

Total No. of Questions : 5]

SEAT No. :

**P202**

[Total No. of Pages : 4

[5522]-1

F.Y. B.Sc.

**MATHEMATICS**

**MT - 101 : Algebra and Geometry**

**(Paper -I) (2013 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) Give any three partitions of the set  $\{a, b, c, d\}$ .
- b) Evaluate  $\frac{\phi(10) + \phi(14)}{\phi(8)}$ , where  $\phi$  is Euler's  $\phi$  function.
- c) If  $f(x)$  and  $g(x)$  are two real polynomials of degree 3 and 7 respectively, then find
  - i)  $\deg[f(x).g(x)]$
  - ii)  $\deg[f(x) + g(x)]$
- d) Find rank of the matrix  $A = \begin{bmatrix} 1 & 1 & 2 & 3 & 4 \\ 2 & 2 & 4 & 3 & 4 \\ -3 & -3 & -6 & -9 & -12 \end{bmatrix}$
- e) Define: Consistent system of linear equations.
- f) Find the centre of the conic
$$2x^2 + 2xy + y^2 - 6x - 2y + 4 = 0$$
- g) Find the distance of the point  $(1, 1, 1)$  from the plane  $3x - 6y + 2z + 10 = 0$ .

**P.T.O.**

- h) Find the equation of the line joining the points  $(-2, 1, 3)$  and  $(3, -1, -2)$ .
- i) Find the equation of the smallest sphere through  $(2, -3, 4)$  and  $(-5, 6, -7)$ .
- j) Define : Cone.

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

**[16]**

- a) Show that  $n < 2^n$ , for all positive integers  $n$ .
- b) If  $p$  is prime and  $p|ab$  then prove that  $p|a$  or  $p|b$ . Where  $a$  and  $b$  are integers.
- c) Let  $A = \{a, b, c\}$  be a set. Give an example of a relation which is
  - i) reflexive
  - ii) symmetric but not transitive on  $A$
- d) Use Euclidean algorithm, find the greatest common divisor of  $f(x) = x^4 + 3x^2 + 2$  and  $g(x) = x^3 - x^2 + x - 1$ .
- e) Find all eigen values of the matrix  $A = \begin{bmatrix} 2 & 3 \\ 0 & 4 \end{bmatrix}$ . Also find eigen vector corresponding to least eigen value.
- f) Obtain the value of  $\lambda$  for which the following system of linear equations has no solution.

$$\begin{aligned} x - z &= 3 \\ 2x + y &= 2 \\ y + 2z &= \lambda \end{aligned}$$

**Q3)** Attempt any Two of the following.

**[16]**

- a) i) Using Euclidean algorithm, find the greatest common divisor of 119 and 272. Also find  $x$  and  $y$  such that  $\text{g.c.d.} = 119x + 272y$ .

ii) Verify Cayley Hamilton theorem for the matrix A, also find  $A^{-1}$ .

$$\text{where } A = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$$

b) i) Let  $f(x)$  be a polynomial of degree  $n \geq 1$ . Prove that if  $f(x)$  is divided by  $(x - \alpha)$  then the remainder is  $f(\alpha)$ , where  $\alpha$  is any constant.

ii) Find the quotient and remainder when  $x^3 - 2x^2 + 3x - 7$  is divided by  $x^2 + 2$ .

c) i) Let  $a, b, c, d, x, y$  are integers.

If  $a \equiv b \pmod{n}$  and  $c \equiv d \pmod{n}$  then prove that  $(ax+cy) \equiv (bx+dy) \pmod{n}$ .

ii) Solve the following system of linear equations using Gauss elimination method.

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

$$2x - 3y - z = -3$$

$$x + 2y + z = 4$$

**Q4)** Attempt any Four of the following.

**[16]**

a) The equation  $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$  is transformed into  $a'x'^2 + 2h'x'y' + b'y'^2 + 2g'x' + 2f'y' + c' = 0$  by rotating the axes through an angle  $\theta$  without changing the origin. Then prove that  $a + b = a' + b'$ .

b) Find the equation of the plane passing through the intersection of the planes  $x + y + z = 1$  and  $2x + 3y + 4z = 1$  and the point  $(1, 1, 1)$ .

c) Show that the line  $\frac{x+10}{1} = \frac{8-y}{2} = \frac{z}{1}$  lies in the plane  $x + 2y + 3z = 6$ .

d) Find the co-ordinates of the points where the line  $\frac{x}{2} = \frac{y}{2} = z$  intersect to the sphere  $x^2 + y^2 + z^2 = 1$ .

- e) Find the equation of a cone with vertex at the point  $(3, 1, 2)$  and guiding curve is  $2x^2 + 3y^2 = 1, z = 0$ .
- f) Find the condition that the plane  $lx + my + nz = p$  is tangent plane to the sphere  $x^2 + y^2 + z^2 = r^2$ .

**Q5)** Attempt any Two of the following.

**[16]**

- a) i) Obtain the equation of plane in normal form.
- ii) Show that the lines  $\frac{x-3}{1} = \frac{y-5}{2} = \frac{z-1}{-1}$  and  $\frac{x-4}{2} = \frac{y-2}{-1} = \frac{z-4}{2}$  are coplanar. Find the equation of plane passing through the lines.
- b) i) Show that the plane  $2x - 2y + z + 12 = 0$  touches to the sphere  $x^2 + y^2 + z^2 - 2x - 4y + 2z = 3$ .  
Also find the point of contact.
- ii) Find the equation of a cylinder whose generators are parallel to the line  $\frac{x}{2} = \frac{y}{1} = \frac{z}{3}$  and whose guiding curve is the ellipse  $x^2 + 2y^2 = 1$  and  $z = 0$ .
- c) Reduce the equation  $5x^2 + 6xy + 5y^2 - 10x - 6y - 3 = 0$  to the standard form and name the conic.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**P211**

**[5522]-10**

**F.Y. B.Sc.**

**ZOOLOGY**

**ZY-102: Fundamentals of Cell Biology and Genetics**

**(2013 Pattern) (Theory) (Paper - II)**

*Time : 3 Hours]*

*[Max. Marks :80*

*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)** Define/explain the following:

**[16]**

- a) Nucleoplasm
- b) Ribosome
- c) Gynandromorph
- d) Genotype
- e) Lysosome
- f) Heterochromatin
- g) Dihybrid cross
- h) Holandric genes

**Q2)** Write short notes on (any four):

**[16]**

- a) Prokaryotic cell.
- b) Complementary factor.
- c) Metaphase of mitosis.
- d) Haemophilia.
- e) Sketch and label structure of mitochondria.
- f) Positive eugenics.

**P.T.O.**

**Q3)** Attempt the following (Any four)

**[16]**

- a) What is nuclear stain? Write composition of any one nuclear stain.
- b) Give an account of cytoplasm of eukaryotic cell.
- c) Give the functions of Golgi complex.
- d) Describe haploid - diploid method of sex determination.
- e) Give an account of Albinism in human being.
- f) Find out the possible blood groups of children of the parents with following genotypes:
  - i)  $I^A I^B \times I^A I^A$
  - ii)  $I^B I^O \times I^A I^A$

**Q4)** Attempt the following (Any two):

**[16]**

- a) What is polygenic inheritance? Explain it with reference to the skin colour in human being.
- b) Describe in detail various functions of plasma membrane.
- c) Give an account of structure of chromosome.
- d) Describe the structure and functions of nucleolus.

**Q5)** What is meiosis? Describe in detail the phases of prophase-I and add a note on significance of meiosis.

**[16]**

OR

- a) What is chromosomal aberration? Describe any three structural aberrations of chromosome.
- b) What is sex-linked inheritance? Explain it with reference to haemophilia.

*EEE*

Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**P212**

**[5522]-11**

**F.Y. B.Sc.**

**GEOLOGY**

**Mineralogy, Petrology & Structural Geology**

**(Paper -I) (2013 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 labelled diagrams wherever necessary.*

**Q1)** Answer the following in 2-3 lines.

**[16]**

- a) Define 'streak' of mineral.
- b) Define structural geology.
- c) Define Centre of symmetry in crystals.
- d) What is dip direction.
- e) What is Basalt?
- f) Define Petrology.
- g) Define magma
- h) Describe Schistose structure.

**Q2)** Answer the following questions (Any Four)

**[16]**

- a) Explain Residual bonding in minerals with suitable examples.
- b) Describe Refractory minerals, give examples.
- c) Define fracture. Explain different types of fractures.
- d) Describe Ionosilicate structure with suitable examples.

***P.T.O.***

- e) Give an account of minerals used in cement industry.
- f) Define specific gravity of minerals. Describe the use of pycnometer in determining the specific gravity of minerals.

**Q3)** Answer the following questions (Any Four)

**[16]**

- a) Explain the different kinds of Metamorphism
- b) Give the classification of rocks based on colour index.
- c) Describe Laterite and Bauxite.
- d) Explain Dynamothermal metamorphism with suitable examples.
- e) Describe the textures in sedimentary rocks.
- f) Explain granulose structure.

**Q4)** Answer the following questions (Any Two)

**[16]**

- a) Describe the various optical properties of minerals in plane polarized light.
- b) Give the tabular classification of Igneous rocks.
- c) Define Metamorphism. Give the role of various agents of metamorphism.
- d) Give the various forms present along with the indices of Hexagonal system-Beryl type.

**Q5)** Answer Any One of the following.

**[16]**

- a) Define Fault. Describe the different parts of the fault. Describe Normal and Reverse Fault

OR

- b) Give the elements of symmetry, crystallographic axes, the various forms present (with indices) in Orthorhombic system. Baryte type.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**P213**

**[5522]-12**

**F.Y. B.Sc.**

**GEOLOGY**

**Physical Geology & Palaeontology**

**(Paper -II) (2013 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) *Draw neat labelled diagrams wherever necessary.*

**Q1)** Answer the following in 2-3 lines

**[16]**

- a) List any two radiometric dating methods.
- b) Give two examples of class Anthozoa.
- c) Give the size and shape of the Earth.
- d) What is an Ox-bow lake?
- e) Draw a neat and labelled diagram of a gastropod shell.
- f) Define suture lines.
- g) Name the scales used for measuring intensity and magnitude of earthquake.
- h) What are coprolites?

**Q2)** Answer the following questions (Any Four)

**[16]**

- a) Describe the nebular hypothesis for origin of the solar system.
- b) Give the comparison between Nautilus and Ammonoids
- c) With the help of a diagram describe the types of sand dunes.
- d) Describe the different branches of Palaeontology.

***P.T.O.***

- e) With the help of a diagram, describe fold mountains and relict mountains.
- f) Give the uses of fossils (Any four)

**Q3) Answer the following questions (Any Four) [16]**

- a) Distinguish between Regular and Irregular Echinoids.
- b) What are the different products of volcanoes?
- c) With the help of a diagram, describe the head/cephalon of trilobites.
- d) Explain Cast and Mould.
- e) Describe the interior structure of the earth.
- f) Describe the layers of the atmosphere.

**Q4) Answer the following questions (Any Two) [16]**

- a) What are earthquake? What are its effects? Describe the types of seismic waves generated during an earthquake.
- b) What is a fossil? Give any 5 modes of preservation of fossils for altered remains.
- c) Describe the erosional landforms formed by action of rivers.
- d) Give the systematic position of phylum Brachiopoda. Describe hard part morphology of a Brachiopod.

**Q5) What is the continental drift theory? Give the evidences of the continental drift theory. [16]**

OR

Describe the hard part morphology of a typical lamellibranch shell. Explain the different types of dentation observed in a lamellibranch shell. [16]



Total No. of Questions : 5]

SEAT No. :

**P214**

[Total No. of Pages : 4

[5522]-13

F.Y. B.Sc.

**STATISTICS/STATISTICAL TECHNIQUES**

**Descriptive Statistics**

**(2013 Pattern) (Paper - I)**

*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 statistical table and calculator is allowed.*
- 4) *Symbols have their usual meanings.*

**Q1) A)** Attempt each of the following:

- a) Define the term ratio scale. [1]
- b) Define the term index number. [1]
- c) Define the term correlation. [1]
- d) Write the 4<sup>th</sup> central moment in terms of raw moments. [1]

**B)** Choose the correct alternative for each of the following:

- a) Median is the [1]
  - i) Minimum value
  - ii) Most frequent value
  - iii) Middle most value
  - iv) Maximum value
- b) Mean deviation is minimum about [1]
  - i) Mean
  - ii) Mode
  - iii) Harmonic Mean
  - iv) Median
- c) With three attributes, the total number of ultimate class frequencies are: [1]
  - i) 4
  - ii) 6
  - iii) 8
  - iv) 2

**P.T.O.**

- d) Karl Pearson's coefficient of correlation lies between [1]
- i)  $-1$  to  $1$                                       ii)  $0$  to  $1$
- iii)  $0$  to  $\infty$                                         iv)  $-\infty$  to  $\infty$
- C) a) Write the two demerits of standard deviation. [2]
- b) If  $\bar{x} = 5$  and  $y = 3x + 2$  then find mean of  $y$ . [2]
- c) For a bivariate data  $\bar{x} = 53, \bar{y} = 28$ , by  $x = -1.5$ . Find the equation of line of regression of  $y$  on  $x$ . [2]
- d) Name any two statistical organisations in India. [2]

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

- a) Write a note on stratified sampling. [4]
- b) Prove that  $\text{cov}(x + y, z) = \text{cov}(x, z) + \text{cov}(y, z)$ . [4]
- c) Construct the stem and leaf diagram for the following marks obtained by 40 students in an examination. [4]

05 41 32 44 36 28 19 35 32 11

40 32 16 18 41 33 09 26 08 33

42 30 08 11 00 19 20 32 41 23

05 15 23 41 35 06 33 40 39 32

- d) The mode of the daily expenditure of 100 families is 43.5. The expenditure of these families are given below. [4]

Expenditure	20-30	30-40	40-50	50-60	60-70
Number of families	14	-	27	-	15

Find the missing frequencies.

- e) Show that Bowley's coefficient of skewness  $S_b$  lies between  $-1$  and  $1$ . [4]
- f) Write any two uses of index number with illustration. [4]

**Q3)** Attempt any four of the following:

- a) Given the following information  $\bar{x} = 120.5\text{cm}$ ,  $\bar{y} = 10.37\text{yrs}$ ,  $\sigma_x = 12.7\text{cm}$ ,  $\sigma_y = 2.39\text{yrs}$ , coefficient of correlation between  $x$  and  $y$  is 0.93. Estimate the value of  $y$  for  $x = 100$  cm by fitting appropriate equation of line. **[4]**
- b) Six entries in a ramp walk contest are judge by two judges X & Y and the ranks given by them are **[4]**

Rank by Judge X	6	5	2	1	4	3
Rank by Judge Y	1	3	5	6	2	4

Compute Spearman's rank correlation between ranks given by judges X & Y.

- c) Describe scatter diagram. **[4]**
- d) The first three moments of a certain variable about '1' are 2, 25 and 80. Find the coefficient of skewness  $v$  and interpret the result. **[4]**
- e) Explain the procedure of fitting the curve  $y = a b^x$ . **[4]**
- f) Explain the terms **[4]**
- Class limits
  - Class width
  - Open end class
  - Relative frequency

**Q4)** Attempt any two of the following:

- a) i) Splice the following series of index number by continuing series A forward **[4]**

Year	2012	2013	2014	2015	2016	2017
Series A	100	120	150	-	-	-
Series B	-	-	100	135	170	200

- ii) Show that  $V(X + Y) = V(X - Y)$  when  $X$  and  $Y$  are uncorrelated. **[4]**

- b) i) Explain the term skewness using suitable diagrams and state measure of skewness by Karl Pearson's. [4]
- ii) If  $(A) = (B) = \frac{N}{2}$  show that  $(AB) = (\alpha\beta)$ . [4]
- c) i) Show that  $\beta_2 \geq 1$ . [4]
- ii) Find coefficient of correlation from the following information [4]
- $n = 10, \Sigma(x - 30) = 11, \Sigma(y - 25) = 7, \Sigma(x - 30)^2 = 215,$   
 $\Sigma(y - 25)^2 = 163, \Sigma(x - 30)(y - 25) = 186$
- d) i) Suppose  $X = \text{year}$ ,  $Y = \text{population in the } x^{\text{th}} \text{ year}$ ,  $u = x - 3$ ,  
 $\Sigma y = 166, \Sigma u^2 = 10, \Sigma u^4 = 34, \Sigma uy = 53, \Sigma u^2 y = 341$ . Fit a second degree curve  $y = a + bx + cx^2$ . [6]
- ii) Define the terms [2]
- 1) Dichotomy
  - 2) Positive Attribute

**Q5)** Attempt any one of the following:

- a) i) Explain the procedure of fitting the line of regression  $y = a + bx$ , by least square method. [8]
- ii) Write the comparison between Laspeyre's and Paasche's Index number. [4]
- iii) If  $N = 100$ ,  $(A) = 50$ ,  $(B) = 75$ , then show that  $25 \leq (AB) \leq 50$ . [4]
- b) i) Karl Pearson's coefficient of correlation between  $X$  &  $Y$  obtained from 10 pairs of items is 0.5. Means of  $X$  &  $Y$  are 12 & 15 respectively. Standard deviations of  $X$  &  $Y$  are 3 and 4 respectively. While checking it was noticed that one of the item was wrongly entered as 16 instead of 26 for  $X$  series and as 9 instead of 18 for  $Y$  series. Calculate correct coefficient of correlation. [8]
- ii) Define Spearman's rank correlation coefficient and derive an expression for it when ties not occur. [8]

*EEE*

Total No. of Questions : 5]

SEAT No. :

**P215**

[Total No. of Pages : 5

[5522] - 14

**F. Y. B. Sc (Regular)**

**STATISTICS**

**Discrete Probability and Probability Distributions**

**(2013 Pattern) (Paper - 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) *Use of statistical table and calculator is allowed.*
- 4) *Symbols have their usual meanings.*

**Q1)** Attempt each of the following:

a) i) Define sample space. [1]

ii) If  $P(A) = 0.6$ ,  $P(B) = 0.5$ ,  $P(A \cap B) = 0.3$  compute  $P(A' \cap B')$  [1]

iii) Give one real life situation where poisson distribution can be applied. [1]

iv) If  $(x,y)$  is bivariate discrete random variable with  $\rho(x,y) = 1$  then

find  $\rho\left(\frac{X+5}{2}, \frac{6-Y}{7}\right)$  [1]

b) Choose correct alternative for each of the following: [1 each]

i) If A and B are two events with  $P(A) = 0.8$ ,  $P(B) = 0.7$  and  $P(A \cap B) = 0.6$  then  $p(A/B)$  is

A] 6/7

B] 6/8

C] 7/8

D] 9/10

**P.T.O.**

ii) If  $X \sim B(n, p)$  then

A]  $E(X) \geq \text{var}(X)$

B]  $E(X) < \text{var}(X)$

C]  $E(X) \leq \text{var}(X)$

D]  $E(X) > \text{var}(X)$

iii) Let  $X$  be a random variable with variance  $g$ , then variance of

$\left(\frac{X-4}{5}\right)$  is

A]  $\frac{3}{5}$

B]  $\frac{9}{25}$

C]  $\frac{1}{5}$

D]  $\frac{4}{5}$

iv) If  $(X, Y)$  is a discrete bivariate r. v. then  $E(x+y)$  is

A]  $E(X) + E(y)$

B]  $E(X)$

C]  $E(Y)$

D]  $E(X) * E(Y)$

c) i) Define probability mass function (p. m. f.) of a discrete r. v. [2]

ii) If  $X \sim B(10, Y_2)$  then find mode of  $X$ . [2]

iii) State axioms of probability [2]

iv) If  $X \sim \text{Geometric}(p)$  such that  $E(X) = 25$  and  $\text{var}(X) = 150$  then find  $P$ . [2]

**Q2)** Attempt any four of the following.

**[4 each]**

a) Explain the following term with an illustration: Mutually exclusive events.

b) Give the classical definition of probability state its limitations.



- c) Let  $X$  be a discrete r. v with probability distribution given below:

X	0	1	2	3
P(x)	0.2	0.4	0.3	0.1

- Find:    i)     $P(X \text{ is even})$   
          ii)    Median of  $x$
- d) Define geometric distribution. Find its mean.
- e) Consider the following sample space  
 $\Omega = \{1, 2, 3, 4, 5, 6, 7, 8\}$   
Write down following events
- i)    A: An even number appears  
ii)    B: Number greater than 3 appears  
iii)    A and B both occurs simultaneously.  
iv)    None of A and B occurs.
- f) Define Bernoulli distribution. Also show that all raw moments of Bernoulli distribution are same.

**Q3)** Attempt any four of the following.

**[4 each]**

- a) State and prove additive property of poisson distribution.
- b) A pair of fair dice is thrown. If the two numbers appearing on the top face are different, find the probability that the sum of numbers on the top face is
- i)    4  
ii)    at the most 4
- c) If  $X \sim \text{poisson}(m)$  such that  $p(X = 0) = \frac{1}{2}$ . Find  $E(X)$  and  $\text{var}(X)$

- d) A fair coin is tossed 3 times.  
A person receives Rs.  $X^2$ , if he gets  $X$  number of heads in all.  
Find his expected gain.
- e) obtain mean and variance of discrete uniform distribution.
- f) Define conditional expectation and conditional variance of  $X$  given  $Y=y$  for bivariate r. v.  $(X,Y)$

**Q4)** Attempt any two of the following.

- a) i) State and prove Bayes theorem [6]  
ii) Define m. g. f. of r. v.  $x$ .  
If  $M_x(t) = (0.2 + 0.8 e^t)^{15}$  then identify the probability distribution of  $X$  [2]
- b) i) Define Hypergeometric distribution. Also obtain its mean [6]  
ii) Explain with an illustration what is meant by Bernoulli trial [2]
- c) Let  $X$  and  $Y$  be two independent binomial random variables with parameters  $(n_1 = 8, p = 0.5)$  and  $(n_2 = 10, p = 0.5)$  respectively  
Find: i)  $p(X+Y=4)$   
ii)  $p(X=2 / X+Y=5)$   
iii)  $p(Y=4 / X+Y=7)$  [2+3+3]
- d) i) Let  $(x,y)$  be bivariate discrete r.v. with joint probability distribution.

$X \backslash Y$	0	1	2
-1	0	0.1	0.1
0	0.1	0.2	0.1
1	0.2	0.1	0.1

- Find: 1)  $P(X \geq y)$   
2)  $P(X \geq 0)$   
3)  $P(Y \text{ is even})$   
4)  $p(X = \frac{2}{X} = 0)$   
5) Marginal probability distribution of  $X$  [5]
- ii) If  $X$  is a discrete r.v. with  $M_x(t) = e^{t^2/2}$  Find first two raw moments of  $X$ . [3]

**Q5)** Attempt any one of the following.

a) i) Let  $X$  be discrete r. V. with following probability distribution.

X	-1	0	1	2
p(x)	0.1	0.2	0.3	0.4

- 1) Obtain c.d.f of  $X$
- 2) Draw a graph of c.d.f. [5]

ii) Let  $A, B, C$ . be three events defined on a sample space  $\Omega$  such they form partition of  $\Omega$ .

If  $2P(A) = 3P(B) = P(C)$ , find  $P(A \cup B)$ . [3]

iii) A discrete bivariate r.v.  $(x,y)$  has joint probability distribution given as below:

X\Y	1	2	3
0	$\frac{1}{4}$	0	$\frac{1}{4}$
1	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{4}$

Find corr  $(x,y)$

[8]

b) i) Let  $x$  be discrete r.V. is given below

X	-1	0	1
P(x)	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$

Find first three central moments of  $X$ . Also comment on the nature of the distribution of  $X$ . [8]

ii) Obtain m. g. f. of  $G(p)$  [4]

iii) A parcel of 12 books contains 4 books with loose binding. What is the probability that a random selection of 6 books (without replacement) will contain 3 books with loose binding? [4]



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**P216**

**[5522]-15**

**F.Y. B.Sc.**

**GEOGRAPHY – I**

**Gg - 110 : Geomorphology  
(Paper -I) (2013 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 diagrams wherever necessary.*
- 4) *Use of map stensils is allowed.*

**Q1)** Answer the following in twenty words (any eight)

**[16]**

- a) Define Physical Geography.
- b) What is meant by paleozoic era?
- c) What are primary earth quake waves?
- d) What are slow crustal movements?
- e) Name any two types of folds.
- f) Name any two types of metamorphic rocks.
- g) What is Biological weathering?
- h) Name any two mass movements?
- i) What is a mushroom rock?
- j) What are moraines?

**Q2)** Explain the following in Fifty words (any four)

**[16]**

- a) Nature of Geomorphology.
- b) Theory of Isostasy.

***P.T.O.***

- c) Two Type of volcanoes.
- d) Charecteristics of Igneous rocks.
- e) Difference between rocks and minerals
- f) Mechanism of wind erosion.

**Q3)** Answer the following in 150 words (Any four) **[16]**

- a) What is the Geological Time scale?
- b) Explain the elements of folds.
- c) Describe the effects of earth quakes.
- d) Discuss the classification of sedimentary rocks.
- e) Explain the types of Mass Movements.
- f) Describe the erosional lanforms of sea waves.

**Q4)** Answer the following in 300 words (Any two) **[16]**

- a) Explain the landforms associated with faults.
- b) Discuss the causes of earth quakes.
- c) Define weathering. Explain physical weathering in detail.
- d) Discuss major glacial erosional features.

**Q5)** Answer the following in 500 words (Any one) **[16]**

- a) Discuss the wegners theory of continental Drift in detail.
- b) With the help of suitable diagrams, explain the Davisian cycle of erosion in detail.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**P217**

**[5522]-16**

**F.Y. B.Sc.**

**GEOGRAPHY - II**

**Gg- 120: Climatology and Oceanography  
(2013 Pattern) (Paper - II)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat diagrams wherever necessary.*
- 4) *Use of map stencils is allowed.*

**Q1)** Answer the following in twenty words (Any Eight):

**[16]**

- a) What do you mean by weather?
- b) What is atmosphere?
- c) What do you mean by heat budget?
- d) Define lapse rate.
- e) What do you mean by monsoon winds?
- f) Define Oceanography.
- g) What is submergence of coast?
- h) Give any two examples of partially enclosed seas.
- i) What do you mean by wavelength?
- j) What do you mean by spring tides?

**P.T.O.**

**Q2) Explain the following in 50 words (Any Four):** **[16]**

- a) Nature of climatology.
- b) Inversion of temperature.
- c) Middle altitude clouds.
- d) Scope of Oceanography.
- e) Ria coasts.
- f) Tsunamis.

**Q3) Answer the following in 150 words (Any Four):** **[16]**

- a) Explain the composition of earth atmosphere.
- b) Describe the causes of global warming.
- c) Explain the land and sea breezes with suitable diagrams.
- d) Describe the submarine relief features of Atlantic Ocean.
- e) Describe the Dalmation type of coast.
- f) Describe the effects of ocean currents.

**Q4) Answer the following in 300 words (Any Two):** **[16]**

- a) Discuss the hydrological cycle with a suitable diagram.
- b) Explain the forms of precipitation.
- c) Describe the importance of Oceanography during the modern times.
- d) Describe the ocean currents in the Indian Ocean.

**Q5) Answer the following in 500 words (Any One):** **[16]**

- a) What are planetary winds? Explain planetary winds with the help of a suitable diagram.
- b) What are ocean currents? Describe the causes of ocean currents.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**P218**

**[5522]-17**

**F.Y. B.Sc.**

**MICROBIOLOGY**

**Introduction to Microbiology**

**(Paper -I) (2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :80*

*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)** Answer the following.

**[16]**

- a) Write names of any two monosaccharides.
- b) What are animalcules.
- c) Name any two diseases caused by bacteria.
- d) Define : Redox potential.
- e) Draw the structure of Adenine and cytosine.
- f) State True or False.
  - i) Proteins are polymers of aminoacids.
  - ii) Prions are low molecular weight RNA molecules.
- g) Fill in the blanks.
  - i) Complete virus particle is called as \_\_\_\_\_
    - 1) Viroid
    - 2) Virion
    - 3) Prion
    - 4) All of the above.
  - ii) Yeasts are \_\_\_\_\_ fungi, and Molds are \_\_\_\_\_ fungi.
    - 1) Unicellular, Unicellular
    - 2) Unicellular, Multicellular
    - 3) Multicellular, Unicellular
    - 4) Multicellular, Multicellular
- h) Write any two functions of bacterial capsule.

***P.T.O.***



**Q2) Write short notes on Any Four. [16]**

- a) Antoni Van Leeuwenhoek.
- b) Morphological characters of bacteria.
- c) Louis Pasteurs experiment to prove theory of biogenesis.
- d) Non covalent bonds.
- e) Types of RNA.
- f) Functions of fimbriae.

**Q3) Answer the following Any Four [16]**

- a) Explain the developments in vaccination.
- b) Write the morphological & differentiating characters of protozoa.
- c) Explain the principles in classification of viruses as per ICTV.
- d) Define pH. Add a note on buffers.
- e) Explain in detail the structure and function of Ribosomes.
- f) Draw a neat labelled diagram of Antibody.

**Q4) Answer the following Any Two. [16]**

- a) Write the morphological & differentiating characters of Algae. Add a note on their Economic importance.
- b) What are biofertilizers? Explain any two types of biofertilizers with examples.
- c) Discuss the developments in microscopy.
- d) What are biomolecules? Write a note on lipids.

**Q5) Answer Any One of the following. [16]**

- a) With a neat labeled diagram explain the structure of cell wall of Gram negative bacteria. Add a note on its functions.
- b) Explain in detail germ theory of disease. Write Koch's and River's postulates.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**P219**

**[5522]-18**

**F.Y. B.Sc.**

**MICROBIOLOGY**

**Basic Techniques in Microbiology**

**(2013 Pattern) (Paper - II)**

*Time : 3 Hours]*

*[Max. Marks :80*

*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 the following:*

**[16]**

- a)  $1 \mu\text{L} = \underline{\hspace{1cm}} \text{ ml} = \underline{\hspace{1cm}} \text{ lit.}$
- b) Define - stain.
- c) Define - Diauxic Growth.
- d) What is oligodynamic action.
- e) State True or False.
  - i) In dark field microscope, modification is in the eye piece.
  - ii) Congo red is acidic stain.
- f) What are accentuators?
- g) Match the following:
  - i) Sodium chloride
  - ii) Glucose
  - 1) Log phase
  - 2) Maintains Osmotic Pressure
  - 3) Source of carbon
- h) Name any two culture collection centres.

**P.T.O.**

**Q2) Write short notes on any four: [16]**

- a) Photoautotrophs.
- b) Streak plate technique.
- c) Autoclave.
- d) Mordants.
- e) Halogens as disinfectants.
- f) Eye pieces in Microscope.

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

- a) Explain the role of peptone in bacteriological media.
- b) Describe phenol coefficient to check efficiency of disinfectant.
- c) What are extremophiles. Explain the method for cultivation of acidophiles.
- d) Explain Gram staining as a differential staining.
- e) What is synchronous culture? Describe any one method to induce synchrony.
- f) Describe filtration as process of sterilization.

**Q4) Attempt any two of the following: [16]**

- a) What is sterilization? Explain use of dry heat for sterilization.
- b) Explain various methods of preservation of bacterial cultures.
- c) Explain capsule staining as method of relief staining.
- d) Enlist methods of enumeration of bacteria. Describe any two methods in detail.

**Q5) Attempt any one of the following: [16]**

- a) With appropriate ray diagram, describe principle and applications of fluorescence microscope.
- b) Explain growth phases of bacteria in a batch culture.

*EEE*

Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**P220**

[5522]-19

F.Y. B.Sc.

**EXPERIMENTAL PSYCHOLOGY**

**General Psychology**

**(Paper -I) (2013 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.*

**Q1)** Answer in 20 words (8 out of 10)

**[16]**

- a) What is observation?
- b) Define Enderime gland.
- c) State the full name of W I S C.
- d) Define Intelligence.
- e) What is personality?
- f) Define Attention.
- g) Define Frustration.
- h) Define emotion.
- i) Define learning.
- j) What is humanism.

**Q2)** Answer in 50 words (4 out of 6)

**[16]**

- a) State the importance of need for Achievement.
- b) State the method of Introspection
- c) Explain the sources of Frustration.

**P.T.O.**

- d) Describe Eysenck's PEN model of personality.
- e) State the characteristics of gifted people.
- f) State the James-Lange theory as emotion.

**Q3)** Answer in 150 words. (4 out of 6)

**[16]**

- a) Explain the fields of Developmental Psychology.
- b) State the types of Attention.
- c) Describe TAT as a projective test.
- d) Explain the Big five model of personality.
- e) State the importance of emotion quotient.
- f) Explain the A-rousal theory of emotion.

**Q4)** Answer in 300 words (2 out of 4)

**[16]**

- a) Explain the goals of Psychology.
- b) State the principles of perceptual organization.
- c) Explain the types of mentally challenged.
- d) Explain the basic types of emotion.

**Q5)** Answer in 500 words (1 out of 2)

**[16]**

- a) What is conditioning? Describe the Pavlov's experiment on classical conditioning and its characteristics.
- b) Explain the structure and function of human brain.



Total No. of Questions : 5]

SEAT No. :

**P203**

[Total No. of Pages : 3

[5522]-2

F.Y. B.Sc.

**MATHEMATICS**

**MT - 102 : Calculus and Differential Equations**

**(Paper -II) (2013 Pattern) (Theory)**

*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 a rational number between  $\sqrt{2}$  and  $\sqrt{3}$ .
- b) Find the supremum and infimum of the set  $S = \left\{ 1 - \frac{1}{n} / n \in N \right\}$ , if they exist.
- c) Evaluate  $\lim_{x \rightarrow 2^+} \frac{|x-2|}{x-2}$ ,  $x \neq 2$
- d) State Taylor's theorem with Lagrange's form of remainder.
- e) Find  $f'(x)$ , if  $f(x) = \frac{x}{1+x^2}$ .
- f) State the necessary and sufficient condition for the differential equation  $Mdx + Ndy = 0$  to be an exact.
- g) Evaluate  $\int_0^{\pi/2} \cos^5 x \, dx$ .
- h) Find the orthogonal trajectories of family of straight lines  $y = mx$ , where  $m$  is parameter.
- i) Solve  $y^2 dx - (1+x^2) dy = 0$ .
- j) Solve  $y = px + \sin^{-1} \left( p + \sqrt{1-p^2} \right)$ , where  $p = \frac{dy}{dx}$ .

**P.T.O.**

**Q2)** Attempt any four of the following.

[16]

a) For  $x, y \in \mathbb{R}$ , prove that  $|x + y| \leq |x| + |y|$ .

Hence prove that  $|x - y| \leq |x| + |y|$ .

b) Find  $\alpha$  and  $\beta$  if the function  $f(x)$  is continuous on  $(-3, 5)$ , where

$$\begin{aligned} f(x) &= x + \alpha, \quad -3 < x < 1 \\ &= 3x + 2, \quad 1 \leq x < 3 \\ &= \beta + x, \quad 3 \leq x < 5 \end{aligned}$$

c) State and prove Lagrange's mean value theorem.

d) Evaluate  $\lim_{x \rightarrow 0} \left( \frac{x^2 + 2 \cos x - 2}{x^4} \right)$ .

e) Verify Rolle's theorem for the function  $f(x) = 9x^3 - 4x$  on  $\left[ -\frac{2}{3}, \frac{2}{3} \right]$ .

f) If  $y = e^{ax} \cos(bx + c)$ , then prove that

$$y_n = (a^2 + b^2)^{n/2} e^{ax} \cos \left[ bx + c + n \tan^{-1} \left( \frac{b}{a} \right) \right].$$

**Q3)** Attempt any two of the following.

[16]

a) State and prove Leibnitz's theorem to find  $n^{\text{th}}$  derivative of the product of two functions.

b) i) Expand  $\sin x$ , using Maclaurin's series expansion.

ii) If  $y = \sin^{-1} x$ , then show that  $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - n^2y_n = 0$

c) i) Prove that the limit of a function  $f(x)$  as  $x \rightarrow c$  is unique, if it exist.

ii) Let  $I = [a, b]$  and let  $f : I \rightarrow \mathbb{R}$  be continuous on  $I$ . If  $f(a) < 0 < f(b)$  then prove that there exist a number  $c \in (a, b)$  such that  $f(c) = 0$ .

**Q4)** Attempt any four of the following.

**[16]**

- a) Evaluate:  $\int \frac{x^2 + 2}{(x-1)(x+2)(x+3)} dx$
- b) Define linear differential equation and explain the method of solving it.
- c) Find orthogonal trajectories of family of parabolas  $y = ax^2$ , where  $a$  is parameter.
- d) Explain the method of solving differential equation  $f(x, y, p) = 0$ , which is solvable for  $x$ , where  $p = \frac{dy}{dx}$ .
- e) Solve  $\frac{dy}{dx} = \frac{xy}{x^2 + y^2}$ .
- f) Solve  $(x^2 + y^2 + 2x)dx + 2y dy = 0$

**Q5)** Attempt any two of the following.

**[16]**

- a) If  $I_n = \int \sin^n x dx$ ,  $n \geq 2$ , then prove that  $I_n = \frac{-\cos x \sin^{n-1} x}{n} + \frac{n-1}{n} I_{n-2}$   
Hence evaluate  $\int_0^{\pi/2} \sin^6 x dx$ .
- b) i) Solve  $p^2 - 5p + 6 = 0$ , where  $p = \frac{dy}{dx}$ .
- ii) Solve  $\frac{dy}{dx} = \frac{x - y + 3}{2x - 2y + 5}$ .
- c) i) Solve  $\frac{dy}{dx} + \frac{y}{x} = xy^4$ .
- ii) Solve  $y = -px + x^4 p^2$ , where  $p = \frac{dy}{dx}$ .





Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**P221**

**[5522]-20**

**F.Y. B.Sc.**

**PSYCHOLOGY**

**Experimental Psychology**

**(Paper -II) (2013 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 right side indicate full marks.*

**Q1)** Answer in 20 words (8 out of 10)

**[16]**

- a) Define variable.
- b) What is Experiment?
- c) Define relevant variable.
- d) What is problem solving?
- e) Define learning.
- f) What is simple reaction time?
- g) Define psychological test.
- h) Define psychophysics.
- i) State the formula of IQ.
- j) State the full name of DAT.

**Q2)** Answer in 50 words (4 out of 6)

**[16]**

- a) State the goals of Experimental psychology.
- b) Describe the test of WAIS.

***P.T.O.***

- c) Explain the performance test.
- d) State the Weber law.
- e) State the importance of problem in Experimentation.
- f) Describe the test of GATB.

**Q3)** Answer in 150 words (4 out of 6)

**[16]**

- a) State the application of organizational psychology.
- b) Explain the method insight learning in problem solving.
- c) State the importance of mental image in thinking.
- d) Explain the uses of Reaction time.
- e) Write short note on S. P. M.
- f) State the characteristics of psychological test.

**Q4)** Answer in 300 words (2 out of 4)

**[16]**

- a) Explain the types of variable.
- b) Describe the history of experimental psychology.
- c) Illustration of Individual and group test.
- d) Explain the types of Reaction time.

**Q5)** Answer in 500 words (1 out of 2)

**[16]**

- a) What is psychophysics? Explain the basic concepts of psychophysics.
- b) Define conditioning? Describe the experiment on classical conditioning and its concepts.



Total No. of Questions : 5]

SEAT No. :

**P222**

[Total No. of Pages : 3

[5522]-23

F.Y. B.Sc.

**ELECTRONIC SCIENCE**

**EL - 101 : Principles of Analog Electronics**

**(Paper -I) (2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :80*

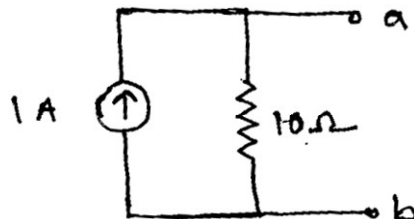
*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Draw neat labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of calculator is allowed.*

**Q1)** Answer the following questions in brief.

**[16]**

- a) Find the value of resistor having colour bands yellow, violet, brown and gold.
- b) Convert following current source into voltage source.



- c) Draw circuit diagram of series LCR circuit.
- d) Sketch output I-V. Characteristics of transistor in CE configuration.
- e) Give circuit diagram of Transistor as switch.
- f) 'FET is called as voltage controlled device', comment.
- g) Define slew rate & CMRR of OPAMP.
- h) Draw circuit symbols of LED & Zener diode.

**P.T.O.**

**Q2)** Attempt any four of the following. **[16]**

- a) i) Define capacitive reactance & give necessary formula.
- ii) Draw circuit symbol of iron core & ferrite core inductor.
- b) Explain working of RC differentiator.
- c) Describe construction and working of optocoupler.
- d) Compare CB, CC & CE configurations of a transistor.
- e) Draw I. V. characteristics of UJT and explain different regions.
- f) State Ideal characteristics of OPAMP & draw its block diagram.

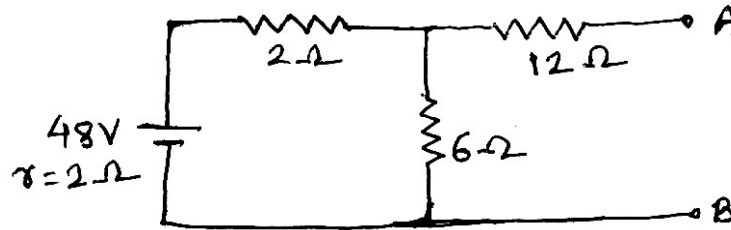
**Q3)** Attempt any four of the following. **[16]**

- a) i) Draw circuit symbols of step down & isolation transformer.
- ii) Give full forms of SPST & DPDT switches and draw their circuit symbols.
- b) Show that in CR circuit voltage lags behind current.
- c) Define clipper and clamper. Give circuit diagram of series +ve clipper & positive clamper.
- d) State different types of transistor biasing. Which biasing is widely used? why? Give circuit diagram of widely used biasing.
- e) Explain construction and working of FET.
- f) Obtain an expression for gain of OPAMP in inverting mode.

**Q4)** Attempt any four of the following. **[16]**

- a) i) Give circuit symbol & important specifications of a fuse.
- ii) Draw construction of general purpose electromagnetic relay.
- b) With the help of neat circuit diagram explain working of Bridge rectifier.

- c) Obtain Norton equivalent of the following.



- d) Draw practical circuit of transistor amplifier. Explain use of coupling & bypass capacitors used in it.
- e) Explain working of MOS as a switch.
- f) With the help of proper circuit diagram explain OPAMP substractor.

**Q5)** Attempt any four of the following.

**[16]**

- a) i) Draw construction of weston cadmium cell.  
ii) Give full forms of BNC & FRC.
- b) State & prove maximum power transfer theorem.
- c) i) State superposition theorem.  
ii) Draw circuit diagram of zener on voltage regulator.
- d) In a CB configuration  $\alpha=0.95$ . The voltage drop across  $1K\Omega$  resistance which is connected in the collector is IV. Find base current.
- e) i) Draw I-V characteristics of n-channel FET.  
ii) Find  $\alpha$  for  $\beta = 50$  & find  $\beta$  for  $\alpha = 0.995$  in a BJT.
- f) Explain use of OPAMP as an schmitt trigger.



Total No. of Questions : 5]

SEAT No. :

**P223**

[Total No. of Pages : 3

[5522]-24

F.Y. B.Sc.

**ELECTRONIC SCIENCE**

**EL - 102: Principles of Digital Electronics**

**(2013 Pattern) (Paper - II)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagram must be drawn wherever necessary.*
- 3) *Use of calculator and log table is allowed.*
- 4) *Figures to the right indicate full marks.*

**Q1)** Answer the following questions in brief:

**[16]**

- a) Convert binary number  $(110010)_2$  into Decimal and Octal.
- b) What is positive and negative logic?
- c) Prove
  - i)  $A + A B = A$
  - ii)  $A (\bar{A} + B) = AB$
- d) Define a redundant group in k-map.
- e) State the difference between half adder and full adder?
- f) What is demultiplexer? Draw the block diagram of it.
- g) Convert R - S Flip-flop to T flip-flop.
- h) List any two saturated and non-saturated bipolar logic families.

**P.T.O.**

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

- a) Explain with suitable examples Gray code to Binary code and Binary code to Gray code conversions.
- b) Explain 3-bit down counter with proper circuit.
- c) Prove  $A + \bar{A}B = A + B$ .
- d) "RC differentiator circuit is a must at the clock input of a J-K flip-flop". Comment.
- e) Subtract decimal 41 from decimal 69 using 2's complement method.
- f) Explain two input TTL NAND gate with the help of circuit diagram.

**Q3)** Answer any FOUR of the following: [16]

- a) Differentiate between asynchronous and synchronous counter.
- b) How EXOR gate can be used as an odd parity generator?
- c) Simplify the equation using laws of Boolean algebra and draw the logic diagram of final equation.

$$Y = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + A\bar{B}\bar{C} + A B \bar{C}$$

Verify the result by considering the input condition  $A = 0, B = 0$  and  $C = 1$ .

- d) Explain Octal to Binary Encoder with suitable example.
- e) What is parallel subtractor? Draw the logic circuit of 4-bit parallel subtractor.
- f) Explain CMOS inverter with proper circuit.

**Q4)** Answer any FOUR of the following: [16]

- a) Simplify the following equation using k-map

$$Y = \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}B\bar{C}D = A\bar{B}\bar{C}\bar{D} + A B C D + A B C \bar{D} + A B \bar{C} D$$

- b) Construct half adder using multiplexer.
- c) Draw the logic diagram of mod -10 counter using J - K flip - flops. Explain its working and write truth table.

- d) Explain 4 - bit SIPO shift register with logic diagram.
- e) List the performance characteristics of digital integrated circuits. Explain noise immunity.
- f) i) Convert the decimal 37.2 into binary number.  
ii) Convert  $(ABC)_{16} = (?)_{10}$ .

**Q5) Answer any FOUR of the following: [16]**

- a) Explain working of simple keyboard encoder with the help of circuit diagram.
- b) Use only NOR gates to design basic logic gates OR and AND.
- c) Explain with suitable timing diagram that a single flip-flop does the frequency division by 2.
- d) Draw the circuit diagram for two input AND gate using diodes. Explain its working.
- e) How will you obtain 1 to 4 line demultiplexer using NAND gates only? Draw logic diagram and function table for the same.
- f) Why half adder is called half adder? Draw block diagram and logic diagram of it. Write truth table of it.

*EEE*



Total No. of Questions : 4]

SEAT No. :

**P224**

[Total No. of Pages : 2

[5522]-25

F.Y. B.Sc.

**DEFENCE AND STRATEGIC STUDIES**

**DS. No-1 : Evolution of Strategic Thought**

**(2013 Pattern) (Paper - I)**

*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 in 20 words each.(Any Ten)

**[20]**

- a) What do you mean by Tactics?
- b) Define Modern War.
- c) State the meaning of "Industrial Revolution".
- d) What do you know about sun-tzu?
- e) By whom the well known Arthasastra it was wrote?
- f) Define "Sea Power".
- g) State the meaning of Civil War.
- h) Who is the author of well known book "On War"?
- i) What do you understand by guerilla?
- j) Define Air Power.
- k) What do you know about Mao-Tse-Tung?
- l) State the meaning of Strategy.
- m) State any two causes of war.

**P.T.O.**

**Q2)** Answer in 50 words (Any Two). **[10]**

- a) Explain the causes of rise of Professional Army.
- b) Highlight on the concept of “Total war”
- c) Write a few lines on J.F.C. Fuller.
- d) Explain in brief the concept of “Heartland”.

**Q3)** Answer in 150 words (Any Two) **[20]**

- a) Highlight on geopolitical thoughts of Karl Haushofer.
- b) Discuss the contemporary implications of American Civil War.
- c) Explain the Prof. Mackinders theory of Heartland.
- d) Analyse the thoughts of Carl von Clausewitz.

**Q4)** Answer in 300 words.(Any Two) **[30]**

- a) Discuss in detail the various causes of war.
- b) Explain the views of Che Guevara on “Guerilla Warfare”.
- c) Evaluate the strategic thoughts of Kautilya.
- d) As per A.T. Mahan discuss the elements of Sea Power.



Total No. of Questions : 4]

SEAT No. :

**P225**

[Total No. of Pages : 2

[5522]-26

F.Y. B.Sc.

**DEFENCE AND STRATEGIC STUDIES**

**DS-2 : India's National Security**

**(2013 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 in 20 Words (Any Ten)

**[2×10=20]**

- a) Define national security.
- b) What do you mean by strategy of war?
- c) Define strategic doctrine.
- d) Write any two fundamentals of political geography.
- e) Write the meaning of strategic control.
- f) State the meaning of national vital interest.
- g) Define Insurgency.
- h) State the meaning of national power.
- i) Write any two features of civil-military relations in India.
- j) Write any two basic features of India's defence policy.
- k) Define Geo-politics.
- l) State the meaning of economic globalization.
- m) Define maritime security.

**P.T.O.**

**Q2) Answer in 50 Words (Any Two)**

**[2×5=10]**

- a) Explain India's relationship with Bangladesh.
- b) Discuss difficulties in India's land border management.
- c) Explain India's relationship with Sri-Lanka.
- d) Discuss India's security challenges to North East Region in India.

**Q3) Answer in 150 Words (Any Two)**

**[2×10=20]**

- a) Explain modernization programme of Indian army sine 1947.
- b) Discuss determinants factors of India's defence policies.
- c) Assess India's military relations with China with reference to border dispute.
- d) Discuss importance of transportation in logistics management.

**Q4) Answer in 300 Words (Any Two)**

**[2×15=30]**

- a) Discuss role of transportation and communication in border management.
- b) Write a note on the challenges to India's maritime security.
- c) Discuss India's relation with pakistan reference to Kashmir dispute.
- d) Write a note on the security challenges to India's North-west borders.



Total No. of Questions : 4]

SEAT No. :

**P226**

[Total No. of Pages : 2

[5522]-27

F.Y. B.Sc

**DEFENCE AND STRATEGIC STUDIES**

**DS-3 : International Security**

**(2013 Pattern) (Paper-III)**

*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 in 20 Words (Any Ten)

**[10×2=20]**

- a) State the meaning of Nation State.
- b) What do you mean by Regionalism?
- c) Define collective security.
- d) State the meaning of Neutrality.
- e) Write the meaning of strategic control.
- f) Define disarmament.
- g) What do you mean by International security?
- h) State the meaning of nationalism.
- i) What do you mean by Conflict studies?
- j) State the meaning of pacific settlement.
- k) What do you mean by peace by peaceful means?
- l) State the meaning of globalization?
- m) What do you mean by protection of core values?

**P.T.O.**

**Q2)** Answer in 50 Words (Any Two)

**[2×5=10]**

- a) Explain principles of Non-Alignment.
- b) Discuss India's freedom movement.
- c) Explain advantages of balance of power.
- d) Discuss role of municipal law in maintaining world peace.

**Q3)** Answer in 150 Words (Any Two)

**[2×10=20]**

- a) Explain conceptual framework of world politics.
- b) Discuss problems and prospects of arms control.
- c) Explain role of collective security in maintaining world peace.
- d) Discuss contributions of NAM and future prospects.

**Q4)** Answer in 300 Words (Any Two)

**[2×15=30]**

- a) Discuss the globalization of world politics.
- b) Explain nature and scope of peace and conflict studies.
- c) Discuss regional environment and its impact on India's national security.
- d) Write a short note on various elements of national power.



Total No. of Questions : 5]

SEAT No. :

**P227**

[Total No. of Pages : 2

[5522]-28

F.Y. B.Sc.

**ENVIRONMENTAL SCIENCE**

**EVS-101: Fundamentals of Environmental Chemistry &  
Environmental Biology**

**(2013 Pattern) (Paper-I)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat and labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Answer the followings in not more than 5 lines:

**[16]**

- a) Give the principle of conductivity meter.
- b) Define molarity and normality.
- c) Give two examples of food additives.
- d) Which heavy metal causes 'itai-itai' disease.
- e) What is continental drift.
- f) What do you mean by geological time scale.
- g) Give two examples of hydrophyte plants.
- h) What do you mean by 'invasive species'.

**Q2)** Answer any four of the following:

**[16]**

- a) Explain the chemical process of sulphur dioxide in acid rain.
- b) Write the physical properties of Cadmium and Arsenic.
- c) Explain the hydrogen bond in water.
- d) Briefly write mimicry classification and its importance.
- e) Explain the objectives and hierarchy of taxonomy.
- f) What are threats of habitat loss in nature.

**P.T.O.**

**Q3)** Write short notes on any four of the following: **[16]**

- a) Forest types in India.
- b) Bentham and Huoker classification.
- c) Characteristics of Vertebrates.
- d) Health effects of Mercury.
- e) Food adulteration and its ill effects.
- f) Scope of environmental chemistry.

**Q4)** Answer any two of the following: **[16]**

- a) Explain the various chemical reactions that occur in the ozone layer.
- b) What are the health effects of lead (Pb) exposure on humans?
- c) Biographical profile in India.
- d) What are the components of systematic classification?

**Q5)** Answer any one of the following: **[16]**

- a) Explain the cationic, anionic, and non-ionic detergents with suitable examples.
- b) Explain various traditional and modern methods of bioresource exploitation. Add a note on over-exploitation.





Total No. of Questions : 5]

SEAT No. :

**P228**

[Total No. of Pages : 2

[5522]-29

F.Y. B.Sc

**ENVIRONMENTAL SCIENCE**

**EVS-102: Fundamentals of Environmental Geosciences &  
Environmental Pollution**

**(2013 Pattern) (Paper-II)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat and labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Answer the followings in not more than 5 lines:

**[16]**

- a) Define metamorphic rocks with examples.
- b) What are plant nutrients? Give its types.
- c) Define Laps rate.
- d) Give two examples of minerals of rocks.
- e) What do you meant by biodegradable & non-biodegradable substances.
- f) Define air pollution with two examples.
- g) Write any four effects of heavy metal deposition in soil.
- h) Define Thermal pollution.

**Q2)** Answer any four of the following:

**[16]**

- a) Explain in detail Internal structure of Earth.
- b) Describe soil classification with suitable examples.
- c) Justify, solar energy as an alternative source of energy.
- d) Write a note on Ozone layer depletion.
- e) Write a note of Rock cycle.
- f) Explain in detail air pollution.

**P.T.O.**

**Q3)** Write short notes on any four of the following: **[16]**

- a) Soil Profile.
- b) Igneous Rocks.
- c) Flood as a natural calamity.
- d) Green house effect.
- e) Marine Pollution.
- f) Biological Pest Management.

**Q4)** Answer any two of the following: **[16]**

- a) Explain different soil types found in India.
- b) Describe vertical & horizontal structure of atmosphere.
- c) Define noise pollution. Explain its sources & effects.
- d) Explain in detail solidwaste pollution.

**Q5)** Answer any one of the following: **[16]**

- a) Give brief account of Hydrological cycle. Explain its role in environment.
- b) Define Radioactive pollution? Explain in detail sources, causes & control measures of Radioactive pollution.



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages : 3

**P204**

**[5522]-3**

**F.Y. B.Sc.**

**PHYSICS - I**

**Mechanics, Heat and Thermodynamics**

**(2013 Pattern) (Paper - I)**

*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 logtables & calculator is allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

**Q1)** Attempt All of the following.

**[16]**

- a) Why Newton's first law is called law of inertia?
- b) State work-energy theorem.
- c) What is surface tension? Give its S.I unit.
- d) Calculate Poisson's ratio  $\sigma$  for brass. Given:  $y=8 \times 10^{10}$  N/m<sup>2</sup> and  $K=8 \times 10^{10}$  N/m<sup>2</sup>.
- e) State the law of corresponding state.
- f) What is meant by a reversible change? Give its example.
- g) Find the temperature on centigrade scale corresponding to 86°F.
- h) Give Clausius statement for second law of thermodynamics.

**Q2)** Attempt any FOUR of the following.

**[16]**

- a) What is electromagnetic force? Give the properties.
- b) Explain the term workdone. Calculate the workdone by a constant force.
- c) Discuss various applications of surface tension.
- d) Find the work done in moving a particle along a vector  $\vec{r} = 3\vec{i} - \vec{j} + 4\vec{k}$  metre, if the applied force is  $\vec{F} = \vec{i} + 3\vec{j} + 5\vec{k}$  newton.

**P.T.O.**

- e) A wire of 0.5m long and 1 sq.mm in cross-section has Young's modulus  $1.24 \times 10^{11}$  N/m<sup>2</sup>. How much work is done in stretching it through 1mm?
- f) Water flowing in a horizontal pipe has a speed 20 cm/s at one end point and 15 cm/s at another point. Determine the pressure drop between two points.

**Q3)** Attempt any Four of the following. **[16]**

- a) Describe Amagat's experiment.
- b) Derive an expression for workdone during an isothermal process.
- c) Explain the concept of entropy.
- d) A definite mass of a perfect gas is compressed adiabatically to half its original volume. Determine the resultant pressure if the initial pressure was one atmosphere. ( $\gamma=1.4$  and  $2^{1.4} = 2.64$ ).
- e) A reversible refrigerator works between 0°C and 30°C. Calculate the coefficient of performance.
- f) The resistance of platinum wire at 0°C is 5.5 ohm. and at temperature it is 7.5 ohm. Find the temperature of wire if coefficient of temperature for platinum = 0.0039/°C.

**Q4)** Attempt any Two of the following. **[16]**

- a) Discuss in detail the working of Venturimeter. Obtain an expression for

$$Q = a_1 a_2 \sqrt{\frac{2Hg}{(a_1^2 - a_2^2)}} \text{ where symbol have their usual meaning.}$$

- b) i) Show that the workdone during volume strain is  $\frac{1}{2}$  X volume stress X change in volume.
- ii) What force is required to accelerate 3000 kg car from 10m/s to 40m/s in time of 1.5 sec?
- c) i) Show that the value of poisson's ratio lies between -1 and 0.5.
- ii) What will be the workdone in blowing a soap bubble of radius 2cm, the surface tension of soap solution is 0.035 N/m?

**Q5)** Attempt any Two of the following.

**[16]**

- a) State and explain principle of air conditioning. Give the air conditioning applications.
- b)
  - i) Give the difference between Diesel engine and otto engine.
  - ii) Calculate the pressure exerted by one mole of water vapour in a  $0.0/\text{m}^3$  container at  $423^\circ\text{K}$  assuming it to obey vander Waal's equation. Given: [ $a = 0.364 \text{ nm}^4 \text{ mole}^{-2}$ ,  $b = 3.05 \times 10^{-5} \text{ m}^3 \text{ mole}^{-1}$ ,  $R = 8.3\text{J}/^\circ\text{K}/\text{mole}$ ]
- c)
  - i) State the principle of gas thermometer. Give its advantages.
  - ii) Find the increase in boiling point of water at  $100^\circ\text{C}$  when pressure is increased by one atmosphere, where 1 gm of water vapour occupies volume  $1598 \text{ cm}^3$ . Latent heat of fusion is  $540 \text{ cal}/\text{gm}$ .



Total No. of Questions : 4]

SEAT No. :

**P229**

[Total No. of Pages : 2

**[5522] - 30**

**F.Y. B.Sc.**

**FOUNDATION COURSE (Restructuring)  
(2013 Pattern) (New)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

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

**Q1)** Explain the following concepts in 50 words each (Any two) : **[10]**

- |                  |  |
|------------------|--|
| a) Mixed Economy | b) Social life of Indus valley culture |
| c) Culture       | d) Globalization                       |

**Q2)** Write the following short notes in 100 words each (Any four) : **[20]**

- |                                       |                               |
|---------------------------------------|-------------------------------|
| a) Responsibilities of Indian Citizen | b) Causes of Regionalism      |
| c) Liberalization                     | d) Sources of data collection |
| e) Planning Commission                | f) Democracy                  |

**Q3)** Write the answer of following in 200 to 250 words each. (Any Three)[30]

- a) State the elements of creation of Nation.
- b) Explain the problems of urbanization.
- c) State the causes of rising transformation movement in India.
- d) Explain the classification of science.
- e) State the causes of Population Explosion.

**Q4)** Write answer of any one of the following in 500 words. **[20]**

- a) Explain the causes and effects of Gender Disparity.
- b) Explain the measures of Women Empowerment.



**P.T.O.**

Total No. of Questions : 4]

P229

[5522] - 30

F.Y. B.Sc.

FOUNDATION COURSE (Restucturing)

(पायाभूत अभ्यासक्रम)

(2013 Pattern) (New)

(मराठी रूपांतर)

वेळ : 3 तास/

/एकूण गुण : 80

- सूचना :- 1) सर्व प्रश्न सोडविणे आवश्यक आहेत.  
2) उजवीकडील अंक पूर्ण गुण दर्शवितात.

**प्र.1)** पुढील संकल्पना 50 शब्दांत स्पष्ट करा. (फक्त दोन) [10]

- |                       |                                   |
|-----------------------|-----------------------------------|
| अ) मिश्र अर्थव्यवस्था | ब) सिंधू संस्कृतीतील सामाजिक जीवन |
| क) संस्कृती           | ड) जागतिकीकरण                     |

**प्र.2)** पुढील टिपा प्रत्येकी 100 शब्दांत लिहा. (फक्त चार) [20]

- |                               |                             |
|-------------------------------|-----------------------------|
| अ) भारतीय नागरिकांची कर्तव्ये | ब) प्रादेशिकता वादाची कारणे |
| क) उदारीकरण                   | ड) माहिती संकलनाचे स्रोत    |
| इ) नियोजन आयोग                | फ) लोकशाही                  |

**प्र.3)** पुढील प्रश्नांची उत्तरे 200 ते 250 शब्दांत लिहा. (फक्त तीन) [30]

- राष्ट्र निर्मितीचे घटक स्पष्ट करा.
- नागरिकीकरणाच्या समस्या स्पष्ट करा.
- भारतातील परिवर्तनवादी चळवळीच्या उदयाची कारणे सांगा.
- विज्ञानाचे वर्गीकरण स्पष्ट करा.
- लोकसंख्या विस्फोटाची कारणे सांगा.

**प्र.4)** पुढीलपैकी एका प्रश्नाचे उत्तर 500 शब्दांत लिहा. [20]

- लैंगिक विषमतेची कारणे व परिणाम स्पष्ट करा.
- महिला सबलीकरणाच्या उपाययोजना स्पष्ट करा.



Total No. of Questions : 10]

SEAT No. :

**P230**

[Total No. of Pages : 3

**[5522]-31**  
**F.Y. B.Sc (Vocational)**  
**INDUSTRIAL CHEMISTRY**  
**(2013 Pattern) (Paper-I)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

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

**SECTION - I**

**Q1)** Answer the following: **[8]**

- a) Define Brownian movement.
- b) What is emulsion? Give its types.
- c) Define:   i) Adsorbent  
              ii) Adsorbate.
- d) Define Gold number.

**Q2)** Attempt any two of the following: **[8]**

- a) Explain the properties of gel.
- b) State and explain Tyndall effect.
- c) Explain ultrafiltration method for purification of sol.

**Q3)** Attempt any two of the following: **[8]**

- a) Explain the term catalytic poisoning.
- b) Explain characteristics of catalyst reactions.
- c) Explain intermediate compound formation theory.

***P.T.O.***



**Q4)** Answer any one of the following: [8]

- a) Give the role of temperature and pressure on extent of adsorption.
- b) State and explain Langmuir's adsorption isotherm in detail.

**Q5)** Answer any one of the following: [8]

- a) Write a short note on:
  - i) Promoters
  - ii) Micelles.
- b) Write a short note on:
  - i) Colloidal dispersion
  - ii) Auto-catalysis.

### **SECTION - II**

**Q6)** Define and explain the following terms: [8]

- a) Kinetic energy.
- b) Volume percent.
- c) Molality.
- d) Derived quantities.

**Q7)** Attempt any two of the following: [8]

- a) Explain material balance involved in drying.
- b) State and explain Henry's law.
- c) Write a note on adiabatic flame temperature.

**Q8)** Write short notes on any two of the following: [8]

- a) Conversion.
- b) Purge ratio.
- c) Recycling operation.

**Q9)** Answer any one of the following: [8]

- a) What is a system? Classify different types of systems. Determine energy balance of closed system.
- b) State Amagat's Law and derive the relationship between partial pressure and mole fraction of component gas to total pressure.

**Q10)** Solve any two of the following: [8]

- a) What is the normality and molarity of solution, if 5g of  $\text{KMnO}_4$  is dissolved in 250 ml water. (Given: molecular weight of  $\text{KMnO}_4$  is 158.4g).
- b) A mixture of  $\text{N}_2$  and  $\text{CO}_2$  at  $25^\circ\text{C}$  and 1 atm. pressure has average molecular weight of 31. What is the partial pressure of  $\text{N}_2$ ?
- c) A stream of carbon dioxide flowing at a rate of 100g mole/min is heated from  $25^\circ\text{C}$  to  $110^\circ\text{C}$ . Calculate the heat that must be transferred using  $C_p$  data.

Given: Gas	a	$b \times 10^3$	$c \times 10^6$
$\text{CO}_2$	6.339	10.14	-3.415



Total No. of Questions : 6]

SEAT No. :

**P231**

[Total No. of Pages : 2

**[5522]-32**

**F.Y. B.Sc (Vocational )  
BIOTECHNOLOGY**

**Voc.Biotech 101 : Biochemistry and Microbiology  
(2013 Pattern) (Paper-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) *Figures to the right indicate full marks.*
- 4) *All questions are compulsory.*

**SECTION-I  
(Biochemistry)**

**Q1)** Answer the following in short: **[8]**

- a) What are lipoproteins? Give an example.
- b) What is a nucleotide? Give an example.
- c) Define catabolism. Name any one catabolic pathway.
- d) What are monosaccharides? Give any two examples.

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

- a) Explain the effect of temperature on enzyme activity.
- b) Give the functions of proteins.
- c) Differentiate between saturated fatty acids and unsaturated fatty acids.
- d) Enlist the types of RNA. Explain the structure of m-RNA.
- e) Describe pentose phosphate pathway.

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

- a) Describe  $\beta$ -oxidation of fatty acids in detail. Give its energetics and features.
- b) What are enzymes? Classify enzymes with the help of suitable examples.
- c) Explain the physical and chemical properties of lipids.

***P.T.O.***

**SECTION-II**  
**(Microbiology)**

**Q4)** Answer the following in short: **[8]**

- a) What are viruses? Give suitable examples.
- b) Name any two Nitrogen fixing organisms.
- c) Give any two contributions of Louis Pasteur in Microbiology.
- d) Define Thermophiles. Give one example of Thermophiles.

**Q5)** Attempt any four of the following: **[16]**

- a) Explain Commensalism with suitable examples.
- b) Write a note on Spread Plate technique.
- c) Write a note on various physical agents used for control of microorganisms.
- d) Differentiate between Prokaryotes and Eukaryotes.
- e) Write a note on Biofilm formation.

**Q6)** Answer any two of the following: **[16]**

- a) What are the steps involved in Coliform testing? Describe presumptive test.
- b) Give the structure of peptidoglycan. Compare cell wall structure of Gram positive and Gram negative bacteria.
- c) What is differential staining? Give examples. Explain any two examples of differential staining in detail.



Total No. of Questions : 5]

SEAT No. :

**P232**

[Total No. of Pages : 2

**[5522]-34**

**F.Y. B.Sc. (Vocational)**

**ELECTRONIC EQUIPMENT MAINTENANCE (EEM)**

**Maintenance Concepts, Instruments and Appliances**

**(2013 Pattern) (Paper-I)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *All questions are compulsory.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt the following.

**[16]**

- a) Define failure rate of component?
- b) Draw diagram of PMMC meter & label it's different parts.
- c) What is MTBF of equipment?
- d) Draw circuit arrangement of series type ohmmeter.
- e) What is accuracy in measurement? Explain in short with one example.
- f) What are types of errors?
- g) What are parameters of pulse or square wave?
- h) What are types of UPS? Which type has switch to switch over from mains supply to inverter operation?

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

**[16]**

- a) Write a short note on AF signal generator.
- b) What is redundancy of system? What are its types? Explain in short.
- c) What are different types of cables used for connecting instruments?
- d) What is circuit breaker? Explain in short.
- e) Explain the working of Linear power supply.

**P.T.O.**

**Q3) Attempt any four of the following. [16]**

- a) Explain the concept of autoranging in instrument.
- b) What are the applications of pulse generator?
- c) Explain the working of analog DC voltmeter.
- d) What are different types of CRO probes? Explain any one in short.
- e) Explain the working of Electronic ignition system.

**Q4) Attempt any two of the following: [16]**

- a)
  - i) Explain the working of meggar.
  - ii) PMMC meter is required to measure 10V & 100V across a circuit. If meter resistance  $R_m=1000\Omega$ , max. meter current  $I_m=1\text{mA}$ . Find the value of series resistances.
- b) Explain front panel controls of analog CRO.
- c) With the help of circuit diagram explain the working of Emergency Light.

**Q5) Attempt any two of the following: [16]**

- a)
  - i) Explain the working of AC ammeter.
  - ii) What are safety precautions when handling dc voltmeter.
- b) Write a short note on SMPS. What are advantages of SMPS over linear power supply?
- c) Explain the working of digital clock.



Total No. of Questions : 5]

SEAT No. :

**P233**

[Total No. of Pages : 2

[5522]-35

F.Y. B.Sc. (Vocational)

**INDUSTRIAL MICROBIOLOGY**

**Microorganism and Systems for Fermentation Processes**

**(2013 Pattern) (Paper-I)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *Draw neat labeled diagrams wherever necessary.*
- 5) *Scientific calculator is allowed.*

**Q1)** Answer each sub-question in one or two lines; Fill in the blanks; State whether the statement is true or false. **[16]**

- a) Define GILSP.
- b) What is yield?
- c) State two advantages of microbial systems over plants.
- d) Give an example of culture collection center.
- e) True or False  
Actinomycetes are used for production of antibiotics.
- f) What is crippled strain?
- g) Name one microorganism used in fermentation along with the product produced.
- h) What is the capacity of laboratory scale fermenter?

**P.T.O.**

**Q2)** Attempt any four of the following. **[16]**

- a) Fungi used in Industrial microbiology.
- b) Suspended mode of fermentation.
- c) Physical variables.
- d) Approaches for isolation for microorganisms from environmental sample.
- e) Strain improvement.
- f) Obsolescence in Industrial microbiology.

**Q3)** Write short note on any four of the following. **[16]**

- a) Firmicutes.
- b) Linear and nonlinear models.
- c) Upstream processes.
- d) Aseptic fermentation.
- e) Multidisciplinary nature of Industrial Microbiology.
- f) Why is 16SrRNA used in classification of organisms?

**Q4)** Answer any two of the following: **[16]**

- a) Following are the 10 measurement carried out on *Saccharomyces cerevisiae* cell diameter. Calculate and represent Mean, Standard deviation and variance.  
Diameter in micrometer : 3.32, 3.6, 3.49, 3.25, 3.33, 3.38, 3.27, 3.1, 3.45 & 3.29.
- b) Explain ideal characteristics of strains used in fermentation.
- c) Describe equation and graphs of log-log plot.
- d) What is a model? Explain components of modeling.

**Q5)** Answer any one of the following: **[16]**

- a) Describe the various methods of presentation of data.
- b) Give complete account of development of pharmaceutical product.





Total No. of Questions : 5]  
**P234**

SEAT No. :   
[Total No. of Pages : 2

[5522]-36  
**F.Y. B.Sc. (Vocational)**  
**COMPUTER HARDWARE & NETWORK ADMINISTRATION**  
**Essentials of Computers**  
**(2013 Pattern) (Paper-I) (78710)**

*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.*

**Q1)** Attempt the following.

**[16]**

- a) What is microprocessor?
- b) Explain working of MOUSE.
- c) List different input & output devices of computer.
- d) Explain working of HDD.
- e) Write notes on bluetooth.
- f) What is SMPS?
- g) Write notes on motherboard.
- h) Write notes on LCD panel.

***P.T.O.***

**Q2) Attempt any FOUR. [16]**

- a) Explain working of DOT matrix printer.
- b) Write notes on generations of computer.
- c) Explain the terms i) SIMM ii) DIMM
- d) Write notes on DMA.
- e) What is instruction prefetch?
- f) Write notes on Device controller.

**Q3) Attempt any FOUR. [16]**

- a) Write notes on web camera.
- b) Explain working of LASER printer.
- c) Write notes on CD ROM.
- d) Explain CPU with block diagram.
- e) Write notes on note book and tablet.
- f) Define plotter.

**Q4) Attempt any TWO. [16]**

- a) Write notes on ON-line & OFF-line UPS.
- b) Explain different types of softwares with examples.
- c) Write notes on i) Digitizer ii) Touch screen.

**Q5) Attempt any TWO. [16]**

- a) Explain different types of Interrupts in computer.
- b) Write notes on Primary and Secondary memory of computer.
- c) Write notes on i) Scanner ii) MODEM.



Total No. of Questions : 5]  
**P235**

SEAT No. :   
[Total No. of Pages : 2

**[5522]-37**  
**F.Y. B.Sc. (Vocational)**  
**SEED TECHNOLOGY**  
**Morphology, Plant Breeding & Testing for Cultivar Genuineness**  
**(2013 Pattern) (Paper-I)**

*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 and labeled diagrams wherever necessary.*

**Q1)** Answer in two lines (any eight).

**[8×2=16]**

- a) Define a seed.
- b) What is mutation?
- c) What is a grow out test?
- d) Define tissue culture.
- e) What is plant introduction?
- f) What is artificial vegetative reproduction.
- g) What do you mean by selection activity in plant breeding.
- h) Define a flower.
- i) Give an example of capsule type of fruit (any two).

**Q2)** Answer any four of the following.

**[4×4=16]**

- a) Describe any one method of natural vegetative propagation.
- b) Write the contrivances in self pollination.
- c) Describe groundnut flower in detail.
- d) What is plant breeding. Write scope and objectives of plant breeding.
- e) Comment on achievements of mutation breeding.

***P.T.O.***

**Q3)** Write notes on any four of the following.

**[4×4=16]**

- a) Plant introduction.
- b) Types of endosperm.
- c) Development of microspore.
- d) Phenol colour test.
- e) Development of female gametophyte.

**Q4)** Answer any two of the following.

**[2×8=16]**

- a) What is hybridization? Write objectives of hybridization and comment on its types.
- b) Define fertilization? Discuss process of fertilization in general.
- c) Describe berry and pepo type of fruits with suitable examples and diagrams.

**Q5)** Answer any one of the following.

**[1×16=16]**

Write the diagnostic characters, floral formula, floral diagram of the families Malvaceae & Liliaceae.

OR

What is clonal selection? Write procedure, advantages, disadvantages and achievements of clonal selection.



Total No. of Questions : 10]

SEAT No. :

**P236**

[Total No. of Pages : 3

**[5522] - 38**

**F. Y. B. Sc. (Vocational)  
INDUSTRIAL CHEMISTRY - II  
(2013 Pattern) (Paper - II)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

- 1) Answer 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) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) All questions are compulsory.*

**SECTION - I**

**Q1)** Answer the following:

**[8]**

- a) Define calorific value. Give examples
- b) Define octane number
- c) Give two uses of natural gas.
- d) Give any two properties of coke.

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

**[8]**

- a) Discuss destructive distillation of wood.
- b) Give the classification of fuels with suitable examples.
- c) Describe the synthesis of bio - gas.

***P.T.O.***

**Q3)** Attempt any two of the following: [8]

- a) Write a short note on processing of crude petroleum.
- b) Describe the process of cleaning and storage of coal.
- c) Write a note on aviation gasoline.

**Q4)** Answer any one of the following: [8]

- a) Give a comparative account of proximate and ultimate analysis of coal.
- b) Discuss the theories of origin of petroleum.

**Q5)** Answer any one of the following: [8]

- a) What is reforming? Discuss in detail.
- b) What is coal tar? Give one process for its synthesis and name the fractions obtained from it.

## **SECTION - II**

**Q6)** Answer the following: [8]

- a) Give the structural formula of talc.
- b) What is an alloy? Give two examples.
- c) What is slag? Give examples.
- d) Give two applications of zeolites.

**Q7)** Answer any two of the following: [8]

- a) Differentiate between calcination and roasting.
- b) What is metallurgy? Give the divisions of metallurgy.
- c) What are silicates? Give their classification.

**Q8)** Attempt any two of the following: [8]

- a) Differentiate between diamond and graphite.
- b) Write a short note on occurrence of metals.
- c) What is a furnace? Describe any two types of furnaces used in metallurgy.

**Q9)** Attempt any one of the following: [8]

- a) Describe in detail thermodynamics of reduction.
- b) What is activated charcoal? Give it's uses.

**Q10)** Attempt any one of the following: [8]

- a) What is ore - dressing? Explain the concentration of sulphide ore by froth - floatation process.
- b) List the different steps involved in the extraction of pure metals from their ores.



Total No. of Questions : 6]

SEAT No. :

**P237**

[Total No. of Pages : 3

[5522] - 39

F. Y. B. Sc.

**VOCATIONAL BIOTECHNOLOGY**

**VOC. BIOTECH 102: Biophysics and Instrumentation, Mathematics,  
Statistics and computers For Biologists  
(2013 Pattern) (Paper - II)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

- 1) *Answer to the two sections should be written in separate answer books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *All questions are compulsory.*

**SECTION - I**

**(Biophysics and Instrumentation)**

**Q1)** Answer the following in short:

**[8]**

- a) State the Beer's law.
- b) Define electrophoresis.
- c) What are isotopes? Give an example.
- d) What is density gradient?

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

**[16]**

- a) Describe the principle and applications of gel filtration chromatography.
- b) With the help of neat and well labelled diagram describe the calomel electrode.

**P.T.O.**



- c) Explain Agarose gel electrophoresis technique in detail.
- d) Write a short note on nephelometer.
- e) Describe Dark field microscopy in detail.

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

- a) Explain the principle of affinity chromatography. Give its procedure and applications.
- b) Describe the components of a colorimeter. Give its applications.
- c) Discuss the role of radioisotopes in biological sciences.

### SECTION - II

**(Mathematics, Statistics and Computer for Biologists)**

**Q4)** Answer the following question in short: **[8]**

- a) Prove that  $1 + \tan^2 x = \sec^2 x$ .
- b) Find  $\frac{dy}{dx}$ , if  $y = \log(\sin x + \cos x)$
- c) Define Coefficient of variation. Give formula to calculate Coefficient of variation.
- d) What are output devices ? Name any 2 output devices.

**Q5)** Answer any four of the following: **[16]**

- a) Find limit of the sequence  $\left\{ \sqrt{n}(\sqrt{n} - 1) \right\}_{n=0}^{\infty}$
- b) Evaluate  $\int \frac{x^3 + 4x^2 + 7x + 2}{x^2 + 3x + 2} dx$

- c) Write a note on Poisson distribution
- d) Explain different types of sampling methods
- e) Write a note on databases

**Q6)** Answer any two of the following:

**[16]**

a) i) If  $\frac{{}^{n-1}C_3}{{}^nC_4} = \frac{1}{n}$ , find value of n.

ii) Evaluate  $\lim_{x \rightarrow 2} \left[ \frac{1}{x-2} + \frac{6x}{8-x^3} \right]$

- b) Give an account of measures of central tendency w.r.t. mean, mode and median.
- c) In a study, 13 children were given usual diet plus vitamins. While 12 children were taking usual diet. After few months gain in weight was noted as given in the table. Test whether there is any gain in weight after taking vitamins using Student's t-test. (t-value at df 23 = 2.07)

A	5	3	4	3	2	6	3	2	3	6	7	5	3
B	1	3	2	4	2	1	3	4	3	2	2	3	-

- d) Give applications of a computers in an industry.



Total No. of Questions :5]

SEAT No. :

**P205**

**[5522]-4**

[Total No. of Pages : 3

**F.Y. B.Sc.**

**PHYSICS - II**

**Physics Principles and Applications and Electromagnetics**

**(2013 Pattern) (New Course) (Paper - 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) *Use of logtables & calculator is allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

**Q1)** Attempt all of the following.

**[16]**

- a) What are drawbacks of Bohr's atomic model?
- b) What is the principle of superposition in electrostatics.
- c) The radius of first Bohr orbit is  $0.5z \text{ \AA}$ . Calculate radius of 4<sup>th</sup> Bohr orbit.
- d) Compare polar and non-polar molecules.
- e) Give any two properties of co-valent compounds.
- f) Find the magnetic field at the surface of the metal wire having diameter of 0.4 cm and carrying current of 25 ampere.  $\left[ \text{Given } \frac{\mu_0}{4\pi} = 10^{-7} \text{ wb/A.m} \right]$
- g) Enlist operating characteristics of radar.
- h) Define remanence and coercivity.

**Q2)** Attempt any FOUR of the following.

**[16]**

- a) Explain laser action using four level energy system.
- b) Find the relative population of two states in a ruby laser that produces a light beam of wavelength  $6943 \text{ \AA}$  at 300k. [Given  $k = 8.61 \times 10^{-5} \text{ eV/k}$ ]
- c) Explain van der waal's bonding in molecules with suitable examples.

**P.T.O.**

- d) The force constant of vibration in oxygen molecule is 1180 N/m. The mass of oxygen atom is  $2.66 \times 10^{-26}$  kg. Find the energy separation between adjacent vibrational levels of molecule in joules and electron unit.
- e) What is x-Ray radiography? State its applications.
- f) Using potential energy curve explain interaction between two atoms.

**Q3) Attempt any Four of the following. [16]**

- a) State Gauss's law in electrostatics. What is the advantage of Gauss law over coulomb's law? Give the limitations of Gauss' law.
- b) The electric field intensity at a point at a distance of 1m from the centre of a charged sphere of radius 30cm is  $10^4$  N/C. Find the surface charge density on the surface of sphere.
- c) Derive an expression for electric intensity at any point due to electric dipole.
- d) Two point charges in a dielectric medium having  $k = 5.2$  interact with a force of  $8.6 \times 10^{-3}$ N. What would be the a force if the charges were in free space?
- e) Using Biot-Savart's law, obtain an expression for magnetic field produced due to current flowing through long straight conductor.
- f) Using hysteresis curve, discuss differences between hard and soft magnetic materials.

**Q4) Attempt any Two of the following. [16]**

- a) Explain in detail Frank-Hertz experiment.
- b)
  - i) What is population inversion? Explain any one method to attain population inversion.
  - ii) If reduced mass of CO molecule is  $1.14 \times 10^{-26}$  kg and it absorbs radiations of frequency  $6.4 \times 10^{13}$  Hz, calculate the force constant of the bond in it. Also, determine the spacing between the vibrational energy levels for CO molecules.
- c)
  - i) Write a note on computer tomography (CT) Scan.
  - ii) Write a note on working of solar cell. The input power to the solar cell is 1.75w. It has  $I_{sc} = 500$  mA,  $V_{oc} = 0.5$ V and fill factor (FF) = 0.7. Calculate the efficiency of solar cell.

**Q5)** Attempt any Two of the following.

**[16]**

- a) State and prove Ampere's circuital law. Obtain an expression for the magnetic field at a point inside the winding of toroid.
- b)
  - i) Using Gauss theorem, obtain an expression for electric intensity at any point due to uniformly charged non-conducting sphere.
  - ii) Two parallel plates have equal and opposite charges. When the space between the two plates is vacuum, the electric intensity is  $3 \times 10^6 \text{ v/m}$ . When the space is filled with dielectric, the electric intensity becomes  $1.5 \times 10^6 \text{ v/m}$ . Find the induced charge density on the surface of the dielectric.
- c)
  - i) Differentiate between paramagnetism and ferromagnetism.
  - ii) Two spheres of charges  $+ 20 \text{ C}$  and  $+ 80 \text{ C}$  are placed  $18 \text{ cm}$  apart. Find the position of the point between them where the intensity is zero.



Total No. of Questions : 5]

SEAT No. :

**P238**

[Total No. of Pages : 2

[5522] - 41

**F. Y. B. Sc. (Vocational)**

**ELECTRONIC EQUIPMENT AND MAINTENANCE**

**Electronic Components Circuit and Equipment Assembly**

**(2013 Pattern) (Paper - II) (New)**

*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 diagrams wherever necessary.*

**Q1)** Attempt the following:

**[16]**

- a) Define resistance.
- b) Write formula of capacitance of parallel plate capacitor.
- c) What is inductance?
- d) What is transformer?
- e) Draw symbol of relay.
- f) State use of fuse.
- g) What is cell?
- h) State typical voltage of cellphone battery.

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

**[16]**

- a) State the precautions during use and disposal of battery.
- b) State the functions of files, plier and hacksaw.

***P.T.O.***

- c) Write a short note on soft tools.
- d) Draw schematic diagram of electric motor.
- e) Write a short note on car audio system.

**Q3) Attempt any Four :** **[16]**

- a) Give name of four types of semiconductor devices.
- b) Discuss the applications of semiconductor devices in electronic equipments.
- c) State types of PCB.
- d) Write a short note on Layout technique.
- e) Define terms – footprint, netlist, PTH, SMD Package.

**Q4) Answer any two :** **[16]**

- a) Draw schematic diagram of soldergun and explain its working.
- b) Discuss on soldering materials required for normal, wave soldering. SMD soldering work. What is Lead free soldering?
- c) Discuss the soldering techniques used for the repairing of circuit boards of mobile phone and microwave oven.

**Q5) Attempt any two:** **[16]**

- a) Draw a typical and simple household wiring.
- b) Explain with neat diagram the operation of tubelight.
- c) Write a short note on grounding and shielding techniques.



Total No. of Questions : 5]

SEAT No. :

**P239**

[Total No. of Pages : 2

[5522] - 42

**F. Y. B. Sc. (Vocational)**

**INDUSTRIAL MICROBIOLOGY**

**INDUSTRIAL PROCESSES AND PRODUCTS**

**(2013 Pattern) (Paper - II)**

*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 logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**Q1)** Answer *any eight* of the following.

**[16]**

- a) Enlist two organisms used for production of organic acids.
- b) Describe in brief use of enzymes for leather manufacturing.
- c) Why 'enablement' is critical criterion of a patent?
- d) What are recombinant proteins? Give two examples.
- e) Enlist two organisms used for production of antibiotics.
- f) Describe in brief use of enzymes for detergent.
- g) What is complex media?
- h) Name any two GRAS certified organisms.
- i) Enlist two organisms used for production of ethanol.
- j) Name two culture collections.

***P.T.O.***



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

- a) Discuss in detail the 'Critical tests for CEO of Biotechnology Company'.
- b) Describe the process of 'Due Diligence'.
- c) Explain the process of Bioremediation.
- d) Draw a neat labelled diagram of fermenter.
- e) Discuss the concept of biomass production with suitable example.
- f) Write in details about food and beverage fermentation

**Q3)** Write a short note on any four of the following. **[16]**

- a) Market need
- b) Competitive advantage
- c) Exit route
- d) Solid state fermentation
- e) Antifoam
- f) Seed funding

**Q4)** Answer any two of the following. **[16]**

- a) With the help of suitable examples describe different methods of strain improvement.
- b) Discuss in detail the ideal characters of an industrial strain.
- c) What is capital cost? Explain capital cost estimates.

**Q5)** Answer any one of the following. **[16]**

- a) Explain in detail all basic components of a 'Biotechnology company'.
- b) With the help of suitable examples discuss the factors affecting fermentation economics.



Total No. of Questions : 5]

SEAT No. :

**P240**

[Total No. of Pages : 2

[5522] - 43

**F. Y. B. Sc. (Vocational)**

**COMPUTER HARDWARE AND NETWORK ADMINISTRATION**

**Computer organisation (Hardware & Software Aspects)**

**(2013 Pattern) (Paper - II) (78720)**

*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 diagrams wherever necessary.*

**Q1)** Attempt the following.

**[16]**

- a) Explain flag register of 8086
- b) Define Editor
- c) Write notes on Firmware
- d) What is debugger
- e) Define USB
- f) What is POST?
- g) Define compiler
- h) What is Assembler?

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

**[16]**

- a) Explain any two arithmetical instructions of 8086 with example.
- b) Write notes on multimedia.

**P.T.O.**

- c) Write notes on control panel of window operating system.
- d) Explain different network topologies.
- e) Define simulator and emulator.
- f) What is algorithm?

**Q3) Attempt any four** **[16]**

- a) Explain any two data transfer instructions of 8086 with example.
- b) Write notes on Wi - Fi system.
- c) Define Tri State buffer.
- d) Write notes on Internet.
- e) Define Math Co- processor.
- f) What is Rs - 232?

**Q4) Attempt any two** **[16]**

- a) Explain architecture of 8086 with block diagram.
- b) Explain flow chart with example
- c) Write notes on
  - i) HDMI
  - ii) i series microprocessor

**Q5) Attempt any two.** **[16]**

- a) Explain logical system architecture of computer.
- b) Write notes on ANDROID operating system
- c) Write notes on
  - i) Device driver
  - ii) System software



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**P241**

**[5522] - 44**

**F. Y. B. Sc. (Vocational)**

**SEED TECHNOLOGY**

**Seed Physiology and Seed Production**

**(2013 Pattern) (Paper - 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 neat labeled diagrams wherever necessary.*

**Q1)** Answer in two lines (Any eight):

**[16]**

- a) What is seed deterioration?
- b) Enlist different types of seed storage products.
- c) Define seed.
- d) Enlist different methods to break seed dormancy.
- e) What are certified seed?
- f) Enlist different types of nursery beds.
- g) Comment on isolation distance.
- h) What are the biotic causes of crop diseases.
- i) Define genetic purity of seed.

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

**[16]**

- a) Comment on seed germination.
- b) Describe various factors affecting seed vigour.

**P.T.O.**

- c) Give an account of synthetic seed.
- d) Explain various methods of sowing
- e) Write on care during harvesting and threshing.
- f) Give an account of identification of entries for release of a variety.

**Q3)** Write notes on any four of the following: **[16]**

- a) Physiology of seed development.
- b) Types of seed dormancy.
- c) Seed deterioration.
- d) Quality tests for evaluation of new variety.
- e) Harvesting and threshing.
- f) Importance of drainage.

**Q4)** Attempt any two of the following. **[16]**

- a) Explain steps in land preparation for cotton and chilli.
- b) Give an account of State seed corporation and its objectives.
- c) Give seed viability concept. Add a note on seed ageing.
- d) What is seed storage? Add a note on physiology of seed storage.

**Q5)** What is seed vigour? Discuss on seed ageing and seed deterioration. Add a note on importance of seed vigour. **[16]**

OR

Give an account of causal organism, symptoms, disease cycle and control measures for tikka disease on groundnut.



Total No. of Questions :5]

SEAT No. :

**P242**

[5522]-45

[Total No. of Pages : 2

F.Y.B.Sc.

**NANO SCIENCE**

**Nano science & Nanotechnology**

**(2013 Pattern) (Paper-I)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates.*

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagram must be drawn wherever necessary.*
- 3) *figure to the right indicate full marks.*

**Q1)** Attempt all of the following.

**[8×2=16]**

- a) Write all phase combination of colloids.
- b) NEMS stands for what?
- c) Define types of CNTS.
- d) Define Tribology.
- e) What is sonochemical synthesis?
- f) What is mean by hydrothermal synthesis?
- g) What is precursors?
- h) What is mean by graphene.

**Q2)** Attempt any four of the following.

**[4×4=16]**

- a) Write a short note on standards for nanotechnology.
- b) Draw a graph of surface plasmon resonance. write conclusion.
- c) Give the applications of MEMS.
- d) Write a note on Biolumenesence.
- e) Give the application of graphene.
- f) Explain synthesis of nanoparticles using DNA.

**P.T.O.**

**Q3)** Attempt any four of the following.

**[4×4=16]**

- a) How cds nanoparticles obtain from protien?
- b) Explain with La-Mer diagram growth of nanoparticles.
- c) Write a note on nanoscopic colour.
- d) Give advantages of hydrothermal method .
- e) Explain micro-wave synthesis.
- f) Explain nanometrology.

**Q4)** Attempt any two of of the following.

**[2×8=16]**

- a) What is CVD? Explain with neat labelled diagram types of CVD?
- b) Explain vapour-liquid-solid method.
- c) Explain Sol-Get mehod.

**Q5)** Attempt any two of of the following.

**[2×8=16]**

- a) Explain IEEE Rad map in details.
- b) Explain nanoperspective.
- c) Explain Lab-or-chip spray pryrolysis method.



Total No. of Questions :5]

SEAT No :

**P243**

**[5522]-46**

[Total No. of Pages : 2

**F.Y. B.Sc.**

**NANO SCIENCE-II**

**Nanoscience & Nanotechnology**

**(Paper-II) (2018 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right indicates full marks.*

**Q1)** Attempt all of the following:-

**[8×2=16]**

- a) What is mean by lattice?
- b) Define macroporous materials.
- c) What is atomic radius? Write the value of atomic radius for FCC crystal structure.
- d) Define electroluminescence.
- e) What is nano- optics?
- f) What is mean by porosity?
- g) Define triple point.
- h) What is mean by emission?

**Q2)** Attempt any four of the following:-

**[4×4=16]**

- a) What is standard solution? Explain primary & secondary standard solutions.
- b) Give the applications of Nano-optics.
- c) Explain experimental set up of photoluminescence.
- d) Write a note on early & modern examples of composites.
- e) Write a note on insulators.
- f) Explain thermogravimetric analysis method.

**P.T.O.**



**Q3)** Attempt any four of the following:-

**[4×4=16]**

- a) Explain particle size determination.
- b) With suitable diagram explain Fourier Transform IR spectrometer.
- c) Explain the types of characterization methods in detail.
- d) Write a note on unary & binary phase diagram.
- e) Explain electron probe microanalysis.
- f) State & explain Lever rule.

**Q4)** Attempt any two of the following:-

**[2×8=16]**

- a) With neat labelled diagram explain pb-sn phase diagram.
- b) Explain core-shell nanoparticles in detail.
- c) Give the classification of bonding in solid in brief.

**Q5)** Attempt any two of the following:-

**[2×8=16]**

- a) What is mean by packing fraction? Derive an expression of packing fraction for BCC crystal.
- b) Explain properties of semiconductor in brief.
- c) Define aerogel. Explain types of aerogel & give its applications.

& & &

Total No. of Questions :5]

SEAT No. :

**P206**

[Total No. of Pages : 3

[5522]-5

F.Y. B.Sc.

**CHEMISTRY - I**

**Physical and Inorganic Chemistry**

**(2013 Pattern) (Paper - I)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Draw neat labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logtable and calculators is allowed.*

**Q1)** Attempt the following questions.

**[16]**

- a) Define the term.
  - i) Oxidising agent.
  - ii) Reducing agent.
- b) Give the rule of differentiation for added and subtracted function.
- c) What is negative catalysis? Give one example of it.
- d) Give the limitations of third law of thermodynamics.
- e) State Heisenberg's uncertainty principle.
- f) What is effect of temperature on viscosity?
- g) How many moles are present in 112 grams of  $N_2$ ?
- h) Explain the terms: covalent bond and co-ordinate bond.

**Q2)** Attempt any four of the following.

**[16]**

- a) Write the assumptions of kinetic theory of gases.
- b) Distinguish between physical adsorption and chemical adsorption.
- c) Draw the graph of linear function and find the expression for the following.
  - i) Linear function passing through (1, 3) and (2, 5).
  - ii) Linear function when slope and intercept are given, slope = 2, intercept = -3.
- d) Describe the operations of Carnot cycle.
- e) Define the terms frequency wavelength and wave number. Give relationship between them.
- f) State different methods on preparation of colloids. Describe any one of them.

**P.T.O.**

**Q3)** Answer any four of the following.

[16]

- a)
  - i) If  $y = (ax^2 + b)^2$ ,  $dy/dx = ?$
  - ii) Solve the integral  $\int (x^3 + a^x) dx$ .
- b) Define
  - i) Compressibility factor.
  - ii) Critical temperature.
  - iii) Critical volume.
  - iv) Critical pressure.
- c) What are liquid crystals? Discuss metallotropic liquid crystals.
- d) What is catalyst? Explain general characteristics of catalytic reaction.
- e) Explain spontaneous and non-spontaneous processes with suitable examples.
- f) Give any four assumptions of Bohr's theory.

**Q4)** Attempt any four of the following.

[16]

- a) Calculate the oxidation number of the following:
  - i) Mn in  $\text{KMnO}_4$
  - ii) O in  $\text{H}_2\text{O}_2$
  - iii) N in  $\text{HNO}_3$
  - iv) Cr in  $(\text{Cr}_2\text{O}_7)^{2-}$
- b) Balance the following equation by oxidation number method:  
$$\text{HNO}_3 + \text{H}_2\text{S} \longrightarrow \text{NO} + \text{S} + \text{H}_2\text{O}$$
- c) What is  $\text{Sp}^3$  hybridization? Explain with suitable example.
- d) Draw the structures of the following
  - i)  $\text{TeCl}_4$
  - ii)  $\text{IF}_7$
  - iii)  $\text{XeO}_3$
  - iv)  $\text{ClF}_3$
- e) State the postulates of valence bond theory.
- f) What is primary standard and secondary standard? Explain with examples.

**Q5)** Solve any four of the following:

**[16]**

- a) 20 ml of the solution of NaOH contains 4 grams of the alkali per liter is exactly neutralized by 30 ml solution of  $H_2SO_4$  and 60 mL solution of HCl separately. Calculate the strengths of both acids in grams per liter.
- b) In an experiment, 400 ml of a gas at  $27^\circ C$  and 655 mm pressure weighed 0.568 grams. Calculate the molecular weight of the gas.
- c) Calculate the viscosity of the solution from the following data at  $20^\circ C$ .

	Toluene	Water
Density	$860 \text{ gm.dm}^{-3}$	$992 \text{ gm.dm}^{-3}$
time of flow	70seconds	100 seconds

Given: viscosity of water = 0.010 poise

- d) Calculate the wavelength and wave number of the first line in the Lyman series [Given  $R = 109677.6 \text{ cm}^{-1}$ ]
- e) Calculate the entropy change when one mole of an ideal gas is heated from  $70^\circ C$  to  $170^\circ C$  at constant pressure.  
[Given  $C_p = 7.88 \text{ cal.deg}^{-1}.\text{mole}^{-1}$ ]
- f) Find the wavelength of  $CO_2$  molecule at a velocity of  $540 \text{ ms}^{-1}$ .  
[Given:  $h = 6.625 \times 10^{-34} \text{ J.S}$ ]



Total No. of Questions : 5]

SEAT No. :

**P207**

[Total No. of Pages : 4

**[5522]-6**  
**F.Y. B.Sc.**  
**CHEMISTRY - II**  
**Organic and Inorganic Chemistry**  
**(2013 Pattern) (Theory Paper - II)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Draw neat diagrams wherever necessary.*
- 3) *Figures to right indicate full marks.*

**Q1)** Answer the following :

**[16]**

- a) Explain the term steric effect with suitable example.
- b) Draw Zig-Zag structure of the following
  - i) Cyclopropane
  - ii) 2-Propanol
- c)  $\pi$ -bond is weaker than  $\sigma$ -bond.
- d) Explain the following term :
  - i) Specific rotation
  - ii) Asymmetric carbon-atom.
- e) Amines have low M.P./B.P than alcohol. Explain.
- f) Size of Cation is smaller than its atom. Explain.
- g) Define :
  - i) Electronegativity.
  - ii) Ionisation Energy.
- h) Write the name and Electronic configuration of
  - i) Cl(17)
  - ii) Mg(12).

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

**[16]**

- a) Discuss the conformational isomerism in propane with energy profile diagram?
- b) What is Inductive effect? Give different types of Inductive effect? Why Acetic Acid is weaker acid than Formic Acid?

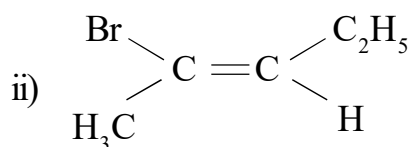
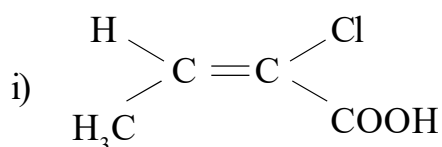
**P.T.O.**

- c) What are ethers? How they are classified? How will you prepare diethyl ether by Williamson synthesis?
- d) What is Ozonolysis? How will you prepare acetaldehyde and acetone from this reaction?
- e) What are carboxylic acids? How will you prepare acetic acid from
  - i) Acetonitrile
  - ii) Dry Ice.
- f) What are phenols? How they differ from alcohol? How will you prepare phenol from Aniline?

**Q3)** Attempt any four of the following :

**[16]**

- a) What are alkyl halides? How are they classified? What is the action of alcoholic KOH on 2-Bromobutane?
- b) Assign E or Z configuration of following :

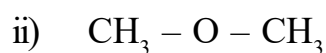
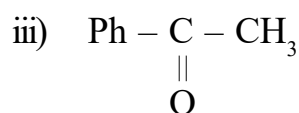
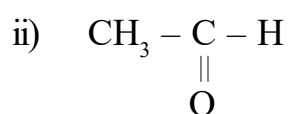
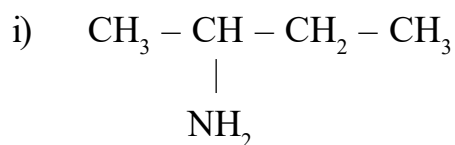


- c) What is hybridisation? Discuss the formation of methane molecule using concept of hybridisation?
- d) What are Amines? How will you prepare ethylamine from :
  - i) Methyl cyanide.
  - ii) Nitro ethane.
- e) Explain Cannizzaro's & Cross-Cannizzaro's reaction with suitable example?
- f) What are alkanes? How will you prepare n-Butane from
  - i) Ethyl Chloride
  - ii) 1-Butene.

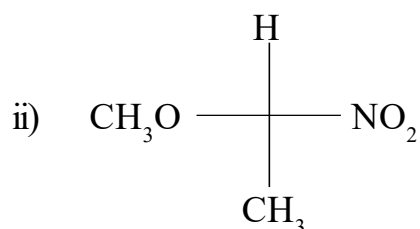
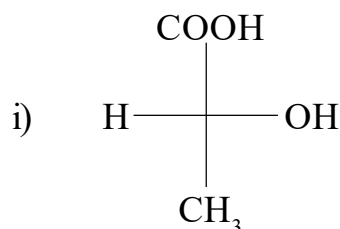
**Q4)** Attempt any four of the following :

**[16]**

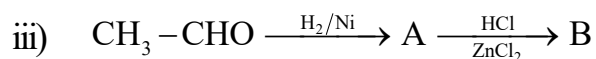
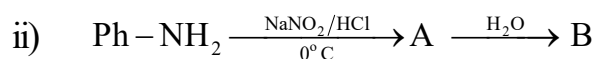
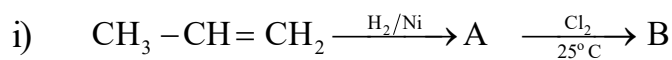
- a) Explain diagonal relationship between Li & Mg.  
b) Explain the Anomalous behaviour of Boron.  
c) Write short note on  
i) Aldol Condensation      ii) Markovnikoff's Rule.  
d) Give IUPAC names of following compounds.



- e) Assign R or S configuration of following compounds.



- f) Identify the products A and B & rewrite the reaction (any two) :



**Q5)** Attempt any four of the following :

**[16]**

- a) Give the names and write electronic configuration of group IA elements.
- b) What are Alkaline earth metals? Explain the trends in following properties of alkaline earth metals.
  - i) Ionisation potential.
  - ii) Reactivity.
- c) Draw the structures of 12-crown-4 ether and 15-crown-5-ether? Explain their use in separation of alkali metal?
- d) Explain the bonding & shape of  $\text{IF}_7$  molecule.
- e) Explain the following properties of group VA on the basis of their electronic configuration.
  - i) Size of atoms and ions.
  - ii) Electronegativity.
- f) Name the elements of IV A group and write their electronic configuration.





Total No. of Questions : 5]

SEAT No. :

**P208**

[Total No. of Pages : 2

[5522]-7

F.Y. B.Sc.

**BOTANY -I**

**BO-111: Fundamentals of Botany**  
**Plant Diversity, Morphology & Anatomy**  
**(2013 Pattern) (71410) (Paper - I)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Draw neat and labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt the following

**[16]**

- a) Define Algae.
- b) Write any two characters of cryptogams.
- c) What is plant diversity?
- d) Give any two characters of Fungi.
- e) Enlist any two characters of Dicotyledons.
- f) Define anatomy.
- g) Name any two elements of xylem.
- h) Define seed.

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

**[16]**

- a) Write symptoms of white rust disease.
- b) Comment on Foliose lichen.
- c) Write structure of sporangium in Nephrolepis.
- d) Explain structure of typical leaf.
- e) What is Fruit? Describe any one type of Fruits.
- f) Define Morphology and give its Importance in identification.

**P.T.O.**

**Q3)** Write short notes on any four of following:

**[16]**

- a) Asexual reproduction in Albuqol Cystopus.
- b) T.S. of rachis in Nephrolepis.
- c) Characters of Angiosperms.
- d) Tendrils.
- e) Functions of root.
- f) Papilionaceous corolla.

**Q4)** Answer any two of the following:

**[16]**

- a) Explain scalariform conjugation in spirogyra.
- b) Comment on internal structure of Riccia thallus.
- c) Describe any two types of cymose inflorescence.
- d) What are vascular tissues? Describe elements of phloem.

**Q5)** Describe structure of sporophyte and ovule of cycas.

**[16]**

OR

Describe internal structure of Dicot stem & leaf.

*EEE*

Total No. of Questions :5]

SEAT No. :

[Total No. of Pages : 2

**P210**

**[5522]-9**

**F.Y. B.Sc.**

**ZOOLOGY**

**ZY-101 : Animal Systematics And Diversity - I &II**

**(2013 Pattern) (Paper - I)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*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) Define/ Explain :**

**[16]**

- a) Binomial Nomenclature
- b) Gemmule
- c) Cyclosis
- d) Clitellum
- e) Cephalochordata
- f) Apoda
- g) Vocal sacs
- h) Neoteny

**Q2) Write short notes on (Any Four)**

**[16]**

- a) Diagnostic features of Kingdom Animalia.
- b) Trichocysts in Paramecium.
- c) Setae in Earthworm
- d) General characters of Urochordata.
- e) General characters of Pisces
- f) Functions of liver in Frog.

***P.T.O.***

**Q3)** Attempt the following (Any Four) : **[16]**

- a) State the distinguishing characters of Phylum Annelida.
- b) Sketch and label external structure of Paramecium.
- c) Describe spermatheca of Earthworm.
- d) General characters of Anura.
- e) Describe parental care in any two amphibians.
- f) Sketch and label V. S. of eye ball of Frog.

**Q4)** Attempt the following (Any Two) : **[16]**

- a) Describe the process of conjugation in Paramecium.
- b) Describe the central nervous system of Earthworm.
- c) Describe the internal structure of heart of Frog.
- d) Describe the female reproductive system of Frog.

**Q5)** Give an account of digestive system of Earthworm. Add a note on food and feeding. **[16]**

OR

Give an account of brain of Frog. **[16]**

