT No. :

P2244

[Total No. of Pages : 4

[4739] - 503

M.Tech. (Semester - V)

INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS

MIM - 503 : Digital Image Processing

(2008 Pattern) (Optional)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of log table/calculator is allowed.

Q1) Attempt any EIGHT of the following:

[8 × 2 = 16]

- a) Define the following terms:
 - i) Illumination.
 - ii) Reflectance.
- b) List the components of a general purpose image processing system.

c) Let $I = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$

be an image of size 5×5 . Let 'p' be a pixel of co-ordinates (3, 3).

Find: i) $N_4(p)$.

ii) $N_D(p)$

- d) Explain Gamma correction in short.

P.T.O.

- e) 'Image cannot be obtained if Histogram is given'. Comment.
- f) Let $V = \{0, 2^0, 2^1, 2^2\}$ be a set of intensity levels for the image

$$I = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 4 & 2 \\ 1 & 2 & 1 \end{bmatrix}.$$

Obtain a smooth image I' after application of averaging filter.

- g) Explain salt and pepper noise.
- h) Define the term Aliasing.
- i) List any four Morphological operations.
- j) State whether the following statement is true or false and Justify your answer:

'If all the pixels in image are shuffled, then there will be a change in Histogram'.

Q2) Attempt any FOUR of the following:

[4 x 4 = 16]

- a) List the fields that use digital image processing and explain any one in brief.
- b) Write a brief note on fundamental steps in Digital Image Processing.
- c) Explain Image acquisition using a single sensor array.
- d) Define the following terms:
- i) 4 - Adjacency.
 - ii) 8 - Adjacency.
- e) List some basic intensity transformation functions and explain the term 'Image Negatives' in brief.

Q3) Attempt any FOUR :

[4 × 4 = 16]

- a) Obtain cropped convoluted image for the image

f : 0 0 0 1 0 0 0 0 and the filter

w : 1 2 3 4 5 using appropriate filters.

zero-padding.

- b) Write a note on Sharpening Spatial Filters.
c) Explain the model of image Degradation/Restoration Process.
d) Draw Histogram for the following 5×5 image I, having intensity levels $[0, L - 1]$ where $L = 2^3$

$$I = \begin{bmatrix} 1 & 1 & 7 & 1 & 1 \\ 2 & 3 & 1 & 1 & 7 \\ 1 & 0 & 1 & 1 & 5 \\ 3 & 4 & 1 & 1 & 1 \\ 0 & 0 & 2 & 1 & 1 \end{bmatrix}.$$

- e) Explain in brief the impulse noise.

Q4) Attempt any FOUR of the following:

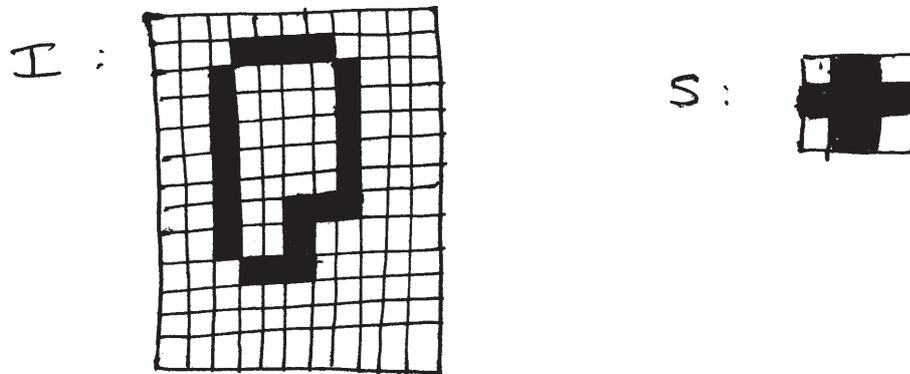
[4 × 4 = 16]

- a) List all the mean filters and explain Harmonic Mean filter in brief.
b) Explain RGB Model of colour image.
c) Define the following terms:
i) Image container.
ii) Compression standards.
d) Discuss the JPEG compression method of digital image file.
e) Explain the role of noise in image thresholding.

Q5) Attempt any TWO of the following:

[2 x 8 = 16]

- a) Write a note on Digital Image Water Marking along with variety of applications.
- b) Explain basic principles of detecting following parts in the images:
 - i) Points.
 - ii) Lines.
 - iii) Edges.
- c) Apply the Hole Fitting Algorithm on the image I and structuring image S.



- d) Explain the method of zooming of an image. Does it increase the information content of an image?



Total No. of Questions : 5]

SEAT No. :

P2245

[Total No. of Pages : 3

[4739] - 504

M.Sc.Tech. (Semester - V)

COMPUTER SCIENCE

Industrial Mathematics with Computer Applications

MIM - 504 : Advanced Operating Systems

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt any Eight of the following:

[8 × 2 = 16]

- a) State the role of process control subsystem.
- b) What is the role of device number and block number field of buffer header?
- c) Write a note on U area.
- d) Explain the role of function parameter used in signal system call.
- e) Discuss the use and syntax of setuid system call.
- f) Explain ioctl () system call with syntax.
- g) Discuss -list, -add options of Chkconfig linux system command.
- h) What do you mean by real user ID and effective user ID?
- i) Explain any two logical sections of a process on the UNIX system.
- j) Write a note on region.

P.T.O.

- Q2) a)** Attempt any one of the following: **[1 × 6 = 6]**
- i) Explain the context layers of a sleeping process.
 - ii) State the several parts of an executable file.
- b)** Attempt any two of the following: **[2 × 5 = 10]**
- i) Write a note on functions of a line discipline.
 - ii) What is demand paging? Explain data structures for demand paging.
 - iii) Explain the structure of buffer header.
-
- Q3) a)** Attempt any one of the following: **[1 × 6 = 6]**
- i) Explain the correspondance between value of pid and sets of processes.
 - ii) Write a note on expansion swap.
- b)** Attempt any two of the following: **[2 × 5 = 10]**
- i) Explain the different operations on Clists and Cblocks.
 - ii) State the role of Valid, Reference, Modify, Copy on write and age bit fields to support demand paging.
 - iii) Explain the third scenario for retrieval of buffer.
-
- Q4) a)** Attempt any one of the following: **[1 × 6 = 6]**
- i) How process space is mapped on to the swap device?
 - ii) Write a note on page stealer process.
- b)** Attempt any two of the following: **[2 × 5 = 10]**
- i) Write a note on controlling process priorities.
 - ii) How Kernel handles the operating system trap?
 - iii) Explain with example race situation for a locked buffer.

Q5) a) Attempt any one of the following: **[1 x 6 = 6]**

i) Write a note on installing packages and verifying an installed packages using rpm command.

ii) Explain different states during page fault.

b) Attempt any two of the following: **[2 x 5 = 10]**

i) How process will respond if the signal is “death of child”?

ii) Write a note on init process.

iii) Explain with diagram relationship between inode table and region table for shared text.

