[5317] - 1

F.Y.B.Sc.

BIOTECHNOLOGY

Bb-101 : Fundamentals of Chemistry

(2013 Pattern)

Time : 3 Hours]   *[Max. Marks : 80*

Instructions to the candidates:

    1)   *All questions are compulsory.*

    2)   *All questions carry equal marks.*

    3)   *Figures to the right indicate full marks.*

    4)   *Neat diagrams must be drawn wherever necessary.*

    5)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

Q1) Answer the following: **[8×2=16]**

    a)   Distinguish between order and molecularity.

    b)   Define average velocity and root mean square velocity. How are they related to each other.

    c)   Define the terms

       i)   Mole fraction   ii)   Molarity

    d)   Explain the terms phase, component and degree of freedom in Gibb's phase rule.

    e)   State and explain Faraday's first law of Electrolysis.

    f)   Comment on feasibility of the given reaction by calculating the EMF of the cell. $H_2 + Zn^{2+} \rightarrow 2H^+ + Zn, E^0 = 0.76$ volts.

    g)   What are the reasons for compounds to exhibit isomorphism?

    h)   What is isomerism and how are they classified?

Q2) Answer the following (Any Four):   **[4×4=16]**

    a)   Give the difference between Sigma and pi bond.

    b)   Draw schematically the phase diagram for sulphur system and apply Gibb's phase rule.

    c)   Write a note on Abnormal molecular weight and Vant Hoff's factor.

    d)   Describe the help of neat diagram, Landsberger method for determination of molecular weight of solute.

e) What is second order reaction? Derive the expression for rate constant of second order reaction involving a single reactant.

f) 0.1 N solution of a salt surrounding two plates of electrodes 1 cm apart and $0.5cm^2$ in area was found to offer resistance of 475 ohms. Calculate the equivalent conductance of the solution.

Q3) Answer the following (Any Four): **[4×4=16]**

a) For a certain reaction the rate constant R is $2.86×10^{-8}sec^{-1}$ at 298 K and $4.65×10^{-8}sec^{-1}$ at 308K. Calculate the energy of activation of the reaction. Given R=1.987 cal/deg/mole.

b) What is depression in freezing point? Explain how depression in freezing point of solvent may be used to determine the molecular weight of dissolved substance.

c) State the rules to determine the oxidation number.

d) Give the types of substitution reaction and explain each type briefly (SN^1 and SN^2).

e) Draw a phase diagram of two components system and explain it, in which two components form a eutectic mixture.

f) Define the energy of activation and how to determine it by graphical method.

Q4) Answer the following (Any Two): **[2×8=16]**

a) What is hydrogen bonding? Explain the types of hydrogen bonding and its effect on physical as well as chemical properties.

b) Explain SN^1 and SN^2 reactions with suitable example. Give the mechanism and the intermediate steps in these reactions.

c) Derive an expression for EMF of the following cells.
   i) Chemical cell with transference.
   ii) Concentration cell without transference.

Q5) Answer the following (Any One): **[1×16=16]**

a) Give and explain the postulates of Kinetic theory of the gases and derive.

   Kinetic gas equation $E=\dfrac{3}{2}(nRT)$

b) What is isomerism? Give the classification of isomerism and explain each class briefly.

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[5317] - 101

S.Y.B.Sc.

BIOTECHNOLOGY

Bb-211 : Genetics & Immunology

(2013 Pattern) (Semester - 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 labelled diagrams wherever necessary.*

Q1) Answer the following: **[10×2=20]**

a) Define co-dominance with example.

b) What is autosomal recessive disease?

c) What is allopolyploidy?

d) What are hot spot mutation?

e) Enlist any four types of bacterial plasmid.

f) What is sex linked inheritance? Give one example.

g) Give genes and their products in arabinose operon.

h) Write cause and characters of Edward Syndrome.

i) What is competance?

j) State Hardy-Weinberg principle.

Q2) Answer the following: **[5×2=10]**

a) What are MHC?

b) Enlist any two factors responsible for antigenecity.

c) Give the role of Fc region.

d) Give application of aglutination reaction.

e) Justify Vaccine also called as artificial active immunity.

Q3) Attempt any three of the following: **[3×5=15]**

    a)   Write a note on pleotropism.

    b)   What is linkage? Describe Incomplete linkage with example.

    c)   Discuss the process of bacterial conjugation.

    d)   What is dosage compensation? Explain the Mechanism of dosage compensation.

Q4) Attempt any three of the following: **[3×5=15]**

    a)   Enlist chemical mutagenic agent. Explain mechanism of action of alkylating agent.

    b)   With the help of neat labelled diagram explain the mechanism of generalised transduction.

    c)   What is epistasis? Explain dominant epistasis with example.

    d)   Describe transposable element in maize and drosophilla.

Q5) Attempt any one of the following: **[1×10=10]**

    a)   Describe in detail catabolite repression in lac operon.

    b)   What are chromosomal aberration? Explain any two types of structural aberration with reference to their types mechanism and biological significance.

Q6) Attempt any two of the following: **[2×5=10]**

    a)   Explain the role of GALT, BALT & MALT in immune system.

    b)   Justify: The principal of ELISA and Western blot are one and same.

    c)   Describe the structure of antibody molecule. Add a note on its function.

    d)   Discuss type II hypersensitivity with example.

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[5317] - 102

S.Y.B.Sc.

BIOTECHNOLOGY

Bb-212 : Cell Biology

(2013 Pattern) (Semester - 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 labelled diagrams wherever necessary.*

Q1) Answer in brief: **[10×2=20]**

   a)   Give examples of cellular diversity.

   b)   Show differences between telophase - I & telophase - II of meiosis diagramatically.

   c)   Comment on role of MPF.

   d)   What are lipid rafts?

   e)   Give two examples of symport & antiport.

   f)   Enlist functions of smooth endoplasmic reticulum.

   g)   What is the role of centriole in cell division?

   h)   Define proto-oncogenes.

   i)   What are microfilaments.

   j)   Comment on caspases.

Q2) Short notes (Any three)   **[3×5=15]**

   a)   Peroxisomes.

   b)   Glycooalyx.

   c)   Facilitated diffusion.

   d)   Role of mitochondria in cell death.

Q3) Attempt any three   **[3×5=15]**

    a)   Comment on role of coat proteins in protein targetting.

    b)   Write a note on ligand gated channels.

    c)   Differentiate between active & passive transport with example.

    d)   Give the structure & function of mitochondria.

Q4) a)   Comment on structure & function of ABC transporters.   **[7]**

    b)   Give a detailed account on cell junctions.   **[8]**

<div align="center">OR</div>

    a)   Describe protein targetting to chloroplast.   **[7]**

    b)   Describe the events of mitosis.   **[8]**

Q5) a)   Explain C_4 pathway of carbon fixation.   **[7]**

    b)   Write a detailed note on plasma membrane receptors.   **[8]**

<div align="center">OR</div>

    a)   Explain the structure & function of Golgi apparatus.   **[7]**

    b)   Elaborate on 'Fluid - mosaic model' of plasma membrane.   **[8]**

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[5317] - 103

S.Y.B.Sc.

BIOTECHNOLOGY

Bb-213 : Environmental Biology and Biotechnology

(2013 Pattern) (Semester - 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 labelled diagrams wherever necessary.

Q1) Answer the following in short   **[20]**

　　a)　Define Ecosystem.

　　b)　What is hydrosere?

　　c)　Give monoclimex theory.

　　d)　Explain: Ecological efficiencies.

　　e)　What is acid rain.

　　f)　Explain energy budget.

　　g)　What is eutrification.

　　h)　What is integrated waste management?

　　i)　Define Pollution.

　　j)　Enlist disaster management plans.

Q2) Attempt any three of the following: **[15]**

　　a)　Give applications of remote sensing.

　　b)　Describe different layers of Atmosphere.

　　c)　Explain Anthropogenic factors affecting ecosystem.

　　d)　Describe phytogeography with respect to terrestrial habitat.

Q3) a) What is bio-remediation? Explain different types of bioremediation & give its significance. **[8]**

   b) Define hazardus wastes. Discuss the disposal of hazardous wastes. **[7]**

<div align="center">OR</div>

   a) Enumerate different methods of conservation. Add a note on role of bio technology in conservation. **[8]**

   b) Describe biotic and abiotic components of forest ecosystem. **[7]**

Q4) a) Describe in detail causes & effect of soil pollution. **[8]**

   b) Give an account of microbial biodegradation of plastic. **[7]**

<div align="center">OR</div>

   a) Describe different types of food chain and give its significance. **[8]**

   b) Elaborate environmental priorties in India. **[7]**

Q5) Write Short notes on (any three) **[15]**

   a) Biosensors.

   b) Forest conservation Act 1980.

   c) Ecosystem evolution.

   d) Carbon cycle.

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[5317] - 2

F.Y.B.Sc.

BIOTECHNOLOGY

Bb-102 : Fundamentals of Physics

(2013 Pattern) (Semester - 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 calculators is allowed.*

   4)   *Neat diagrams must be drawn wherever necessary.*

Q1) Attempt all of the following: [8×2=16]

   a)   State relationship between celcius and Fahrenhiet scales of temperature.

   b)   What is Poisson's ratio? What are its limits?

   c)   Explain Fresnel diffraction.

   d)   Define Pascal.

   e)   What is wettability of a liquid.

   f)   State Gauss's law in magnetism.

   g)   Define Beils.

   h)   Describe Carnot's heat engine.

Q2) Answer any four of the following: [4×4=16]

   a)   Write a note on relevance of viscosity in life sciences.

   b)   Describe Jaeger's method for determination of surface tension of liquid.

   c)   State different types of energies possessed by the liquid flow. Explain the concept of pressure energy of the liquid.

   d)   If the pressure on water of volume $8m^3$ is increased by $10^7N/m^2$, its volume decreases by $0.04m^3$. Determine compressibility of water.

   e)   Two organ pipes open at both ends sounding simultaneously produce 5 beats per second. If the smaller pipe is 66cm long then determine the length of the bigger organ pipe. (Speed of sound in air is 330 m/s).

   f)   Write a note on International System of Units.

Q3) Answer any four of the following: **[4×4=16]**

   a) State and explain Zeroth law of thermodynamics.

   b) Define entropy. Explain the change in entropy during a reversible cycle.

   c) Differentiate between polarized and unpolarized light.

   d) State and explain Coulomb's law of electrostatics. Express it in vector form.

   e) A current of 10 nA is established in a circular loop of radius 5 cm. Find the magnetic dipole moment of current loop.

   f) Consider interference between waves from two sources of intensities I and 4I. Find the intensities at points, where phase difference is

      i) Π ii) $\Pi/2$

Q4) Answer any two of the following: **[2×8=16]**

   a) With the help of suitable diagram, explain the principle, construction and working of a venturimeter. Derive the necessary formula.

   b) State Doppler effect. Give its applications.

      A train is travelling at a speed of 90 Km/h. The frequency of note produced by the whistle of train is 520 Hz. Find the frequency of sound heard by a stationary observer when the train approaches him. (Velocity of sound = 340 m/s.)

   c) i) Explain the role of physics in life sciences.

      ii) Explain why steel is more elastic than rubber.

   d) Describe capillary rise method to determine surface tension of liquid. Derive the necessary formula.

Q5) Answer any one of the following: **[2×8=16]**

   a) Explain the terms:

      i) Adiabatic change.

      ii) Isothermal change.

      iii) Isobaric change.

      iv) Isochoric change.

   b) Define coefficient of performance and efficiency of refrigerator. Obtain relation between them. A refrigerator works under reversible cycle between the temperatures 450°K and 600°K. Calculate:

      i) Thermal efficiency.   ii) Coefficient of performance.

<div align="center">OR</div>

[5317] - 2   **2**

a) What is the origin of energy bonds in the solid? What the help of energy bond diagram, distinguish between the conductors, insulators and semiconductors. A battery circulates 1000 µc charge per millisecond in the circuit. Find the value of current flowing through the circuit.

b) Define the following terms-

i)   Magnetism.

ii) Magnetic Intensity.

iii) Magnetic permeability.

iv) Magnetic susceptibility.

obtain the relation between $\bar{B}, \bar{M}$ and $\bar{H}$.

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[5317] - 201

S.Y.B.Sc

BIOTECHNOLOGY

Bb - 221: Molecular Biology

(2013 Pattern) (Semester - II)

Time : 3 Hours]   *[Max. Marks :80*

Instructions to the candidates:

    1)   *All questions are compulsory.*

    2)   *Draw neat labelled diagram wherever necessary.*

    3)   *Figures to the right indicate full marks.*

Q1) Answer in 2-3 Sentences: **[10 × 2 = 20]**

    a)   What is Z- form DNA?

    b)   Write the conclusions of Grifith experiment.

    c)   Define: Gene family.

    d)   What is heterochromatin?

    e)   What is genetic codes?

    f)   Role of helicases.

    g)   What is 'TATA box'?

    h)   What is silensor region?

    i)   Role of RNA Pol I.

    j)   Write two examples of inhibitors of transcription.

Q2) Write short notes on (any three)   **[3 × 5 = 15]**

    a)   Chloroplast genome organisation.

    b)   Degeneracy of codons.

c) Signal recognition particles (SRPs).

d) Histone proteins.

Q3) Answer the following (any three). **[3 × 5 = 15]**

a) Write a note on "Wobble Hypothesis".

b) Explain the structure of DNA polymerase III.

c) Give an account of post translational modification of profein.

d) Explain the process of protein transport to chloroplast.

Q4) Answer any one. **[1 × 15 = 15]**

a) Give a detail account of replication process in Eukaryotes.

OR

b) Explain in detail process of translation in prokaryotes.

Q5) a) Describe rho-indepent termination of transcription process in prokaryotes.
[8]

b) Write a note on DNA damage and repair. **[7]**

OR

a) Explain Arabinose operon as a mean of trancriptional regulation in prokaryotes. **[8]**

b) Give a detail account of non- coding RNAs in Eukaryotes. **[7]**

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[5317] - 202

S.Y.B.Sc.

BIOTECHNOLOGY

Bb - 222: Plant & Animal Development

(2013 Pattern) (Semester - II)

Time : 3 Hours]   *[Max. Marks :80*

Instructions to the candidates:

1) *All questions are compulsory.*

2) *Answers to the two sections should be written on separate answer sheets.*

3) *Draw neat diagrams wherever necessary.*

4) *Figures to the right indicate full marks.*

SECTION - I

Plant Development

Q1) Answer in 2-3 Sentences: **[5 × 2 = 10]**

  a)   Define endosperm.

  b)   What is determination & commitment?

  c)   Enlist any four genes involved in embryo development.

  d)   Define meristem.

  e)   Give role of tapetum.

Q2) Answer any four of the following: **[4 × 5 = 20]**

  a)   Elaborate dicot embryogenesis.

  b)   Explain significance of fucus as a model plant.

  c)   Write a note on organogenesis.

  d)   Double fertilization is unique feature of angiosperm. Justify.

  e)   Explain role of programmed cell death in plant development with suitable examples.

Q3) Attempt any one: **[1 × 10 = 10]**

    a)   Describe floral patterning in <u>Arabidopsis thaliana</u>.

    b)   Enumerate the process of female gametophyte development in plants.

SECTION - II

Animal Development

Q4) Answer the following: **[5 × 2 = 10]**

    a)   What is progenitor cell? Give its characteristics.

    b)   Explain importance of Grey crescent in frog.

    c)   Differentiate between radial & bilateral cleavage.

    d)   Draw neat labelled diagram of blastula.

    e)   What is morphallaxis?

Q5) Attempt the following (any 4):   **[4 × 5 = 20]**

    a)   Explain in detail about dedifferentiation & redifferentiation in animals.

    b)   What is gametogenesis? Explain the process of spermatogenesis.

    c)   Describe in brief cortical reaction & its significance.

    d)   How Anterio-posterior axis formation takes places in Drosophila?

    e)   Explain in detail theories of ageing.

    f)   Describe the cleavage patterns on the basis of quantity & distribution of yolk.

Q6) a)   Describe the process of formation of three germ layers in chick embryo.
                                                                                           [1 × 10 = 10]

<div align="center">OR</div>

    b)   Write a note on.   **[2 × 5 = 10]**

       i)   Neurulation in frog

       ii)   Teratogenesis

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S.Y.B.Sc.

BIOTECHNOLOGY

Bb - 223: Scientific Writing and Communication

(2013 Pattern) (Semester - II)

Time : 2 Hours]   *[Max. Marks :40*

Instructions to the candidates:

   1)   *All questions are compulsory.*

   2)   *Figures to the right indicate full marks.*

Q1) Answer in brief: **[5 × 2 = 10]**

   a)   Give two examples of commonly used prepositions.

   b)   What is a hypothesis?

   c)   Enlist any two Audio-visual aids used for presentation.

   d)   Define 'suffix' with two examples.

   e)   What are abbreviations? Give two examples.

Q2) Write short notes on (any 4):   **[4 × 5 = 20]**

   a)   Review article

   b)   Journal Impact factor.

   c)   Design of experiment.

   d)   Importance of t- test in data analysis.

   e)   Components and sequence of discussion in a research article.

   f)   Fluency and clarity in oral presentation.

P.T.O.

Q3) Attempt any one of the following: [1 × 10 = 10]

Write a detailed note on preparation of an effective written presentation.

OR

What is scientific reasoning? Explain inductive and deductive reasoning with examples.

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S.Y.B.Sc.

BIOTECHNOLOGY

Bb - 224 : Metabolic Pathways

(2013 Pattern) (Semester - II)

Time : 2 Hours]   *[Max. Marks :40*

Instructions to the candidates:

1) *All questions are compulsory.*

2) *Figures to the right indicate full marks.*

3) *Draw neat diagrams wherever necessary.*

Q1) Answer in 2-3 Sentences.   **[5 × 2 = 10]**

a)   What are ligases? Give one example.

b)   What do you mean by coupled biochemical reactions. Give one example.

c)   What are the energetics of ED Pathway?

d)   Write the significance of ketone bodies.

e)   Give the regulatory step in cholesterol synthesis.

Q2) Attempt any four.   **[4 × 5 = 20]**

a)   Discuss the energetics of glycolysis under aerobic and anaerobic conditions.

b)   Explain in brief the effect of competitive and non- competitive inhibitors on enzyme activity.

c)   How fatty acids are transported to mitochondria for β - oxidation.

d)   Describe in brief diagnestic value of plasma aminotransferases with reactions.

e) Explain sequence of events in cyclic photophosphorylation. Write a note on its significance.

f) Metabolic Pathways are integrated.Justify.

Q3) Attempt any one: [1 × 10 = 10]

a) Discuss in detail the reactions of glycogenesis and glycogenolysis.

b) Explain in detail biological Nitrogen fixation. Add a note on its significance.

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[5317] - 3

F.Y.B.Sc.

BIOTECHNOLOGY

Bb-103 : Basics of Plant & Animal Sciences

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

    1)   *Answer to the two section should be written in seperate answer books.*

    2)   *All questions are compulsory.*

    3)   *Neat diagrams must be drawn wherever necessary.*

    4)   *Figures to the right indicate full marks.*

Section - I

(Botany)

Q1) Answer the following questions: **[4×2=8]**

    a)   What is inflorence.

    b)   Define respiration.

    c)   Give functions of cell wall.

    d)   What is tuber? Give two examples.

Q2) Write short notes on (Any two):   **[2×4=8]**

    a)   Process of diffusion.

    b)   Draw the labeled diagram of internal structure of monocot root.

    c)   Photoperiodism.

Q3) Attempt the following (Any two):   **[2×4=8]**

    a)   Photomorphogenesis.

    b)   Phytohormone.

    c)   Modifications of roots.

Q4) Answer in detail (Any two): [2×8=16]

    a) What is ascent of Sap? Explain the Mechanism of water absorphon with suitable diagram.

    b) Explain in detail photophosphorylation.

    c) Give general characters of gymnosperms.

Section - II
(Zoology)

Q5) Answer the following questions: [4×2=8]

    a) Give two examples of Phylum Arthropoda.

    b) Enlist any two hormones of the Anterior Pituitary Gland.

    c) Mention 2 characteristics of Mammals.

    d) Give two examples of neurotransmitters.

Q6) Write short notes on (Any two): [2×4=8]

    a) Structure and Function of Epithelial tissue.

    b) Social organization in Honey bees.

    c) Sense organs of Frog.

Q7) Attempt the following: (Any 2) [2×4=8]

    a) Write a short note on factors effecting O_2-dissociation curves.

    b) Describe the structure of Frog heart.

    c) Write a note on Parasitic adaptations of Taenia.

Q8) Answer the following: (Any 2) [2×8=16]

    a) Describe the structure and Function of Adrenal gland.

    b) What is Vermiculture? Explain the method of Vermiculture.

    c) Give an account on the life cycle of Plasmodium vivax.

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[5317] - 301

T.Y.B.Sc.

BIOTECHNOLOGY

Bb-331 : Microbial Biotechnology

(2013 Pattern) (Semester - III)

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 all the following in 2-4 lines: **[20]**

a) What are the contributions of Louis Pasteur and Robert Koch in Microbial Biotechnology.

b) What is Yield coefficient?

c) Enlist any two indicator organisms of faecal pollution.

d) What is Kefir?

e) Name the dyes present in EMB agar.

f) Give two examples of microbial sweetners.

g) Name the causative agent and diagnostic test of typhoid.

h) What is stormy fermentation?

i) What is ropiness?

j) Pseudomonas was cultured in production medium containing 12 g/L glycerol as substrate. After 24 hours, only 2 g/L glycerol was found in residual broth and 5 gm biomass was recovered. Calculate Yx/s.

Q2) Attempt the following questions (any three):   **[15]**

a) Explain the molecular adaptations in halophiles.

b) Describe the color and flavor defects of milk.

c) Describe any two methods of Enzyme Immobilisation.

d) Explain Kinetics of product formation in Batch culture.

P.T.O.

Q3) Write short notes on (any 3): **[15]**

    a)   Added and Developed Preservatives.

    b)   Microbial Biofertilisers.

    c)   Presumptive Test.

    d)   Idli and Dhokla as fermented food.

Q4) a)   Explain food intoxication and infection with suitable examples. **[8]**

<div align="center">OR</div>

    Describe grading of milk using Dye reduction test.

    b)   With the help of flowsheet, explain the production of Beer. **[7]**

<div align="center">OR</div>

    Explain Slow and Rapid sand filtration with the help of neat labelled diagram.

Q5) Attempt any one of the following: **[15]**

    a)   Discuss the disease polio with respect to

        i)   Causative agent.

        ii)   Symptoms.

        iii)   Pathogenesis and

        iv)   Treatment.

    b)   Enlist different Biological waste water treatment processes. Explain any two in detail.

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[5317] - 302

T.Y.B.Sc.

BIOTECHNOLOGY

Bb-332 : Plant & Animal Tissue Culture

(2013 Pattern) (Semester - III)

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) *Answer to each section should be written in separate answer books.*

Section -I

Plant Tissue Culture

Q1) Answer in brief **[5×2=10]**

    a) Explain the term redifferentiation?

    b) What are somaclonal variations?

    c) Enlist two applications of embryo culture.

    d) What are cybrids?

    e) What is acclimatisation of tissue culture plants?

Q2) Attempt any four: **[4×5=20]**

    a) Write a short note on endosperm culture.

    b) Give a brief account of the role of various components of a standard plant tissue culture medium on plant growth in vitro.

    c) Describe the various applications of plant tissue culture.

    d) What are protoplasts? How are they isolated?

    e) What is meristem culture? What are the advantages of their type of a technique?

    f) Explain the role of plant growth regulators on morphogenesis in in vitro cultures.

P.T.O.

Q3) Attempt any one: **[1×10=10]**

a) What are suspension culture? How are they initiated? Describe the various applications of suspension culture.

OR

a) Differentiate between direct and indirect organogenesis. Describe the various factors affecting organogenesis. Add a note on the applications of organogenesis as a plant tissue culture technique.

Section - II
Animal Tissue Culture

Q4) Answer the following in 3-4 lines **[5×2=10]**

a) Define feeder layers.

b) Organic material should not be kept in laminar air flow cabinet when UV is switched on. State true of false & Justify.

c) Why is inverted microscope preferred in ATC?

d) Explain why cell cultures should be regularly checked for mycoplasma contamination.

e) What are optimal growth conditions for mammalian cell cultures?

Q5) Answer the following (Any 4): **[4×5=20]**

a) Write the characteristics of transformed and neoplastic cell lines.

b) Write a note on minerals and organic components of ATC medium.

c) What is a primary culture? Explain a suitable method to establish chick embryo fibroblast culture.

d) Write a note on need for cryopreservation of cells. Also comment on role of cryoprotectants during cell preservation.

e) Define vital stain. Add a note on its application in ATC.

f) Write a note on routine maintenance of cell lines in vitro.

Q6) What is organ culture? Enlist different methods to establish organ culture. Explain advantages and disadvantages of organ culture. **[1×10=10]**

OR

Q6) Describe any two methods for characterization of a cell line and explain importance of it. **[1×10=10]**

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[5317] - 303

T.Y.B.Sc.

BIOTECHNOLOGY

Bb-333 : Biodiversity and Systematics

(2013 Pattern) (Semester - III)

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.*

Q1) Answer the following in short (2-3 sentences)   **[10×2=20]**

    a)   Define ecosystem diversity with example.

    b)   What is biome?

    c)   Define Habitat.

    d)   Enlist any four organizations for conservation.

    e)   Define allopatric speciation.

    f)   What is imprinting?

    g)   Define mutualism.

    h)   What is systematics.

    i)   Enlist Biodiversity databases.

    j)   What is species eveness?

Q2) Write short notes on (any three):   **[3×5=15]**

    a)   Population size and density.

    b)   Rio conference.

    c)   Prey - Predator dynamics.

    d)   Three domain system of classification.

Q3) Answer the following (any three):   [3×5=15]

   a)   Explain ecological and genetic perspectives of biodiverstiy.

   b)   Give an account of aquatic biome.

   c)   Elucidate concept of niche with example.

   d)   Describe types of population age structure.

Q4) a)   Enlist various methods of Ex-situ conservation and describe any two of them with examples.   [8]

   b)   Explain Mathematical model of logistic growth.   [7]

                                OR

   a)   Mention in brief conservation policies, laws in India.   [8]

   b)   Molecular techniques have brought revolution in classification. Justify.[7]

Q5) Write short notes on (any three)   [3×5=15]

   a)   Santvaries.

   b)   Biodiversity of domesticated animals.

   c)   Innate behavior.

   d)   Diversity Indices.

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F.Y.B.Sc (Biotechnology)

MATHEMATICS & STATISTICS

Bb - 104 : Mathematical and Statistical Methods for Biologists

(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)   Use of non-programmable scientific calculator is allowed.

4)   Solve each section on separate answer paper.

<u>SECTION - I</u>

(Mathematics)

Q1) Attempt each of the following.   **[4 × 2 = 8]**

a)   If $A = \begin{bmatrix} 1 & -7 & 5 \\ 2 & 3 & -4 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 1 \\ -2 & -1 \\ 0 & 1 \end{bmatrix}$,

   Find determinant of the matrix AB. Is AB invertible?

b)   If $x = \dfrac{1+i}{2}$, Find real and imaginary parts of $x^4 + x^2 + 1$.

c)   Is the set $\{(1, -2), (-3, 6)\}$ dependent in $\mathbb{R}^2$? Justify.

d)   Discuss the convergence of the series $\sum\limits_{n=0}^{\infty} \left(\dfrac{n}{2n+3} \right)$.

Q2) Attempt any four of the following. [4 × 4 = 16]

a) Solve the following system of linear equations.

$x + y + 2z = 8$

$-x - 2y + 3z = 1$

$3x - 7y + 4z = 10$

b) Show that the following differential equation is exact. Hence find its solution.

$(y^2 - 2xy + 6x) \, dx - (x^2 - 2xy + 2) \, dy = 0$

c) For any $z_1, z_2 \in \mathbb{C}$, show that

$$|z_1 + z_2|^2 + |z_1 - z_2|^2 = 2|z_1|^2 + 2|z_2|^2$$

d) Show that the set $W = \{(x, y) \in \mathbb{R}^2 \mid x - 2y = 0\}$ is a subspace of $\mathbb{R}^2$.

e) Use $\in$ - definition to prove that

$$\lim_{n \to \infty} \left(\frac{n+1}{2n+3} \right) = \frac{1}{2}$$

f) If $u = (x^2 + y^2 + z^2)^{-\frac{1}{2}}$, show that

$$\left(\frac{\partial u}{\partial x} \right)^2 + \left(\frac{\partial u}{\partial y} \right)^2 + \left(\frac{\partial u}{\partial z} \right)^2 = u^4.$$

Q3) Attempt any two of the following. [2 × 8 = 16]

a) i) Explain the method of solving the differential equation

$$\frac{dy}{dx} + P \, y = Q,$$

Where P and Q are functions of x only.

ii) Solve $\dfrac{dy}{dx} + 2xy = 2e^{-x^2}$.

b) Prove that the sequence

$$x_n = \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \dots + \frac{1}{n!} \text{ is convergent.}$$

c) i) Find rank of the following matrix

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \end{bmatrix}$$

ii) Find eigenvalues and eigenvectors of the matrix $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$.

d) Find the extreme values of the function $f(x, y) = xy + \dfrac{50}{x} + \dfrac{20}{y}$.

SECTION - II

Q4) Attempt each of the following.   **[4 × 2 = 8]**

a) State the classical definition of probability.

b) Explain the term variance.

c) Define poisson distribution.

d) An integer is chosen at random from 1 to 100. Find probability that number is not divisible by 'g'.

Q5) Attempt any four of the following.   **[4 × 4 = 16]**

a) Four cards are drawn at random from a well shuffled pack of 52 cards. Find probability that

i) all cards are of same suit

ii) all cards are of different suits.

b) State merits and demerits of mode.

c) Write short note on normal distribution

d) State the properties of correlation coefficient

e) Define

i) type I error

ii) type II error

f) Find quartile deviation for given data

12,10, 9, 4, 1, 5, 7, 8, 3, 2, 6,11.

Q6) Attempt any two. **[2 × 8 = 16]**

a) Explain with illustration.

    i) Independence of two events.

    ii) Conditional probability of two events

    iii) Probability of an event.

b) Compute standard deviation and coefficient of variation for following frequency distribution

Class	0-10	10-20	20-30	30-40	40-50
frequency	5	15	25	18	12

c) Explain the technique of one way ANOVA

d) Calculate coefficient of correlation by using given data:

$n = 7$, $\Sigma x = 349$, $\Sigma y = 366$, $\Sigma xy = 20343$, $\Sigma x^2 = 19753$,

$\Sigma y^2 = 21100$

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T.Y.B.Sc.

BIOTECHNOLOGY

Bb - 341 : Large Scale Manufacturing Process

(2013 Pattern) (Semester - IV)

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 in 2-3 lines: **[10 × 2 = 20]**

a) What is Dummy variable?

b) Define Del factor.

c) Give functions of baffles.

d) What is whole broth processing?

e) Enlist any 2 culture collection centres for industrially important micro-organisms.

f) What is Fed - batch fermentation?

g) Give the function of steam value.

h) What is amortization?

i) Explain scale - up.

j) What is the application of LAL Test.

Q2) Write short notes on (any three).   **[3 × 5 = 15]**

a) Medium optimisation

b) Non - Mechanically agitated fermentors (any one).

c) Methods of strain Improvement.

d) Batch sterilisation.

Q3) Attempt <u>any</u> <u>three</u> from the following: **[3 × 5 = 15]**

   a)   Biotransformation of steroids.

   b)   Applications of computers in Bioprocess.

   c)   Physical cell disruption methods used in product recovery.

   d)   Different types of rheologies of fermentation media.

Q4) a)   Explain the measurement and control of P^H and temperature in fermentation process. **[7]**

<div align="center">OR</div>

       Give the principle of filtration. Describe the types of filters used in sterilization of media and air.

   b)   What is $K_L a$? Describe any two factors affecting mass transfer in a fermentation process. **[8]**

<div align="center">OR</div>

       Enlist the different types of chromotographic methods used in product recovery. Add a note on the principle of gel filtration chromotography an its application in recovery.

Q5) Explain with the help of neat labelled diagram, the large scale manufacturing process and recovery of a secondary metabolite. **[15]**

<div align="center">OR</div>

With the help of neat labelled diagram, Explain the construction and different parts of a classical submerged fermentor.

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T.Y.B.Sc.

BIOTECHNOLOGY

Bb - 342 : Biochemical and Biophysical Techniques

(2013 Pattern) (Semester - IV)

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 all the following in 2-4 lines: **[20]**

    a)   What are strong electrolytes.

    b)   What are chromophores in proteins.

    c)   What is meant by dark field microscopy.

    d)   What is the basic principle of sedimentation.

    e)   What is hyperchromic shift.

    f)   What is fluorescence.

    g)   What are biological buffers.

    h)   What is the relation between wavelength & frequency.

    i)   What is retention time in chromatography.

    j)   State Lambert's law.

Q2) Attempt the following questions (any three).   **[3 × 5 = 15]**

    a)   What is partition chromatography? Explain the principle of HPTLC and give its application.

    b)   What is NATIVE Gel electrophoresis? How does it differ from SDS PAGE.

    c)   Explain the principle of UV Visible Spectroscopy. Distinguish between a colorimeter and a spectrophotometer.

P.T.O.

d) What are buffers? Explain the significance of biological buffers in the living system.

Q3) Write short notes on any three: **[3 × 5 = 15]**

    a) Agarose Gel Electrophoresis.

    b) Anion Exchange chromatography.

    c) Inverted Microscopy.

    d) Thin Layer chromatography.

Q4) a) What is phase contrast microscopy. Explain the principle, working and applications of phase contrast microscopy. **[8]**

    b) What is lab safety. Explain the various precautions taken in a laboratory during experimentation. **[7]**

<div align="center">OR</div>

    a) What is affinity chromatography? Give its principle and applications.**[8]**

    b) What is preparative centrifugations. Give a detailed account of density gradient centifugation. **[7]**

Q5) Attempt any one. **[15]**

    a) What is ultra centrifugation. Give an account of rotor types. Explain the care maintenance and safety procedures to be taken in a laboratory set up.

    b) Discuss Spectroscopy with respect to-

        i) Absorption and Transmission.

        ii) Emission spectra.

        iii) EMR radiation and its interaction with matter.

        iv) Chromophores.

        v) Detectors.

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T.Y.B.Sc.

BIOTECHNOLOGY

Bb - 343 : Recombinant DNA Technology

(2013 Pattern) (Semester - IV)

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) Answer the following in 2-4 lines: **[20]**

   a)   Mention the use of tris buffer & EDTA during nucleic acid purification.

   b)   What are type I restriction endonucleases.

   c)   What are properties of a vector used in RDT?

   d)   What are adapters? Write any 1 application of them.

   e)   Write any two guidelines for the use of recombinant DNA.

   f)   How does A_{260}: A_{280} ratio help in determining purity of DNA?

   g)   Write any two applications of genetic engineering.

   h)   Define cDNA library.

   i)   What are DIG - labelled probes?

   j)   Explain activity of RNA ase A.

Q2) Write short notes on (any 3).   **[3 × 5 = 15]**

   a)   Structure and applications of P^{BR}.

   b)   Factors affecting efficiency of transformation.

   c)   Strategies to avoid genomic DNA contamination while isolating plasmid DNA.

   d)   Genome Mapping.

Q3) Write short notes on: (Any 3)   **[3 × 5 = 15]**

    a)   Artificial chromosomes.

    b)   Different Polymerases used in RDT.

    c)   Structure of dCTP & dGTP (Draw and label each structure).

    d)   Blue - White screening.

Q4) a)   Describe the steps for construction of genomic library. Also mention applications of genomic library.   **[7]**

    b)   Define mutagensis. Describe any one method of site directed mutagenesis. Add a note on applications.   **[8]**

<div align="center">OR</div>

    a)   Elaborate on strategy for RNA isolation and purification.   **[7]**

    b)   Write a note on northern blotting.   **[8]**

Q5) a)   Give a detailed account of sanger's DNA sequencing Method.   **[15]**

<div align="center">OR</div>

    b)   Compare and contrast between the techniques of PCR & RT. PCR.**[15]**

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F.Y.B.Sc.

BIOTECHNOLOGY

Bb : 105 - Fundamentals of Biological Chemistry

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks :80*

Instructions to the candidates:

1) *All questions are compulsory.*

2) *Draw neat labelled diagram wherever necessary.*

3) *Figures to the right indicate full marks.*

Q1) Attempt all of the following. **[8 × 2 = 16]**

a) Calculate the P^H of 0.001 M NaoH

b) What are holoenzymes.

c) What is Handeryon Hasselbalch equation? Give it's importance.

d) Draw structure of citidylate.

e) Name the coenzyme form of Vit B_6 and give any one role of it.

f) What do you mean by ionic product of water.

g) Define reducing sugars. Give at least one example.

h) Phospholipids are amphipathic in nature? Justify.

Q2) Attempt Any Four of the following. **[4 × 4 = 16]**

a) Discuss the important physiological functions of proteins.

b) Describe induced fit hypothesis and lock and key model with respect to binding of substrate to enzyme.

c) Explain the functions of coenzymes form of Vit B_2 and Vit B_7.

d) Enlist the types of RNA. Discuss various structural features of each.

P.T.O.

e) Write an account on peptidoglycan matrix.

f) Define - i) Redox reaction

           ii) Energy of activation

Q3) Attempt any four of the following.   **[4 × 4 = 16]**

a) Define allosteric enzymes. Write a note on feed back inhibition.

b) Discuss the similar and distingushing features of glycogen and amylopectin.

c) Explain physiological functions of lipids.

d) Show hydrogen bonding between adenylate and Thymidylate and write salient features of Z form of DNA.

e) Elaborate the findings of pauling and corey with respect to peptide bond.

f) Write a note on folic acid and cyanocobalamine.

Q4) Attempt any two of the following.   **[2 × 8 = 16]**

a) Discuss the classification of polysacchrides based on it's function. Discuss in detail at least one example of each class.

b) Explain in detail protein sequencing by Edman's method.

c) Write in detain regarding various covalent and non-covalent interactions which stabilize Nucleic acid.

Q5) Attempt any one of the following.   **[1 × 16 = 16]**

a) Classify amino acids based on their 'R' groups.

<div align="center">OR</div>

b) Discuss- i) First three classes of Enzymes given in IUB Enzyme classification system

           ii) Detail classification of lipids.

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F.Y.B.Sc.

[BIOTECHNOLOGY]

Bb : 106 - Biophysics and Instrumentation

(2013 Pattern) (Semester - 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 scientific claculator is allowed.*

Q1) Attempt all of the following.   **[8 × 2 = 16]**

    a)   State Bohr's first postulate.

    b)   What is electromagnetic spectrum?

    c)   What is half life of radio - active element?

    d)   Name any two instruments used as radiation detector.

    e)   Enlist any two types of thermometer.

    f)   What is A.A.S.?

    g)   Enlist basic types of microscope.

    h)   State Pauli's exclusion principle.

Q2) Attempt Any Four of the following.   **[4 × 4 = 16]**

    a)   Derive the relation between radius of Bohr's orbit and principle quantum number.

    b)   Give principle, construction and working of flurometer.

    c)   Write the properties of α, β & r = rays.

P.T.O.

d) Write a note on clinical thermometer.

e) Explain Bohr - Sommerfeld model.

f) Define P^H and P^{OH}. Write the relation between P^H and P^{OH} which indicate different degree of aqueous solution.

Q3) Attempt Any Four of the following. **[4 × 4 = 16]**

a) Explain construction and working principle of the compound microscope.

b) Explain RCF and sedimentation concept in centrifuge.

c) Write a note on a membrane potential.

d) Why body temperature regulation is important, explain.

e) Using Rydberg's formula calculate wavelength of first and second spectral line of hydrogen spectrum in Lyman series.

   [Given $R=1.09678 \times 10^7$ m^{-1}]

f) Calculate the time required for 10% of a sample of thorium to disintegrate. Assume half life of thorium to be 1.4×10^{10} years.

Q4) Attempt any two of the following. **[2 × 8 = 16]**

a) Explain vector atom model.

b) Explain GM counter.

c) Describe SEM.

d) Write the application of electromagnetic spectrum in any four regions.

Q5) Attempt any one of the following. **[1 × 16 = 16]**

a) What are radioactive isotopes? Give its biological applications.

b) Define aberrations of microscope & explain following two types of aberrations.

   i) Chromatic aberration.

   ii) Spherical aberration.

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F.Y.B.Sc

BIOTECHNOLOGY

Bb - 107 : Microbiology

(2013 Pattern)

Time : 3 Hours]   *[Max. Marks :80*

Instructions to the candidates:

  1)   *All questions are compulsory.*

  2)   *Draw neat labelled diagram wherever necessary.*

  3)   *Figures to the right indicate full marks.*

Q1) Answer the following.   **[8 × 2 = 16]**

  a)   Enlist contribution of Louis Pasteur.

  b)   What is oligodynamic action of heavy metal?

  c)   What is prophage?

  d)   Why do we add peptone in nutritional media

  e)   What is importance of fixation step in microbial staining technique? give 2 examples of fixatives.

  f)   Enlist safety precautions one should take while disposing microbial cultures.

  g)   Write any 4 distinguishing characters of fungi.

  h)   State importance of preservation of microbial cultures.

Q2) Attempt Any 4 of the following.   **[4 × 4 = 16]**

  a)   Justify: Mc cenkey's agar is selective and differential media.

  b)   Explain biofilm formation in micro organism.

  c)   Give contribution of Robert Koch to microbiology.

P.T.O.

d) Give mode of action of U.V. light on micro-organism and give its uses.

e) With neat labelled diagram explain structure of bacterial endospore.

f) Write principle and method of cell wall staining.

Q3) Write self explainatory note on any four of the following.   **[4 × 4 = 16]**

a) Microbe - Microbe interaction.

b) Classification of Bacteria on the basis of O_2 requirement.

c) Turbidometric measurement of microbial growth.

d) Biogenesis vs Abiogenesis.

e) Archaebacteria.

f) Hot air oven.

Q4) Attempt any two of the following.   **[2 × 8 = 16]**

a) Explain in detail principle and significance of Gram staining.

b) Explain pure culture technique with schematic representation.

c) Justify: Microorganisms are biologically complex.

Q5) With neat labeled diagram explain lytic cycle of Bacteriophage.   **[16]**

OR

Describe in detail different types of bacteria on the basis of nutritional requirment.

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[5317] - 8

F.Y.B.Sc.

BIOTECHNOLOGY

Bb-108 : Computers and Applications

(2013 Pattern) (Semester - 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 all of the following: **[8×2=16]**

    a)   What is an Information?

    b)   What is a Computer virus?

    c)   List the types of graphs available in Ms-Excel.

    d)   State True/False:

        i)   Co-axial cable has more EMI than unshielded twisted cable.

        ii)   Unix is multiuser, single tasking operating system.

    e)   What is secondary memory? Give example of it.

    f)   List different types of computers based on processing speed.

    g)   What is ALU? Give its function.

    h)   List various functions of operating system.

Q2) Attempt any four of the following: **[4×4=16]**

    a)   Discuss various generations of computers.

    b)   What is DBMS? Give its advantages over file system.

    c)   What is an input device? Explain working of optical mouse.

    d)   Define computer network. Also discuss goals of computer network.

    e)   What is Mail-Merge? Write steps involved in creating Mail-Merge.

Q3) Attempt any four of the following: **[4×4=16]**

a) Explain use of toolbar. Also discuss toolbar of Ms-Word.

b) List various cables used in computer networking. Explain any one in detail.

c) Explain any four Linux commands.

d) What is a biological database? Give their importance.

e) What is a search engine? Write a short note on Google Search Engine.

Q4) Attempt any two of the following: **[2×8=16]**

a) Define an operating system. Discuss various types of operating systems.

b) Draw neat block diagram of computer. Explain different components of it.

c) What is a Data model? Also discuss

   i) Network Model.

   ii) Relatienal Model.

Q5) Attempt the following: **[2×8=16]**

a) Write an algorithm and flow chart for adding all even numbers between n_1 & n_2.

OR

Write an algorithm and flow chart for checking whether number is an V Armstrong number or not.

b) What is a flow-chart? Discuss different flowchart symbols. Also draw flowchart to find factorial of a number.

OR

What is a network topology? Discuss any three topologies in detail.

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