

**CREDIT BASED FIRST SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018
PHYSICS**

Paper I: Mathematical Physics, Properties of Materials and Relativity

Duration: 3 Hrs.

Max. Marks: 80

PART – A

1. Answer any TWELVE of the following: 12×1=12
- i) Define instantaneous velocity of a moving body.
 - ii) What is a complex number?
 - iii) Is velocity of light a vector or a scalar?
 - iv) Write the differential equation describing the motion of a pendulum of length ' ℓ '.
 - v) What are the types of differential equation?
 - vi) What is the effect of impurity on elasticity?
 - vii) What is the dimensional equation of Coefficient of viscosity?
 - viii) What is a fictitious force?
 - ix) Define rest mass.
 - x) What is a cantilever?
 - xi) What is the difference between cohesive and adhesive force?
 - xii) What is the SI unit of elasticity?
 - xiii) Give an example for inertial frame of reference.
 - xiv) Write Einstein's mass-energy relation.
 - xv) Give the expression for the variation of mass with velocity.

PART – B

UNIT – I

- Answer any Two of the following: 8×2=16
2. a) Show that power is a Scalar quantity.
 - b) What is a second order differential equation? Give an example. Write the differential equation for simple harmonic oscillator and find its solution. (2+6)
 3. a) Define dot product of two vectors and discuss the main characteristics of its product.
 - b) Write the first order differential equation and find its solution by direct integration and separating the variables methods. (2+6)
 4. a) Represent $(4 + j5)$ and $(8 - j9)$ on Argand diagram.
 - b) Obtain expressions for radial and transverse velocity and accelerations of a particle. (2+6)

UNIT – II

- Answer any TWO of the following: 8×2=16
5. a) Why is it easier to spray soap solution than water?
 - b) Obtain the relation between the elastic moduli in the case of isotropic solid. (2+6)
 6. a) What is velocity gradient? Explain.
 - b) Define surface tension. Give the molecular theory of surface tension with diagram. (2+6)
 7. a) Which is more elastic, steel or rubber? Explain.
 - b) Using Stoke's method, derive an expression for the terminal velocity of the liquid. (2+6)

UNIT – III

Answer any TWO of the following:

8×2=16

8. a) Show that velocity is no invariant to Galilean transformation.
b) Write Lorentz transformation equations and obtain an expression for time dilation. (2+6)
9. a) State the postulates of special theory of relativity.
b) Enunciate the laws of conservation of momentum and conservation of energy and show that they are both invariant to Galilean transformation. (2+6)
10. a) Obtain classical velocity addition theorem using two inertial frames.
b) Write a note on Gravitational red shift. (2+6)

PART – C

Answer any Four of the following:

4×5=20

11. $\vec{A} = 5t^2\hat{i} + t\hat{j} - t^3\hat{k}$ and $\vec{B} = \sin t\hat{i} - \cos t\hat{j}$, find (i) $\frac{d}{dt}(\vec{A} \cdot \vec{B})$ (ii) $\frac{d}{dt}(\vec{A} - \vec{B})$.
12. If $\vec{Z}_1 = 3 - j4$ and $\vec{Z}_2 = -4 - j3$ find $\vec{Z}_1 \cdot \vec{Z}_2$ and $\vec{Z}_1 \times \vec{Z}_2$ and the acute angle between the two vectors.
13. What couple must be applied to a wire one meter long, 1mm in diameter in order to twist one end of it, through 90°, the other end remaining fixed. Rigidity of material of the wire is $2.8 \times 10^{10} \text{ Nm}^{-2}$.
14. Calculate the excess pressure inside a soap bubble of radius $3 \times 10^{-3} \text{ m}$. Surface tension of soap solution is $20 \times 10^{-3} \text{ N m}^{-1}$. Also calculate surface energy.
15. In the laboratory, the life-time of particle moving with speed $2.8 \times 10^8 \text{ m s}^{-1}$ is found to be $2 \times 10^{-7} \text{ s}$. Calculate the proper life- time of the particle.
16. Calculate the velocity at which electron mass is $\sqrt{3}$ times the rest mass.

CREDIT BASED THIRD SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018
PHYSICS

Paper III: Acoustics and Optics

Duration: 3 Hrs.

Max. Marks: 80

PART – A

1. a) **Answer any TEN of the following:** **10×1=10**
- i) Define quality factor.
 - ii) What is the condition for resonance in mechanical system?
 - iii) Give the expression for the velocity of sound in air.
 - iv) What causes noise pollution?
 - v) What are coherent sources?
 - vi) Why do we observe colors on soap bubbles?
 - vii) What is the shape of the wave front emitted from a point source of light?
 - viii) What are Newton's rings?
 - ix) What is a diffraction grating?
 - x) Define resolving power.
 - xi) Define isotropic crystal.
 - xii) What is optical activity?
- b) **Answer any FIVE of the following:** **5×2=10**
- i) Distinguish between forced and resonant vibrations.
 - ii) State the laws of transverse vibrations of string.
 - iii) Mention the conditions for constructive and destructive interference in terms of path difference.
 - iv) Draw a neat diagram of Michelson interferometer and label its parts.
 - v) Give any two differences between Fresnel's and Fraunhofer's diffraction.
 - vi) Define plane of vibration and plane of polarization.

PART – B
UNIT – I

- Answer any TWO of the following:** **2×10=20**
2. a) What is simple harmonic motion? Give example. Derive an expression for the displacement of simple harmonic oscillator.
- b) A plane wave travelling through a medium is given by $y = 0.02e^{(2\pi t - 0.04\pi x)}$ meters. Calculate the wavelength and frequency. **[6 + 4]**
3. a) What are damped oscillations? Set up the equation for displacement of damped oscillations of a vibrating body.
- b) A simple pendulum has a time period of 1s and an amplitude of 10° . After 10 complete oscillations its amplitude is reduced to 5° . What is the relaxation time of the pendulum and quality factor? **[6 + 4]**
4. a) Derive an expression for velocity of longitudinal waves in a fluid.
- b) A wire of area of cross section 0.8 square mm is stretched by a weight of 15kg. Compare its frequencies in the fundamental mode of longitudinal vibrations and of transverse vibrations. Given $q = 1.8 \times 10^{11} \text{ Nm}^{-2}$. **[6 + 4]**

UNIT – II

Answer any TWO of the following:

2×10=20

5. a) What is interference of light? Describe Young's double slit experiment to demonstrate the phenomenon of interference of light.
b) Light of wavelength 589.3nm from a narrow slit is incident on a double slit. The screen is placed 2m away and the width of 25 fringes on the screen is measured as 0.02m. Calculate the slit separation. [6 + 4]
6. a) Explain the interference due to a wedge shaped film and obtain expression for fringe width.
b) A biprism is placed at a distance of 5cm in front of a narrow slit illuminated by sodium light of wavelength 589nm and the distance between the two virtual sources is found to be 0.05cm. Find the width of the fringes observed in an eyepiece placed at a distance of 0.75m from the biprism. [6 + 4]
7. a) Deduce an expression for diameter of dark and bright ring using Newton's rings and hence find the spacing between consecutive dark rings and bright rings with respect to their order.
b) In a Newton's rings experiment, the diameter of 15th ring was found to be 0.59cm. Find the diameter of 5th and 20th ring. [6 + 4]

UNIT – III

Answer any TWO of the following:

2×10=20

8. a) What is meant by half period elements? How rectilinear propagation of light is explained on the wave theory?
b) Calculate the number of lines/m in a grating of width 4cm which will just resolve the sodium lines in the second order. Given: wavelength of sodium lines are 589nm and 589.6nm. [6 + 4]
9. a) Discuss the phenomenon of diffraction at a straight wire and hence find the diameter of the given wire.
b) What is the radius of the first zone plate of focal length 20cm for a light of wavelength 5000Å? [6 + 4]
10. a) Give the theory of production of polarized light. How would you detect plane and elliptically polarized light.
b) A column of cane sugar solution of length 20cm rotates the plane of polarization through 17°. If the specific rotation of sugar solution is 0.01 rad m⁻¹ unit concentration⁻¹, calculate the strength of the solution. [6 + 4]

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PHYSICS**

Paper V: Spectroscopy and Quantum Physics

Duration: 3 Hrs.

Max. Marks: 80

PART – A

1. a) **Answer any TEN of the following:** **10×1=10**
- i) In an atom for an electron, quantum number $n=3$. What are the possible values of m_l .
 - ii) Give the expression for energy levels of vibration spectra.
 - iii) Which experiment confirms electron spin?
 - iv) What is Rayleigh scattering?
 - v) What is Stefan-Boltzmann law of blackbody radiation?
 - vi) Define photo electric work function.
 - vii) What are matter waves?
 - viii) What is the absorptive power of a perfectly blackbody.
 - ix) What do you understand by the wave function of a moving particle?
 - x) Write the eigen equation for a particle in one dimensional box.
 - xi) What is a harmonic oscillator?
 - xii) What is the zero point energy of a particle in a three dimensional box?
- b) **Answer any FIVE of the following:** **5×2=10**
- i) State and explain Pauli's exclusion principle.
 - ii) Compare Compton effect with Raman effect.
 - iii) What are the characteristics of a black body?
 - iv) Draw a labeled diagram of an electron microscope.
 - v) What is normalization of wave function?
 - vi) Define expectation value and explain its significance.

PART – B

UNIT – I

- Answer any TWO of the following:** **2×10=20**
2. a) Explain in detail the essential features of vector atom model.
- b) In an experiment in the study of Raman effect using mercury green radiation of wavelength 546.1nm, a stokes line of wavelength 554.3 nm was observed. Find Raman shift and wavelength of corresponding antistokes line. **[6 + 4]**
3. a) Give the quantum mechanical theory of normal Zeeman effect.
- b) In Stern-Grelach experiment silver atoms traverse a distance of 0.1 m in a non-homogeneous magnetic field of gradient $55 T m^{-1}$. If the velocity of the silver atoms is $450 m s^{-1}$, calculate the separation between the two traces on the photographic plate.
[Given: Bohr Magneton = $9.2 \times 10^{-24} J T^{-1}$, Mass of silver atom = $1.75 \times 10^{-25} kg$]
[6 + 4]
4. a) What is Raman effect? With the help of a neat diagram, give the experimental set up to study Raman effect.
- b) Find the minimum magnetic field needed for the normal Zeeman effect to be observed in a spectral line of 400 nm wavelength. The Zeeman shift is 0.33 \AA
[Given: $m = 9.1 \times 10^{-31} kg$, $e = 1.6 \times 10^{-19} C$]
[6 + 4]

UNIT – II

Answer any TWO of the following:

2×10=20

5. a) Define phase velocity and group velocity of the wave packet. Derive the relation between them. Also show that group velocity of the wave packet is equal to particle velocity.
- b) Photons of energy 1.02 MeV undergo Compton scattering through 180°. Calculate the energy of the scattered photon. [Given: $h = 6.625 \times 10^{-34}$ J s, $c = 3 \times 10^8$ m s⁻¹, $e = 1.6 \times 10^{-19}$ C] [6 + 4]

6. a) State the laws of photo-electric effect. Derive Einstein's photo-electric equation. How does it explain the laws of photoelectric equation.
- b) Using Wien's displacement law, estimate the temperature of the sun. [Given: $\lambda_m = 4900$ Å, Wien's Constant = 0.289 cm K] [6 + 4]

7. a) Derive Planck's law of radiation in terms of Einstein's coefficients.
- b) An electron of mass 9.1×10^{-31} kg has a speed of 1 km s⁻¹ with an accuracy of 0.05%. Calculate the uncertainty with which the position of the electron can be located. ($h = 6.625 \times 10^{-34}$ J s) [6 + 4]

UNIT – III

Answer any TWO of the following:

2×10=20

8. a) Obtain one dimensional time independent Schrodinger wave equation from time-dependent Schrodinger wave equation.
- b) An electron is moving in a one dimensional box of infinite height and width 0.1 nm. Find the first three eigen values in eV. [6 + 4]

9. a) Write down the Schrodinger wave equation and obtain expression for energy of a linear harmonic oscillator and discuss the energy level and probability curves.
- b) A particle is moving in a one-dimensional potential well of infinite height. What is the probability of finding the particle in a small interval $\Delta x = 0.01$ nm at $x = 0.25$ nm in the box in the first excited state of energy. Width of the box is 1 nm. [6 + 4]

10. a) Set up the Schrodinger wave equation for a free particle in a linear potential box and obtain eigen functions and eigen values.
- b) Find the zero point energy of a harmonic oscillator and the energy of the 3rd excited state if the frequency of vibration is 7×10^{12} Hz. [Given: $h = 6.625 \times 10^{-34}$ J s]. [6 + 4]

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PHYSICS**

PAPER VI: SOLID STATE PHYSICS

Duration: 3 Hours

Max Marks: 80

PART -A

1. (a) Answer any TEN of the following. 10X1=10

- i) Give an example for fermions.
- ii) Define molar specific heat of solid.
- iii) What are elastic waves?
- iv) Define mean free path.
- v) What is doping?
- vi) Draw energy level diagram of Conductor.
- vii) What is breakdown voltage?
- viii) Why hydrogen atom cannot emit-rays?
- ix) How many crystal systems are possible in a crystal structure?
- x) State Duan- Hunt's Law.
- xi) Name the two types of dislocations.
- xii) Define spin exchange interaction.

(b) Answer any FIVE of the following. 5X2=10

- i) Write the condition under which quantum statistics reduces to classical statistics.
- ii) Explain Hall effect.
- iii) Show the formation of 3S bands using energy level diagram.
- iv) Give the expression for diode current.
- v) Explain the origin of Characteristic X-rays.
- vi) What is interstitial impurity? Give an example.

PART-B

UNIT-I

Answer any TWO from the following: 2X10=20

2. (a) Derive expression for specific heat of solids using Einstein's theory.
- (b) Debye temperature for a crystal is 200K and its density is 3500 kgm^{-3} . Assuming the transverse and longitudinal velocities are equal, calculate velocity of sound in the crystal. Given Avogadro's number = 6.024×10^{26} per K mole. Atomic weight =12, $k=1.38 \times 10^{-23} \text{ JK}^{-1}$ (6+4)
3. (a) Compare the MB, FD and BE distribution laws to describe statistical system.
- (b) A semiconducting crystal 12mm long, 5mm wide and 1mm thick has a magnetic flux density of 0.5T applied from front to back perpendicular to largest faces. When a current of 20mA flows length-wise through the specimen, the voltage measured across its width is found to be 37V. What is the Hall coefficient of the semiconductor (6+4)

4. (a) Obtain an expression for electrical conductivity of metals on the basis of free electron theory.
- (b) Find the Fermi energy in copper on the assumption that each copper atom contributes one free electron to the electron gas. The density of copper is $8.94 \times 10^3 \text{ kg m}^{-3}$ and its atomic mass is 63.35 amu.
 $1 \text{ amu} = 1.67 \times 10^{-27} \text{ kg}$. (6+4)

UNIT-II

Answer any TWO of the following.

10x2=20

5. (a) Show that Fermi level lies midway between the valence band and conduction band in an intrinsic semiconductor.
- (b) Find the resistance of an intrinsic germanium rod 1 cm long, 1mm thick at 300 K, Given $n_e = 2.5 \times 10^{19} \text{ m}^{-3}$, $\mu_e = 0.39 \text{ m}^2 \text{V}^{-1} \text{s}^{-1}$, $m_n = 0.19 \text{ m}^2 \text{V}^{-1} \text{s}^{-1}$ at 300K. (6+4)
6. (a) Explain the working of pn junction diode.
- (b) Ratio of resistivity of germanium at 0°C and 100°C is 53.75. find the energy gap of germanium. Given $k = 1.38 \times 10^{-23} \text{ JK}^{-1}$ (6+4)
7. (a) Explain the mechanism of emission of light by LED.
- (b) The resistivity of Ge at 27°C is $0.47 \text{ } \Omega \text{m}$. Calculate the intrinsic carrier density. Electron mobility = $0.38 \text{ m}^2 \text{V}^{-1} \text{s}^{-1}$, Hole mobility = $0.18 \text{ m}^2 \text{V}^{-1} \text{s}^{-1}$. (6+4)

UNIT-III

Answer any TWO of the following.

10x2=20

8. (a) Draw the diagram of Bragg's spectrometer and explain how it is used to determine the wavelength of x-rays.
- (b) Calculate the wavelength of X-rays spectrum incident at 15° with the plane for first order reflection from Calcite crystal with inter atomic spacing of 3.5 \AA (6+4)
9. (a) What are edge dislocation and screw dislocation? Give the difference between two.
- (b) The p.d across the X-ray tube is $5 \times 10^5 \text{ V}$. What is the minimum frequency of x-rays emitted? What is the corresponding wavelength? (6+4)
10. (a) Describe the Langevin's theory of paramagnetic and obtain an expression for paramagnetic susceptibility.
- (b) Monochromatic X-rays of wavelength 0.82 \AA undergo first order Bragg reflection from a crystal cubic lattice with lattice constant 3 \AA , at a glancing angle of $7^\circ 51' 18''$. Identify the possible planes which give rise to this reflection in terms of their miller indices. (6+4)

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CHEMISTRY**PAPER I: GENERAL CHEMISTRY**

Duration: 3 hours

Max marks: 80

PART A

1. Answer any **TEN** of the following: 10x2=20
- Balance the following equation by Hit and trial method

$$MnO_2 + Al \rightarrow Mn + Al_2O_3$$
 - Define Electronegativity.
 - Give reason: Electron affinity of F is less than Cl.
 - What are agrochemicals? Give an example.
 - State first law of thermodynamics.
 - What is Kirchoff's equation?
 - Define entropy. Give its S.I. unit.
 - Calculate the efficiency of a Carnot engine working between $27^\circ C$ and $100^\circ C$
 - State Markownikoff's rule.
 - What are annulenes? Give two examples.
 - What is a nucleophile? Give two examples.
 - How do you convert cyclopropane into 1, 3 – dibromopropane?

PART-B**UNIT-I**

- Answer any **TWO** of the following. 2x10=20
- What are the factors determining the ionization energy? Why is the ionisation energy of Nitrogen greater than that of oxygen. 04
 - Explain the classification of chemicals based on sources with suitable examples. 03
 - How is electron affinity evaluated by Born Haber cycle? 03
 - Give reason: - i) Ionisation energy of Beryllium is greater than that of Boron.
 ii) Size of alkali metals increases down the group. 04
 - Discuss the trends in the periodic table with respect to acidic and basic properties of elements. 03
 - Explain the determination of ionisation energy by discharge tube method. 03
 - Define ionic radius. Compare the radius of anion and cation with respect to its neutral atom. 04
 - Explain the reducing, oxidizing trend of the elements in the periodic table. 03
 - Define electron affinity. How does it vary in the periodic table. 03

UNIT-II

Answer any TWO of the following.

2x10=20

5. a) Derive an expression for entropy change of an ideal gas with temperature and volume change. 04
b) Derive an expression for Joule-Thomson coefficient for an ideal gas. 03
c) Calculate the free energy change which occurs when one mole of an ideal gas expands reversibly and isothermally at 300K from initial volume of 5 litres to 50 litres. $R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}$. 03
6. a) Derive Gibbs-Helmholtz equation. 04
b) State and explain Carnot theorem. How can the efficiency of a heat engine be increased? 03
c) Calculate the entropy change for the fusion of 1 mole of a solid which melts at 300 K. The molar heat of fusion is 2.51kJ/mole. 03
7. a) Explain the variation of Gibb's free energy with temperature and pressure. 04
b) Derive the relationship between C_p and C_v . 03
c) Calculate the amount of heat supplied to Carnot's cycle working between 368K and 288K if the maximum work obtained is 895J. 03

UNIT-III

Answer any TWO of the following.

2x10=20

8. a) Write the chemical reaction of the following:
i) Cyclopropane with Bromine
ii) Cyclopropane with hydrogen 04
b) Explain Diel's-Alder reaction with suitable example. 03
c) Explain the mechanism of Friedel-Craft's alkylation. 03
9. a) Explain Baeyer's strain theory. What are its limitations? 04
b) What are dienes? How are they classified? 03
c) Explain the mechanism of aldol condensation. 03
10. a) Explain the mechanism of Reimer-Tiemann reaction. 04
b) Write a note on Sachse-Mohr theory. 03
c) What is inductive effect? Explain +I and -I effect with examples. 03

CREDIT BASED THIRD SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018

CHEMISTRY
PAPER III: GENERAL CHEMISTRY

Duration: 3 hours

Max marks: 80

PART A

1. Answer any TEN of the following:

10x2=20

- a) Water is a liquid, while H_2S is a Gas. Give reason.
- b) What are clathrates? Give an example.
- c) What are boranes? Give an example.
- d) Name the molecule $H_2N_2O_2$ and give its structure.
- e) Define unit cell and lattice energy.
- f) What is meant by viscosity? Give its S.I. unit.
- g) Write the difference between ideal and real gas.
- h) What is Rosenmund reduction? Give an example.
- i) Formaldehyde answers Cannizzaro reaction while acetaldehyde does not. Justify.

- j) Write the IUPAC name of $\begin{array}{c} \text{CH}_2 - \text{COOH} \\ | \\ \text{CH}_2 \\ | \\ \text{CH}_2 - \text{COOH} \end{array}$

- k) How is Urotropine formed?
- l) Name any four types of Bravais lattices.

PART-B
UNIT-I

Answer any TWO of the following.

2x10=20

2.
 - a) Explain the method of preparation for XeF_4 and XeO_3 04
 - b) Write a note on different types of carbides. 03
 - c) Name any three types of silicates and give their structure. 03
3.
 - a) Explain the variation of ionization energy and oxidation state of Group 13 elements. 04
 - b) Write a note on banana bonding to diborane. 03
 - c) What is inert pair effect? Give two examples to support your answer? 03
4.
 - a) Explain the general trends in the properties of oxides of p-block elements. 03
 - b) Explain the structure and preparation method of XeF_6 . 03

- c) Give reason: (i) BF_3 is a weaker acid than BCl_3 .
(ii) Oxygen does not show + 4 and + 6 oxidation state. 04

UNIT-II

Answer any TWO of the following. 2x10=20

5. a) Derive the expressions for critical constants T_c , V_c and P_c in terms of van-der Waals constants. 04
b) Write a note on intermolecular forces in liquids. 03
c) State the (i) law of constancy of interfacial angles
(ii) law of rationality of indices 03
6. a) Explain X-ray diffraction by crystal and derive Bragg's equation. 04
b) Explain the principle and determination of viscosity by Ostwald's Viscometer. 03
c) What is continuity of state? How is it achieved? 03
7. a) Write a note on Miller indices. 04
b) Calculate the height of ethyl alcohol that must have risen in a capillary tube of diameter 0.2 mm. Surface tension of ethyl alcohol = $22.75 \times 10^{-3} Nm^{-1}$ at $20^\circ C$ and $d = 0.7893 \times 10^3 kg / m^3$ 03
c) Explain Andrew's isotherm of carbon dioxide. 03

UNIT-III

Answer any TWO of the following. 2x10=20

8. a) Explain the mechanism of Perkin's condensation reaction. 04
b) Explain the acid catalysed cleavage reaction of ethylene oxide. 03
c) Explain the effect of heat on α , β and γ hydroxy acids. 03
9. a) Give any two methods for the preparation of monocarboxylic acids. 04
b) How does acetaldehyde react with hydroxylamine and hydrazine? 03
c) Write any three applications of crown ethers. 03
10. a) Explain the addition of Grignard reagent to aldehydes and ketones. 04
b) Explain the effect of substituents on the acidity of carboxylic acids. 03
c) Explain HVZ reaction. 03

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CHEMISTRY

PAPER V: GENERAL CHEMISTRY

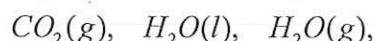
Duration: 3 hours

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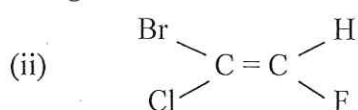
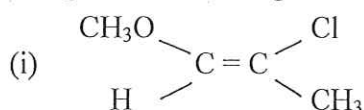
PART A

1. Answer any TEN of the following: 10x2=20

- a) Write Schrodinger wave equation and explain the terms.
- b) Write the values of n, l, m and s for the last electron of Na atom.
- c) Write the IUPAC name and structure of linkage isomer: $[Cr(H_2O)(NC)_5]^{2-}$
- d) $CrCl_3 \cdot 3H_2O$ does not give precipitate with silver nitrate. Give reason.
- e) Define congruent melting point. Give one example.
- f) Calculate the number of components in the system:



- g) How do specific and equivalent conductance vary with dilution?
- h) What is conductance ratio?
- i) Give the structure of sucrose and 2-dioxy ribose.
- j) Assign E and Z configuration for the following:



- k) What is Lobry de Bruyn and Van Ekenstein rearrangement?
- l) How does glucose react with (i) Tollen's reagent (ii) Nitric acid

PART-B

UNIT-I

Answer any TWO of the following. 2x10=20

2.
 - a) Explain de-Broglie hypothesis and derive an equation for de Broglie wavelength. 03
 - b) What is photoelectric effect? Explain how classical theory failed to explain the phenomenon. 03
 - c) Write the possible geometrical and optical isomers of $[Co(en)_2Cl_2]^+$. 04
3.
 - a) Discuss the structure of $Cu(NH_3)_4SO_4$ based on VBT? 04
 - b) What is ambidentate ligand? Give two examples. 03
 - c) Explain Compton effect. 03
4.
 - a) State and explain Heisenberg's uncertainty principle. 03
 - b) Give any three postulates of quantum mechanics. 03
 - c) With suitable examples explain (i) ionisation isomerism (ii) co-ordination isomerism. 04

UNIT-II

Answer any TWO of the following.

2x10=20

5. a) Explain desilverisation of lead. 03
b) Explain the following terms with suitable example.
(i) Degrees of freedom (ii) Metastable equilibrium 03
c) A solution containing 10.09 g of CuSO_4 in 189.9 g of water was electrolysed using platinum electrode. After electrolysis 275.4g of the solution around anode was found to contain 15.4 g of CuSO_4 and 3.096 g of silver was deposited in a coulometer connected in series. Calculate transport number of Cu^{2+} and SO_4^{2-} ions. 04
6. a) Discuss the conductometric titration curve obtained in the titration of
(i) AgNO_3 vs KCl
(ii) Weak acid and weak base 04
b) How is solubility of a sparingly soluble salt determined by conductance method? 03
c) Explain the phase diagram of water system. 03
7. a) What are the advantages of conductometric titration? 03
b) The ratio of the ionic mobility of Ag^+ and NO_3^- ions was found to be 0.916 during the electrolytes of AgNO_3 solution. Calculate the transport number of Ag^+ and NO_3^- ions. 03
c) Discuss the phase diagram of magnesium-zinc system. 04

UNIT-III

Answer any TWO of the following.

2x10=20

8. a) How is glucose converted to mannose? 03
b) What are enantiomers? How do they differ from diastereomers? 03
c) Explain the configuration of fructose. 04
9. a) What is resolution of racemic mixture? Explain any two methods of resolution of a racemic mixture. 03
b) What are conformational isomers? Discuss the conformational isomers of ethane. 03
c) How is cyclic structure of D(+) glucose determined? 04
10. a) Describe the geometrical isomerism exhibited by maleic acid and fumaric acid. 03
b) Draw the Newmann projection formulae for different conformations of 1,2 dichloroethane molecule. Explain their relative stabilities. 03
c) Explain the mechanism of osazone formation. 04

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018

CHEMISTRY**PAPER VI: GENERAL CHEMISTRY**

Duration: 3 hours

Max marks: 80

PART A1. Answer any **TEN** of the following: 10×2=20

- a) What are Lanthanides? Give their general electronic configuration.
- b) Gadolinium and Lutetium show only +3 oxidation state. Give reason.
- c) NaI is more covalent than NaCl. Why?
- d) Give two examples for border line acids.
- e) Which of the following molecules are microwave active? CO, CO₂, N₂, HCl, HF, CCl₄.
- f) What is meant by shielding and deshielding in NMR spectroscopy?
- g) What is Rayleigh scattering?
- h) Define Chemical shift.
- i) How is malonic ester prepared?
- j) Give one method of preparation of Grignard reagent.
- k) How is acetic acid obtained from Grignard reagent?
- l) What are the characteristics of a dye?

**PART-B
UNIT-I**Answer any **TWO** of the following. 2×10=20

2.
 - a) Describe ion exchange method of separation of lanthanides. 04
 - b) Differentiate between conductors, semiconductors and insulators on the basis of band theory. 03
 - c) Discuss two applications of hard soft acid base principle. 03
3.
 - a) Explain how lattice energy of sodium chloride crystal is calculated using Born Haber Cycle. 04
 - b) State Fajan's rule and explain any four applications. 03
 - c) What is lanthanide contraction? Explain its cause and consequences. 03
4.
 - a) What are hard and soft acids and bases? Explain the HSAB principle with suitable examples. 04
 - b) Give any three similarities between actinides and lanthanides. 03
 - c) Write a note on polarization and polarizing power. 03

UNIT- IIAnswer any **TWO** of the following. 2×10=20

5.
 - a) The absorption of infrared frequency by CO molecule showed an absorption band at 2140cm⁻¹. Calculate the force constant of CO (Molar mass of C¹²=12.00g/mol O¹⁶=16.00g/mol) 03

- b) Derive an expression for the moment of inertia of a molecule considered as a rigid rotor. 04
- c) Explain NMR spectrum of ethanol. 03
6. a) Draw and explain the energy level diagram of a molecule for
- a) Rotational transition
- b) Vibrational transition with simple harmonic oscillator 04
- b) Explain with example the coupling constant in NMR spectroscopy. 03
- c) How does PMR spectra of a compound help to elucidate the structure of a molecule? 03
7. a) What is mutual exclusion principle? Write one application of mutual exclusion principle. 03
- b) Define a) Stokes lines b) Antistokes lines
- c) Rayleigh lines 03
- c) What is selection rule? Write and explain the selection rule for
- a) microwave (rotational) transition.
- b) Infrared (vibrational) transition. 04

UNIT-III

Answer any TWO of the following.

2×10=20

8. a) Write the synthesis of methyl orange. 03
- b) Write the synthesis of barbituric acid from DEM. Give its application. 03
- c) How is ethyl aceto acetate prepared? Give its mechanism. 04
9. a) Write a note on i) mordant dyes ii) vat dyes 03
- b) Write the synthesis of a) 2 – methyl propanoic acid
- b) adipic acid from DEM 04
- c) Write the synthesis of phenolphthalein. 03
10. a) Write the synthesis of (i) succinic acid (ii) Crotonic acid from AAE 04
- b) Explain the acidity of C-H bond of methylene group in ethyl aceto acetate and DEM. 03
- c) Write the classification of dyes (any 6) based on the structure. 03

CREDIT BASED FIRST SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018

MATHEMATICS
PAPER I: CALCULUS

Duration: 3 hours

Max Marks: 120

- Note: 1. Answer any TEN questions in Part A. Each question carries 3 marks.
2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

PART A

3x10=30

1. a) Find the values of z in the interval $(a, b) = (0, 2)$ satisfying Cauchy's mean value theorem for the pair of functions, $f(x) = x^3$ and $g(x) = x^2$.
- b) Evaluate $\lim_{x \rightarrow 0} \left(\frac{2^x - 3^x}{x} \right)$ if it exists.
- c) Find the 3rd degree Maclaurin's polynomial for the function $f(x) = e^x$
- d) Find critical numbers of the function
 $f(x) = x^3 + 7x^2 - 5x$
- e) Find horizontal and vertical asymptotes of the function $f(x) = \frac{2x+1}{x-3}$
- f) Find the points of inflection for the function $f(x) = \frac{2}{x+3}$
- g) Find the radius of curvature at any point on the curve, $x = \frac{a \cos t}{t}$, $y = \frac{a \sin t}{t}$
- h) Given a polar equation of the graph as $r^2 = 4 \sin 2\theta$, find Cartesian equation.
- i) Sketch the graph of the equation $r \sin \theta = 3$
- j) Find $\int_0^{\pi/2} \sin^5 x \cos^6 x dx$
- k) Evaluate $\int_0^1 x^4 (\log x)^2 dx$
- l) Find $\int_0^{\pi/4} \cos^6 2t dt$
- m) Find the length of arc of the curve $y = x^{2/3}$ from $(1, 1)$ to $(8, 4)$
- n) Find the area of the region enclosed by the graph of the equation $r = 3 \cos \theta$
- o) The region bounded by the curve $y = x^2$, x axis and the line $x = 2$ is revolved about y axis. Find the volume of the solid generated. Take the elements of area parallel to axis of revolution.

PART - B

UNIT-I

2. a) State and prove Cauchy's Mean Value Theorem. (6)
- b) Find $\lim_{x \rightarrow 0} \left(\frac{1}{x^2} - \frac{1}{x^2 \sec x} \right)$ if it exists. (6)
- c) Determine n^{th} degree Maclaurin polynomial for $f(x) = \sin x$. (6)

3. a) If $f(x) = \begin{cases} \frac{e^x - 1}{x} & \text{if } x \neq 0 \\ 1 & \text{if } x = 0 \end{cases}$ (6)

Prove that f is continuous at 0 by using definition. Also prove that f is differentiable at 0 by computing $f'(0)$.

- b) Find $\lim_{x \rightarrow 0} (x+1)^{\cot x}$ if it exists. (6)
- c) Find Taylor polynomial of degree 3 with Lagrange form of remainder at $a = \frac{\pi}{6}$ for the function $f(x) = \sin x$ (6)

UNIT-II

4. a) If $f(x)$ exists for all values of x in the open interval (a,b) and if f has a relative extremum at c , where $a < c < b$ then if $f'(c)$ exists, prove that $f'(c) = 0$. (6)
- b) Given $f(x) = (1-2x)^3$ find the point of inflection of the graph of f and determine where the graph is concave upward and where it is concave downward. Draw the sketch of the graph. (6)
- c) Find the horizontal and vertical asymptotes of the graph of the function $f(x) = \frac{8x-2x^2}{x^2-9}$ (6)
5. a) A cardboard box manufacturer wishes to make open boxes from pieces of cardboard 12 inch. square by cutting equal squares from the corners and turning up the sides. Find the length of the side of the square to be cutout to obtain a box of the largest possible volume. (6)
- b) Let c be a critical number of a function f at which $f'(c) = 0$ and let f' exist for all values of x in some open interval containing c . If $f''(c)$ exists and
- i) If $f''(c) < 0$ then prove that f has a relative maximum value at c .
- ii) If $f''(c) > 0$ then prove that f has a relative minimum value at c . (6)
- c) Given $f(x) = x^3 - 3x^2 + 3$ draw a sketch of graph of f , finding relative extrema, points of inflection, where the graph is concave upward, concave downward, and finding slope of any inflectional tangent. (6)

UNIT-III

6. a) Find the evolute of the astroid, $x = a \cos^3 \theta$, $y = a \sin^3 \theta$. (6)
b) Find the polar coordinates of the point having Cartesian coordinates $(1, -1)$ (6)
c) Sketch the graph of $r = 2 - 2 \cos \theta$. (6)
7. a) Find the coordinates of centre of curvature at the point (x, y) of the parabola $y^2 = 4ax$ and hence obtain its evolute. (6)
b) Find the polar equation of a graph whose Cartesian equation is $x^2 + y^2 - 4x = 0$ (6)
c) Sketch the graph of $r = 2 \sin 2\theta$. (6)

UNIT-IV

8. a) State and prove Mean Value theorem for definite integrals. (6)
b) Derive reduction formula for $\int_0^{\pi/2} \sin^n x dx$, n is positive integer. (6)
c) Obtain the reduction formula for $\int \tan^n x dx$ and hence evaluate $\int \tan^6 x dx$ (6)
9. a) Obtain the reduction formula for $\int x^n e^{ax} dx$ and hence evaluate $\int x^3 e^{ax} dx$ (6)
b) State and prove first fundamental theorem on integral calculus. (6)
c) Find the exact value of $\int_1^4 x^2 dx$ as a limit of Riemann Sum with regular partitions and for suitable choice of ξ_i . (6)

UNIT-V

10. a) Find the volume of the solid generated by revolving about x axis, the region bounded by the parabola $y = x^2 + 1$ and line $y = x + 3$. (6)
b) Find the area of the region inside the circle $r = 3 \sin \theta$ and out side the limaçon $r = 2 - \sin \theta$ (6)
c) Find the length of the arc of the curve $x^{2/3} + y^{2/3} = 1$ in the first quadrant from the point where $x = \frac{1}{8}$ to the point where $x = 1$. (6)
11. a) The region bounded by $y = x^2$ and $x = y^2$ is revolved about x -axis. Find the volume of the solid by taking rectangular elements parallel to the axis of revolution. (6)
b) Find the area of the region enclosed by one loop of the graph of the equation $r = 4 \cos 3\theta$ (6)
c) Find the volume of the sphere generated by revolving about a diameter, the region enclosed by the circle $x^2 + y^2 = r^2$ (6)

CREDIT BASED FIRST SEMESTER B.C.A. DEGREE EXAMINATION OCTOBER 2018

MATHEMATICS**PAPER I: FUNDAMENTALS OF MATHEMATICS 1**

Duration: 3 hours

Max Marks: 80

- Note: 1. Answer any SIX questions in Part A. Each question carries 2 marks.
2. Answer FOUR full questions from Part B choosing ONE full question from each unit.

PART A

2x6=12

1. a) Resolve $\frac{x+3}{x^2-x}$ into partial fractions.
b) Using binomial theorem find the value of 11^7 .
c) If $\sin A = \frac{3}{5}$, A is acute, then find the value of $\operatorname{cosec} A$.
d) Find the value of $\cos^2 30^\circ - \cos^2 60^\circ$
e) Find the equation of a straight line passing through the point (1, 3) and having a slope $-\frac{2}{3}$
f) Show that the points (1, 7), (-1, 1) and (0, 4) are collinear.
g) Find the equation of a circle with centre (3, 4) and radius 6 units.
h) Find the eccentricity of the hyperbola $\frac{x^2}{25} - \frac{y^2}{16} = 1$

PART - B**UNIT-I**

2. a) Resolve $\frac{x+1}{(x-1)^2(x-2)}$ into partial fractions. (5)
b) If $A = \begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix}$ prove that $A^2 - 4A - 5I = \bar{0}$. (6)
c) Find the term independent of x in the expansion of $\left(x^2 - \frac{1}{3x}\right)^9$ (6)
3. a) Resolve $\frac{9x-27}{(x+1)(x-2)^2}$ into partial fractions. (5)
b) Solve by Cramer's rule $x + y + z = 7$, $2x + 3y + 2z = 17$, $4x + 9y + z = 37$ (6)
c) Find the middle term in the expansion of $\left(\sqrt{x} - \frac{4}{x^2}\right)^{12}$ (6)

UNIT-II

4. a) Find the value of $\cos(765^\circ)$ (5)
b) If $\sin \theta = \frac{8}{17}$, $\frac{\pi}{2} < \theta < \pi$, then find the value of $\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta}$ (6)
c) Prove that $\frac{\cos(-A) \tan(90^\circ - A) \tan(180^\circ + A)}{\cot(90^\circ + A) \sin(-A) \cos(180^\circ - A)} = -\operatorname{cosec} A \cdot \cot A$ (6)

5. a) Simplify : $\frac{\tan(180^\circ + A) \sec(180^\circ + A) \operatorname{cosec}(90^\circ + A)}{\sec(-A) \cot(90^\circ + A)}$ (6)
- b) If $\cot \theta = \frac{24}{7}$, θ is acute, then find the remaining trigonometric functions of θ (5)
- c) Prove that $\cos 570^\circ \cdot \sin 510^\circ - \cos(-390^\circ) \cdot \sin(-30^\circ) = 0$. (6)

UNIT-III

6. a) Show that the points A (4, 1), B (7, 4) and C (13, -2) are the vertices of a right angled triangle. Also find its area. (5)
- b) Find the area of the quadrilateral ABCD where A is (1, 1), B (3, 4), C (5, -2) and (4, -7) (6)
- c) Find the equations of the straight lines passing through (2, 4) and (i) parallel (ii) perpendicular to $5x - 7y = 100$. (6)
7. a) Find the ratio in which the line joining the points (5, 4) and (11, -16) is divided by the point (2, 14). (5)
- b) Find the co-ordinates of circumcentre of the triangle ABC with vertices A (-2, 0), B (5, -1) and C (2, 8). (6)
- c) Reduce the equation $3x + 7y - 10 = 0$ to
i) Slope intercept form and ii) intercept form (6)

UNIT-IV

8. a) Find the equation to the locus of a point P which moves such that the triangle PAB is of area 6 sq. units where A (3, 4) and B (-1, 2). (6)
- b) Find the equation of the circle with centre (1, 2) and passing through the point (4, 6). Also find the area of the circle. (5)
- c) Find the focus, vertex, axis, directrix, length of latus rectum and end points of the latus rectum of the parabola $y^2 = 16x$ (6)
9. a) Find the equation of the perpendicular bisector of the line joining the points (-4, 6) and (8, 8). (6)
- b) Find the centre and radius of the circle $3x^2 + 3y^2 - 6x + 4y + 1 = 0$. Also find its area. (5)
- c) Find the vertices, foci, length of major axis, length of minor axis, and equations of directrices of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$. (6)

CREDIT BASED THIRD SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018

MATHEMATICS**PAPER III: FUNCTIONS OF SEVERAL VARIABLES, MULTIPLE INTEGRALS AND GROUP THEORY**

Duration: 3 hours

Max Marks: 120

- Note: 1. Answer any TEN questions in Part A. Each question carries 3 marks.
2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

PART A

3x10=30

1. a) Find the domain of $f(x, y) = \sqrt{x^2 + y^2 - 25}$.
- b) If $f(x, y) = \frac{1}{16}x^2 + \frac{1}{9}y^2$ find the gradient of f at the point $(4, 3)$.
- c) Find an equation of the tangent plane to the elliptic paraboloid $4x^2 + y^2 - 16z = 0$ at the point $(2, 4, 2)$
- d) Evaluate $\int_1^2 \int_0^{2x} xy^3 dy dx$
- e) Find by double integration the area of the region enclosed by one leaf of the rose $r = \sin 3\theta$
- f) Find the area of the surface that is cut from plane $2x + y + z = 4$ by the planes $x = 0$, $x = 1$, $y = 0$ and $y = 1$.
- g) Evaluate $\int_0^1 \int_0^x \int_0^{x+y} (x + y + z) dz dy dx$.
- h) Evaluate the iterated integral $\int_0^\pi \int_2^4 \int_0^1 r e^z dz dr d\theta$
- i) Evaluate the line integral $\int_c (x^2 + xy)dx + (y^2 - xy)dy$, c : the line $y = x$ from the origin to the point $(2, 2)$.
- j) If G is a group such that $(a.b)^2 = a^2.b^2$ for all $a, b \in G$, then show that G is abelian.
- k) Show that every group of prime order is cyclic.
- l) Compute $a^{-1}ba$ where $a = (5, 7, 9)$, $b = (1, 2, 3)$.
- m) If G is a group and H is a subgroup of G of index 2 in G , then prove that H is a normal subgroup of G .
- n) If G and G' are groups and $\phi: G \rightarrow G'$ is an isomorphism, then show that $\ker \phi = \{e\}$ where e is the identity in G .
- o) If $\phi: G \rightarrow G$ is defined by $\phi(x) = x \quad \forall x \in G$, then prove that ϕ is a homomorphism and find its kernel.

PART - B

UNIT-I

2. a) Prove that $\lim_{(x,y) \rightarrow (3,2)} (3x-4y) = 1$ applying $\epsilon - \delta$ definition. (6)
- b) If $f(x, y) = 3x^2 - 2xy + y^2$ find $D_1f(x, y)$ and $D_2f(x, y)$ by applying the definition of partial derivatives of f . (6)
- c) If $f(x, y) = 2x^4 + y^2 - x^2 - 2y$, determine the relative extrema of f if there are any. (6)

3. a) If $f(x, y) = \begin{cases} \frac{xy}{x^2 + y^2} & \text{if } (x, y) \neq (0, 0) \\ 0 & \text{if } (x, y) = (0, 0) \end{cases}$
Prove that f is not differentiable at $(0, 0)$. (6)

- b) Given $u = x^2 + 2xy + y^2$, $x = t \cos t$, $y = t \sin t$ find $\frac{du}{dt}$ by two methods
a) use the chain rule b) express 'u' in terms of 't' before differentiating. (6)
- c) Given $f(x, y) = 2x^3y + 5x^2y^2 - 3xy^2$, find a) $f_{121}(x, y)$ b) $f_{211}(x, y)$ at $(1, 1)$ (6)

UNIT-II

4. a) Find the volume of the solid in the first octant bounded by the cone $z = r$ and $r = 3 \sin \theta$ (6)
- b) Evaluate the double integral $\iint_R e^{-(x^2+y^2)} dA$ where the region R is in the 1st quadrant and bounded by the circle $x^2 + y^2 = a^2$ and the Co-ordinate axes. (6)
- c) Find the surface area of the paraboloid $z = x^2 + y^2$ below the plane $z = 4$. (6)
5. a) Find an approximate value of the double integral $\iint_R (xy + 3y^2) dA$, where R is the rectangular region having the vertices $P(-2, 0)$ and $Q(4, 6)$. Take the partition of R formed by the lines $x_1 = -2, x_2 = 0, x_3 = 2, y_1 = 0, y_2 = 2, y_3 = 4$. (6)
- b) Evaluate $\iint_R x^2 \sqrt{9-y^2} dA$ where R is the region bounded by the circle $x^2 + y^2 = 9$. (6)
- c) Find the surface area of the top half of the sphere $x^2 + y^2 + z^2 = a^2$ (6)

UNIT-III

6. a) Evaluate : $\int_0^1 \int_0^{1-x} \int_{2y}^{1+y^2} x \, dz \, dy \, dx.$ (6)
- b) Find the volume of the solid bounded by the paraboloid $x^2 + y^2 + z = 12$ and the plane $z = 8.$ (6)
- c) Evaluate the line integral $\int_c F \cdot dR; F(x, y) = y \sin x \, i - \cos x \, j; C:$ the line segment from $(\pi/2, 0)$ to $(\pi, 1)$ ((6)
7. a) Find the volume of the solid bounded by the cylinder $x^2 + y^2 = 25,$ the plane $x + y + z = 8$ and the xy plane. (6)
- b) A homogeneous solid in the shape of a right circular cylinder has a radius of 2m and an altitude of 4m. Find the moment of inertia of the solid with respect to its axis. (6)
- c) Evaluate the line integral $\int_c 3x \, dx + 2xy \, dy + z \, dz$ if the curve C is the circular helix defined by the parametric equations $x = \cos t, y = \sin t, z = t, 0 \leq t \leq 2\pi.$ (6)

UNIT-IV

8. a) State and prove Lagrange's Theorem. (6)
- b) If H and K are two subgroups of $G,$ prove that HK is a subgroup of G if and only if $HK = KH.$ (6)
- c) Prove that every permutation is the product of its cycles. (6)
9. a) If 'n' is a positive integer and 'a' is relatively prime to $n,$ then prove that $a^{\phi(n)} \equiv 1 \pmod{n},$ where $\phi(n)$ is Euler's Phi function. (6)
- b) If H and K are finite subgroups of G of orders $O(H)$ and $O(K)$ respectively, prove that
$$O(HK) = \frac{O(H) O(K)}{O(H \cap K)}$$
 (6)
- c) Represent $(1 \, 2 \, 3)(4 \, 5) (1 \, 6 \, 7 \, 8 \, 9)(1 \, 5)$ as a product of disjoint cycles. Find its order and state whether it is even or odd permutation. (6)

P.T.O.

UNIT-V

10. a) Prove that a subgroup N of a group G is a normal subgroup of G if and only if every left coset of N in G is a right coset of N in G . (6)
- b) If ϕ is a homomorphism of G in to \bar{G} , then prove that
- 1) $\phi(e) = \bar{e}$, the unit element of \bar{G}
- 2) $\phi(x^{-1}) = \phi(x)^{-1} \quad \forall x \in G$ (6)
- c) If G is any group, prove that the mapping $T_g : G \rightarrow G$ defined by $T_g(x) = g^{-1}xg, \quad \forall g \in G$ where $x \in G$, is an automorphism of G . (6)
11. a) Prove that N is a normal subgroup of G if and only if $gNg^{-1} = N$ for every $g \in G$. (6)
- b) If ϕ is a homomorphism of a group G onto \bar{G} with Kernel K , then prove that $\frac{G}{K}$ is isomorphic to \bar{G} . (6)
- c) If G and G' are groups, $\phi : G \rightarrow G'$ is a homomorphism, then prove that Kernel ϕ is a normal subgroup of G . (6)

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018

MATHEMATICS

PAPER VI: DISCRETE MATHEMATICS

Duration: 3 hours

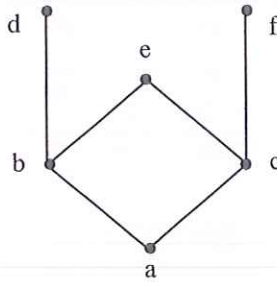
Max Marks: 120

- Note: 1. Answer any TEN questions in Part A. Each question carries 3 marks.
 2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

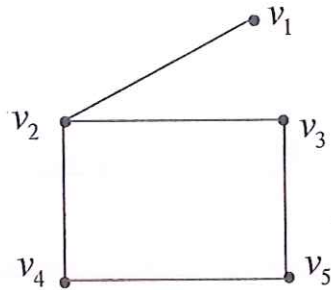
PART A

3x10=30

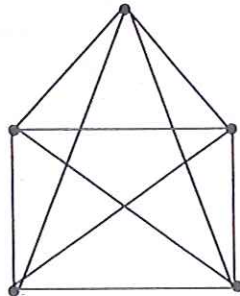
1. a) Define lattice. Whether the partially ordered set in the following figure is a lattice. Justify.



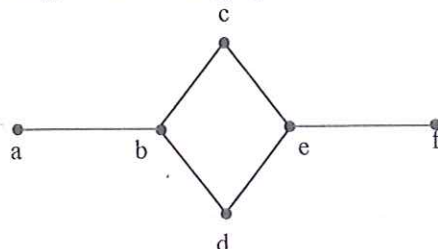
- b) Show that any integer composed of 3^n identical digits is divisible by 3^n .
 c) Prove that $2^n > n^3$ for $n \geq 10$.
 d) Define k-factor of a graph. Give an example.
 e) Write an Eulerian path and a Hamiltonian path in the following graph.



- f) Show that the following graph is non planar.



- g) Prove that there is one and only one path between every pair of vertices in a tree.
 h) Draw all the spanning trees of the graph.



- i) Define (i) Cutset of a graph (ii) Fundamental cutset
- j) Prove that two states are in the same block in π_k if and only if they are in the same block in π_{k-1}
- k) Represent the model of modulo 3 sum counter in Tabular form.
- l) Write the output sequence produced by the finite state machine given below corresponding to the input sequence 11010.

State	Input		Output
	0	1	
A	A	C	0
B	C	A	0
C	D	B	0
D	B	D	1

- m) If $A(Z) = \frac{2}{1-4Z^2}$ find a_r
- n) If $a = \alpha_0 + \alpha_1 r + \dots + \alpha_n r^n$ Show that a is $O(r^n)$.
- o) Find the particular solution of the difference equation $a_r - 5a_{r-1} + 6a_{r-2} = 1$

PART - B

UNIT-I

2. a) Determine the number of integers between 1 and 200 which are divisible by any one of the integers 2, 3 and 5. (6)
- b) Define conditional probability. If $P(A) = 0.392$ and $P(B) = 0.512$ and $P(A \cap B) = 0.090$, then find $P(A \cup B)$ and $P(A|B)$ (6)
- c) Prove that $\frac{\omega}{\omega_0} \leq \frac{3}{2}$ where ω is the total elapsed time and ω_0 is the minimum possible time for a given set of tasks. (6)

3. a) Provide a step-by-step derivation to obtain -010 using the following set of productions.

Signed integer \rightarrow Sign integer

sign $\rightarrow +$

sign $\rightarrow -$

integer \rightarrow digit integer

integer \rightarrow digit

digit $\rightarrow 0$

digit $\rightarrow 1$ (6)

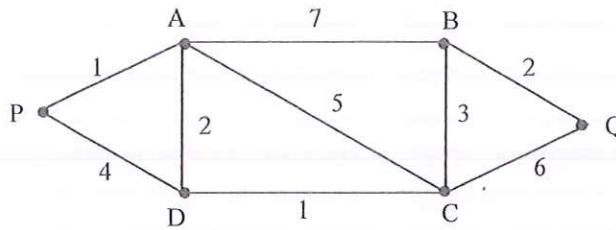
- b) In how many ways can a group of 8 people be divided into committees subject to the constraint that each person must belong to exactly one committee and each committee must contain at least two people? (6)

- c) For the sets A_1, A_2, \dots, A_r Prove that $|A_1 \cup A_2 \cup \dots \cup A_r| = \sum_i |A_i| - \sum_{i < j} |A_i \cap A_j| +$

$$\sum_{i < j < k} |A_i \cap A_j \cap A_k| + \dots + (-1)^{r-1} |A_1 \cap A_2 \cap \dots \cap A_r| \quad (6)$$

UNIT-II

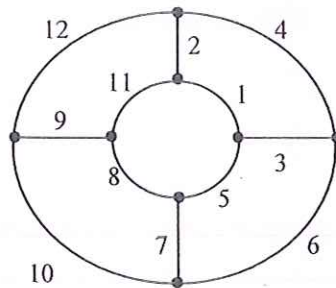
4. a) In a directed graph with n vertices if there is a path from vertex v_1 to vertex v_2 then prove that there is a path of not more than $n - 1$ edges from vertex v_1 to vertex v_2 . (6)
- b) Find the shortest distance from the vertex P to the vertex Q in the graph given below. (6)



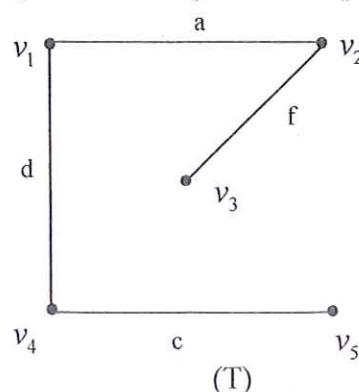
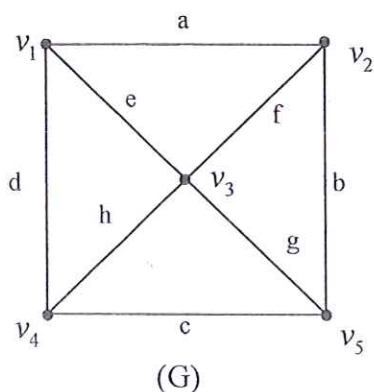
- c) Show that there is always a Hamiltonian path in a directed complete graph. (6)
5. a) Prove that an undirected graph possesses an Eulerian path if and only if it is connected and has either zero or two vertices of odd degree. (9)
- b) Let G be a linear graph of n vertices. If the sum of the degrees for each pair of vertices in G is $n-1$ or larger, then prove that there exists a Hamiltonian path in G . (9)

UNIT-III

6. a) Define tree and show that a tree with two or more vertices has at least two leaves. (6)
- b) When is a set of sequences said to be a prefix code? Give one example each for
 (i) a set which cannot be a prefix code.
 (ii) a set which is a prefix code. (6)
- c) Describe a procedure to determine a minimum spanning tree of a connected weighted graph. Apply it to obtain a minimum spanning tree for the graph given below. (6)



7. a) In a graph G , Let T be a spanning tree and $D = \{e_1, e_2, \dots, e_k\}$ be a fundamental cut set in which e_1 is a branch and e_2, e_3, \dots, e_k are chords of T . Show that
 (i) e_1 is contained in the fundamental circuits corresponding to e_i for $i = 2, 3, \dots, k$ and
 (ii) e_1 is not contained in any other fundamental circuits. (6)
- b) Prove that every circuit has an even number of edges in common with every cutset. (6)
- c) Write all the fundamental cutsets in the given graph G with respect to the spanning tree T .



(6)

UNIT-IV

8. a) Show that the language $L\{a^k \mid k = i^2, i \geq 1\}$ is not a finite state language (9)
- b) State the algorithm 'BUBBLESORT' used to sort n numbers stored in n registers. Justify the correctness of the algorithm by a formal proof. Also analyse its time complexity. (9)
9. a) Let L be a finite state language accepted by a finite state machine with N states. Prove that for any sequence α , whose length is N or larger in the language, α can be written as uvw such that v is non empty and $uv^i w$ is also in the language for $i \geq 0$ where v^i denotes the concatenation of i copies of the sequence v. (9)
- b) State the algorithm LARGEST2 for finding the largest of n numbers. Justify the correctness of the algorithm. Also analyse its time complexity. (9)

UNIT-V

10. a) Write the recurrence relation for the Fibonacci sequence of numbers and find its homogeneous solution. (6)
- b) Determine the numeric function a_r corresponding to the generating function
- $$A(z) = \frac{4 + z - 6z^2}{(1 - 4z^2)(1 + z)} \quad (6)$$
- c) Obtain the particular solution for the difference equation
- $$a_r - 5a_{r-1} + 6a_{r-2} = 2^r + r \quad (6)$$
11. a) Find the particular solution of the difference equation
- $$a_r - 5a_{r-1} + 6a_{r-2} = 3r^2 \quad (6)$$
- b) If $a_r = 3^r, r \geq 0, b_r = z^r, r \geq 0$ and $c = a * b$ then show that $c_r = 3^{r+1} - 2^{r+1}$ (6)
- c) Find the particular solution of the difference equation $a_r + a_{r-1} = 3r2^r$ (6)

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018
MATHEMATICS
PAPER V: SPECIAL FUNCTIONS & DIFFERENTIAL EQUATIONS

Duration: 3 hours

Max Marks: 120

- Note: 1. Answer any TEN questions in Part A. Each question carries 3 marks.
 2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

PART A

3x10=30

1. a) Write the formulae for the coefficients a_0 and a_n in the Fourier Series of an even function $f(x)$ of period 2π
- b) Prove that $\Gamma(n+1) = n!$
- c) Evaluate $\int_0^{\infty} x^7 e^{-x^2} dx$
- d) Solve $(D^3 - 3D^2 + 4)y = 0$.
- e) Find the particular integral of $(D^2 + 4D + 3)y = e^{-3x}$
- f) Solve $y'' - y = 0$, $y(0) = 2$, $y'(0) = 3$
- g) Prove that $y = x$ is a part of complementary function of the equation $(1-x)y'' + xy' - y = (1-x)^2$, $x \neq 1$
- h) Reduce $y'' - \frac{2}{x}y' + \left(1 + \frac{2}{x^2}\right)y = xe^x$ to normal form.
- i) Transform the equation $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} - 3y = x^2$ into another with constant coefficients by taking $z = \log x$.
- j) Find $L\{\cosh at\}$
- k) Find Laplace transform of $f(t) = 6 - 2\alpha(t - \pi) - 4\alpha(t - 2\pi)$ where α is step function.
- l) Evaluate $L^{-1}\left\{\frac{e^{-2s}}{(s+1)}\right\}$
- m) Write the differential equation of an elastic spring when both damping and impressed forces are present.
- n) A spring is such that 6 pound weight stretches it by 6 inches. Find the spring constant.
- o) Write the one dimensional wave equation.

PART - B

UNIT-I

2. a) Find the Fourier series of the function $f(t) = \begin{cases} 0 & -2 < t < -1 \\ k & -1 < t < 1 \\ 0 & 1 < t < 2 \end{cases}$. (6)

b) Show that $B(m, n) = \int_0^{\infty} \frac{y^{n-1}}{(1+y)^{m+n}} dy$ (6)

c) Show that $\int_0^1 x^5 (1-x^3)^{10} dx = \frac{1}{396}$ (6)

3. a) Find the Fourier coefficients of the periodic function $f(x) = \begin{cases} -k & -\pi < x < 0 \\ k & 0 < x < \pi \end{cases}$ (6)

b) Evaluate $\int_0^{\pi/2} \sin^{10} \theta d\theta$ using β -function. (6)

c) Show that $\int_0^1 x^{9/2} (1-x)^{-1/2} dx = \frac{63}{256} \pi$ (6)

UNIT-II

4. a) Solve $(D^2 + 4)y = \cos 2x$ (6)

b) Solve $(D^2 + 3D + 2)y = \sin x + x^2$ (6)

c) Solve $(D^2 - 13D + 12)y = e^{-2x} + 5e^x$ (6)

5. a) Solve $(D^2 - 4)y = \sin^2 x$ (6)

b) Solve $(D^2 - 3D + 2)y = \cos 3x \cos 2x$ (6)

c) Solve $(D^2 - D^2 - D + 1)y = 1 + x^2$ (6)

UNIT-III

6. a) Solve $x^3 \frac{d^2 y}{dx^3} + 3x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + y = x + \log x$ (6)

b) Solve $(D^2 + 1)y = \operatorname{cosec} x$ by the method of variation of parameters. (6)

c) Solve by reduction of order method $x \frac{d^2 y}{dx^2} - (2x-1) \frac{dy}{dx} + (x-1)y = e^x$ (6)

7. a) Solve by change of independent variable method: $\frac{d^2y}{dx^2} + \frac{dy}{dx} \tan x + y \cos^2 x = 0$. (6)
- b) Solve $(D^4 - 1)y = e^x \cos x$. (6)
- c) Solve $y_2 - 4xy_1 + (4x^2 - 3)y = e^{-x^2}$ by reducing to normal form. (6)

UNIT-IV

8. a) If $F(t)$ has a Laplace transform and if $F(t + \omega) = F(t)$, prove that

$$L\{F(t)\} = \frac{1}{1 - e^{-s\omega}} \int_0^{\omega} e^{-s\beta} F(\beta) d\beta$$
 (6)
- b) Solve $y'' + y = 6 \cos 2t$, $y(0) = 3$, $y'(0) = 1$ (6)
- c) Find $L^{-1}\left\{\frac{1}{s^2(s-1)}\right\}$ using the convolution theorem. (6)
9. a) Find (i) $L\{t^2 \sin kt\}$ (ii) $L^{-1}\left\{\frac{15}{s^2 + 4s + 13}\right\}$ (6)
- b) Find the Laplace transform of the function $f(t) = \begin{cases} t^2 & 0 < t < 2 \\ 6 & 2 < t \end{cases}$ using α - function. (6)
- c) Define gamma function and show that

$$L\{t^x\} = \frac{\Gamma(x+1)}{s^{x+1}}$$
 for $x > -1$, $s > 0$ (6)

UNIT-IV

10. a) A spring is such that it would be stretched 6 inches by a 12 pound weight. Let the weight be attached to the spring and pulled down 4 inches below the equilibrium point. Let the weight be started with an upward velocity of 2 feet per second, describe the motion. No damping or impressed force is present. (9)
- b) Find the solution $u(x, y)$ of the equation $u_x + u_y = 2(x + y)u$ by separation of variables. (9)

P.T.O.

11. a) A spring is such that a 4 pound weight stretches it 0.32 feet. The weight is attached to the spring and moves in a medium which furnishes a damping force of magnitude $\frac{3}{2}v$. The weight is drawn down $\frac{1}{2}$ foot below the equilibrium point and given an initial upward velocity of 4 ft/sec. Find the position of the weight thereafter. (9)

b) Solve the one dimensional heat equation. (9)

$$\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$$

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018

MATHEMATICS

PAPER VI: LINEAR PROGRAMMING

Duration: 3 hours

Max Marks: 120

- Note: 1. Answer any TEN questions in Part A. Each question carries 3 marks.
2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

PART A

3x10=30

1. a) Define (i) Hyperplane (ii) closed half space in R^n .
b) Convert the L.P.P. below to canonical form:
Maximize $f(x, y) = -2y - x$
subject to $2x - y \geq -1$
 $3y - x \leq 8$
 $x, y \geq 0$
c) Pivot on $a_{22} = 2$ in the following canonical maximization table.

x_1	x_2	-1	
2	1	8	$= -t_1$
1	2	10	$= -t_2$
30	50	0	$= f$

- d) Define negative transpose of the minimum table.
e) Write the dual Simplex Algorithm for maximum table.
f) Write the matrix reformulation of canonical maximization L.P.P.
g) Define mixed strategy and pure strategy for a row player of a matrix game.
h) Reduce the pay-off matrix $\begin{bmatrix} 0 & \frac{x}{4} \\ \frac{x-y}{4} & 0 \end{bmatrix}$ when $x \leq y$ and $x > 0$.
i) State the Von-Neumann Minimax theorem.
j) Define a balanced transportation problem.
k) Define a cycle in a balanced transportation problem.
l) Apply the 1st step of Hungarian Algorithm to

0.5	2	1
1.2	$\frac{1}{6}$	7
$\frac{5}{9}$	0	3.14

- m) Define a capacited directed network and given an example.
n) Explain the procedure to find the minimal cut corresponding to maximal flow according to Max-flow Min-cut theorem.
o) Define a path in a directed network and give an example.

PART - B

UNIT-I

2. a) Solve by sketching the constraint set: (9)

Maximize $g(x, y) = 5x + 2y$

subject to $x + 3y \geq 14$

$2x + y \geq 8$

$x, y \geq 0$

- b) Apply simplex algorithm to the maximum table. (9)

x_1	x_2	-1	
2	1	8	$= -t_1$
1	2	10	$= -t_2$
30	50	0	$= f$

3. a) List the ten steps in the Simplex Algorithm for Maximum table. (9)

- b) Apply simplex algorithm to the maximum table:

x	y	-1	
-1	-1	-2	$= -t_1$
1	-2	0	$= -t_2$
-2	1	1	$= -t_3$
-1	3	0	$= f$

UNIT-II

4. a) Apply simplex algorithm to the minimum table: (9)

x_1	20	25	300
x_2	40	20	500
-1	1000	800	0

$= t_1$ $= t_2$ $= g$

- b) Solve the noncanonical L.P.P.: (9)

Maximize $f(x, y) = x + 3y$

subject to $x + 2y \leq 10,$

$-3x - y \leq -15$

5. a) Solve the noncanonical LPP: (9)

Maximize $f(x, y, z) = x + 2y + z$

subject to $x + y + z = 6$

$x + y \leq 1$

$x, z \geq 0$

b) Solve the dual canonical L.P.P.: (9)

	x_1	x_2	-1	
y_1	1	2	20	$= -t_1$
y_2	2	2	30	$= -t_2$
y_3	2	1	25	$= -t_3$
-1	200	150	0	$= f$
	$=s_1$	$=s_2$	$=g$	

UNIT-III

6. a) Solve the dual non canonical L.P.P. below: (9)

	x_1	x_2	x_3	-1	
y_1	1	-1	2	1	$= -0$
y_2	2	0	2	-1	$= -t_1$
y_3	0	1	-1	-1	$= -t_2$
-1	1	-1	3	0	$= f$
	$=0$	$=0$	$=s_1$	$=g$	

b) Solve the matrix game: $\begin{bmatrix} -5/3 & 0 \\ 5 & -10/3 \end{bmatrix}$ (9)

7. a) Solve the dual non canonical L.P.P.: (9)

	x_1	x_2	-1	
y_1	2	-1	-1	$= -0$
y_2	-1	1	-1	$= -t_1$
-1	2	1	0	$= f$
	$=0$	$=s_1$	$=g$	

b) Solve the matrix game $\begin{bmatrix} 0 & y/4 \\ \frac{x-y}{4} & 0 \end{bmatrix}$ (9)

UNIT-IV

8. a) State the transportation algorithm. (9)
 b) Solve the assignment problem below. (9)

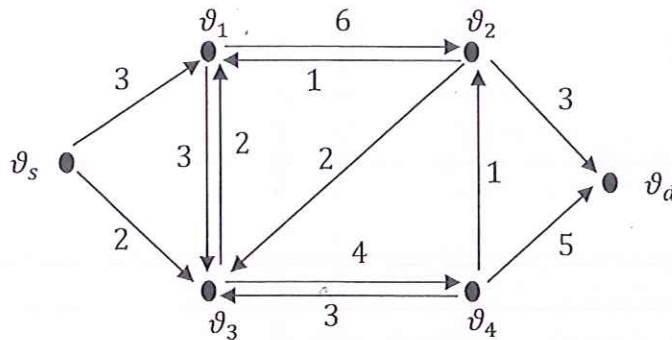
2	3	2	4
5	8	4	3
5	9	5	2
7	6	7	4

9. a) State the Hungarian algorithm. (9)
 b) Solve the transportation problem, below. (9)

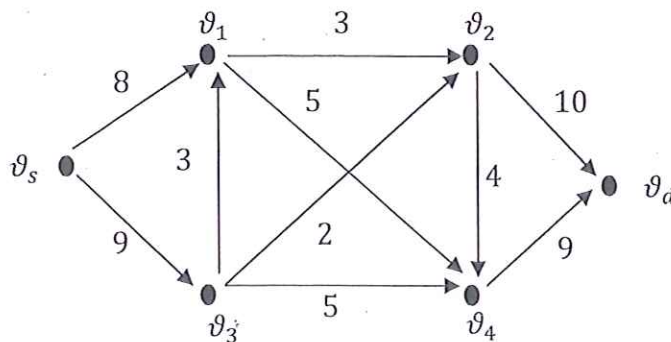
2	1	2	50
9	4	7	70
1	2	9	20
40	50	20	

UNIT-V

10. a) State the Maximal-flow algorithm. (9)
 b) Solve the shortest path network problem (9)



11. a) State the Dijkstra's algorithm for finding the shortest path. (9)
 b) Solve the maximal flow network problem: (9)



CREDIT BASED FIRST SEMESTER B.Sc. DEGREE EXAMINATION
OCTOBER 2018
BOTANY
PLANT DIVERSITY-I

Time: 3 Hrs

Max. Marks: 80

Instructions:

1. Answer both Part A & Part B.
2. Answer two full questions from each unit.
3. All questions in Part B carry equal marks.
4. Draw diagrams wherever necessary.

PART – A

1. Answer **any TEN** of the following. 10x2=20
- a) What are Viroids?
 - b) Write any two control measures of bunchy top disease of banana.
 - c) What is the basis of five kingdom system of classification? Who proposed it?
 - d) Mention any two applications of phase contrast microscope.
 - e) What are chemotrophic bacteria? Give an example.
 - f) Draw a neat labeled diagram of *Nostoc* filament.
 - g) What is eutrophication?
 - h) What is an endospore? Mention its significance.
 - i) What is an auxospore? Add a note on its significance.
 - j) Mention the pigments and reserve food in Phaeophyceae.
 - k) Name one parasitic alga and its host.
 - l) What is triphasic life cycle? Give an example.

PART – B**UNIT – I**

Answer **any TWO** of the following. 2x10=20

2. a) Explain the structure of TMV and symptoms of Tobacco Mosaic disease. 6
- b) What is dark field microscope? Add a note on its working principle and applications. 4
3. a) Describe the structure and reproduction in *Mycoplasma*. 6
- b) Give an account of Prions. Add a note on disease caused by them. 4

4. a) Explain the lytic cycle of bacteriophage. 6
b) Mention salient features of kingdom Monera. 4

UNIT – II

Answer any TWO of the following. 2x10=20

5. a) Explain any two types of genetic recombination in bacteria. 6
b) Write a note on false branching giving an example. 4
6. a) Explain role of bacteria in agriculture and industry. 6
b) What are single cell proteins? Give any two sources. 4
7. a) Name the causative agent, symptoms and control measures of Citrus Canker disease. 6
b) Give an account of structure of *Euglena*. 4

UNIT – III

Answer any TWO of the following. 2x10=20

8. a) Describe the sexual reproduction in *Volvox*. 6
b) Explain the thallus structure of *Vaucheria*. 4
9. a) Give an account of assimilatory shoots in *Caulerpa* with reference to atleast three species. 6
b) List the uses of Algae in industry. 4
10. a) Describe male and female conceptacles in *Sargassum*. 6
b) Write note on structure of *Cystocarp*. 4

CREDIT BASED THIRD SEMESTER B.Sc. DEGREE EXAMINATION
OCTOBER 2018
BOTANY
PLANT DIVERSITY-II

Time: 3 Hrs

Max. Marks: 80

Instructions:

1. Answer both Part A & Part B.
2. Answer two full questions from each unit.
3. All questions in Part B carry equal marks.
4. Draw diagrams wherever necessary.

PART – A

1. Answer any **TEN** of the following. **10x2=20**
- a) What are Caralloid roots? What is its significance?
 - b) Write any two differences between Racemose and Cymose inflorescences.
 - c) What are needles? Where do you find them?
 - d) Give the merits of APG III system.
 - e) Differentiate Didynamous condition from Tetradynamous condition.
Give an example.
 - f) Write a short note on Gynobasic style.
 - g) Give the scientific names of i) Ground nut ii) Lady's finger
 - h) Draw a neat labelled sketch of spikelet inflorescence.
 - i) What are transfusion tissues? Mention its function.
 - j) What is petalloid sepal? Give an example.
 - k) Write a note on Androecium in Myrtaceae.
 - l) Mention the types of fruits in Rosaceae.

PART – B**UNIT – I**

- Answer any **TWO** of the following. **2x10=20**
2. a) Give the detailed account of L.S. of *Cycas* ovule. **6**
 - b) Write a note on any two simple fleshy fruits. **4**
 3. a) Explain the anomalous secondary growth in the stem of *Gnetum*. **6**
 - b) Describe the various types of root modifications for mechanical function. **4**
 4. a) Explain the special types of inflorescences with example. **6**
 - b) Write a note on Phylloclades and Cladodes. **4**

UNIT – II

Answer **any TWO** of the following.

2x10=20

5. a) Give the salient features and merits of Bentham & Hooker system of classification. 6
b) Write a note on Papilionaceous Corolla. Give two examples. 4
6. a) What is placentation? Explain the types of placentation. 6
b) Give any Eight diagnostic characters of the family Malvaceae. 4
7. a) Mention the Diagnostic characters and morphological peculiarities of the family Anacardiaceae. 6
b) Write a note on cohesion in androecium. 4

UNIT – III

Answer **any TWO** of the following.

2x10=20

8. a) Give an account of the family Orchidaceae. 6
b) Write a note on the economic importance of the family Solanaceae. 4
9. a) Write the differences between the family Rubiaceae and Apocynaceae. 6
b) Write a note on leaves in family Liliaceae. 4
10. a) Write the salient features of family Arecaceae. 6
b) Give botanical name, family, part used and economic importance of
i) clove ii) Ashwagandha 4

BOT 501.2

Reg. No.

**CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION
OCTOBER 2018**

**BOTANY
PLANT PHYSIOLOGY**

Time: 3 Hrs

Max. Marks: 80

Instructions:

1. Answer both Part A & Part B.
2. Answer two full questions from each unit.
3. All questions in Part B carry equal marks.
4. Draw diagrams wherever necessary.

PART – A

1. Answer any TEN of the following. 10x2=20
- a) Distinguish between diffusion and imbibition.
 - b) What is Guttation? Give a plant example.
 - c) What are enzyme inhibitors? Give an example.
 - d) Define water potential.
 - e) What is Emerson effect?
 - f) Name the water soluble photosynthetic pigments.
 - g) Give two industrial uses of fermentation.
 - h) Define Phlaem loading.
 - i) What are auxins? Name two synthetic auxins.
 - j) Why glucose and fructose are considered reducing sugars?
 - k) What are photo neutral plants? Give an example.
 - l) Mention any two practical applications of ethylene.

PART – B

UNIT – I

Answer any TWO of the following. 2x10=20

2. a) Describe the starch hydrolysis theory to explain the mechanism of stomatal movements. 6
- b) Give any four important properties of enzymes. 4
3. a) Write the role played by manganese and phosphorous in plants. 6
- b) Explain the path of ascent of sap. 4
4. a) Write an essay on hydroponics and its applications. 6
- b) What is plasmolysis? How it can occur in plants. 4

UNIT – II

Answer any **TWO** of the following.

2x10=20

- | | | | |
|----|----|---|---|
| 5. | a) | Describe action and absorption spectrum. | 6 |
| | b) | Explain Munch hypothesis. | 4 |
| 6. | a) | Describe EMP pathway. | 6 |
| | b) | Differentiate Photosystem I and Photosystem II. | 4 |
| 7. | a) | Describe the non-cyclic photophosphorylation. | 6 |
| | b) | Define RQ. Explain RQ for respiratory substrates. | 4 |

UNIT – III

Answer any **TWO** of the following.

2x10=20

- | | | | |
|-----|----|--|---|
| 8. | a) | Explain glyoxylate cycle. Mention its significance. | 6 |
| | b) | Write a note on vernalization. | 4 |
| 9. | a) | Explain the role played by gibberellins in plant growth. | 6 |
| | b) | Differentiate amylase and amylopectin. | 4 |
| 10. | a) | Give schematic representation of Nitrogen cycle. | 6 |
| | b) | Define growth. Describe the role of external factors affecting growth. | 4 |

BOT 502.2

Reg. No:

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION
OCTOBER 2018

BOTANY
MOLECULAR BIOLOGY

Time: 3 Hrs

Max. Marks: 80

Instructions:

1. Answer both Part A & Part B.
2. Answer two full questions from each unit.
3. All questions in Part B carry equal marks.
4. Draw diagrams wherever necessary.

PART – A

1. Answer any **TEN** of the following. 10x2=20
- a) What are nucleotides? Give an example.
 - b) Mention the significance of primers in DNA replication.
 - c) What are monocistronic genes? Where are they found?
 - d) What is a Translation initiation complex?
 - e) Mention any two applications of RFLP.
 - f) What is a Co-repressor? Give an example.
 - g) Differentiate Somatic and Germinal mutations.
 - h) What is transition? Mention its significance.
 - i) What is reverse tandem duplication?
 - j) Name any two sequence alignment tools.
 - k) What is haploidy? Give its significance.
 - l) Differentiate between paracentric and pericentric inversions.

PART – B

UNIT – I

- Answer any **TWO** of the following. 2x10=20
2. a) Explain Hershey-Chase experiment. 6
b) List any 4 differences between the DNA and RNA. 4
 3. a) What is genetic code? Explain its properties. 6
b) Give an account of tRNA. 4
 4. a) Explain the process of mRNA biosynthesis in prokaryotes. 6
b) Write note on post transcriptional modification of RNA in eukaryotes. 4

UNIT – II

Answer any TWO of the following.

2x10=20

5. a) What is an Operon? Explain the structure of lactose operon. 6
b) What are aneuploids? Give the differences between monosomic and nullisomic conditions with examples. 4
6. a) Explain different types of chromosomal deficiency and their cytological significances. 6
b) Write a note on applications of polyploids in plant breeding with suitable examples. 4
7. a) What is translocation? Explain its cytological effects. 6
b) Explain allopolyploid with an example. 4

UNIT – III

Answer any TWO of the following.

2x10=20

8. a) Give an account of different databases. 6
b) What are physical mutagens? Explain the mutagenic effects of UV radiations. 4
9. a) Give a detailed account of PCR. 6
b) List out any four important outcomes of HGP. 4
10. a) Explain the mechanism of frameshift mutations. 6
b) Write the applications of southern and Northern blotting. 4

18ZOO101

Reg. No.....

CREDIT BASED FIRST SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018

ZOOLOGY

Paper I: Zoomorphology I

Duration: 3 Hrs.

Max. Marks: 80

Note: Answer any **TEN** questions from **PART – A**

Answer **SIX** questions from **PART – B** choosing any two questions from each unit.

PART – A

1. Answer any TEN of the following:

10×2=20

- 1) Define Species. Give an example.
- 2) Draw a neat labeled diagram of the structure of trophozoite.
- 3) What are choanocytes? Mention their function.
- 4) Name any two types of medusoid zooids.
- 5) What is metagenesis? Give an example.
- 6) What is triploblastic body wall?
- 7) Draw a neat labeled diagram of scolex of tapeworm.
- 8) What are tubicolous polychaetes? Give an example.
- 9) What are malpighian tubules? State its function.
- 10) List any two beneficial insects give their scientific names.
- 11) What is mantle?
- 12) What is ambulacral system?

PART – B

UNIT – I

- II.** a) Explain the principles of binomial nomenclature with three examples. (07)
b) Write any four unique characters of class Rhizopoda with an example. (03)
- III.** a) Write explanatory notes on leuconoid canal system in sponges. (07)
b) What are coral reefs? Mention its types. (03)
- IV.** a) With neat labeled diagram explain the different kinds of zooids found in the cormidium of *Halimeda*. (05)
b) Explain the exoerythrocytic cycle of *Plasmodium vivax*. (05)

UNIT – II

- V.** a) Give an account of the general characters of the Phylum Annelida with two examples. (07)
b) Explain the characteristics of class Trematoda with two examples. (03)

- VI. a) Give an account of pathogenicity of hook worm and human pin worm. (07)
b) Draw a neat labeled diagram of Pheretima. (03)
- VII. a) Explain any eight general characters of phylum Platyhelminthes with two examples. (05)
b) With the aid of neat labeled diagram explain the externals of Ascaris lumbricoides. (05)

UNIT – III

- VIII. a) Explain the morphology of Anopheles with a neat labeled diagram. (07)
b) Write any four unique features of class Polyplacophora with two examples. (03)
- IX. a) Explain the general characters of phylum Echinodermata with examples. (07)
b) With a neat labeled diagram explain the antenna of Penaeus. (03)
- X. a) Write six distinguishing features of class Gastropoda with two examples. (05)
b) Explain the externals of Asterias. (05)

ZOO 301.2

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CREDIT BASED FIRST SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018

ZOOLOGY

PHYSIOLOGY, BIOTECHNOLOGY AND IMMUNOLOGY

Duration: 3 hours

Max Marks: 80

Note: Answer any **TEN** Questions from Part-A

Answer **SIX** questions from Part-B choosing any two questions from each unit.

PART A

I. Answer any **TEN** of the following:

10x2=20

1. Name any two branches of Physiology.
2. What is osmoregulation?
3. What is Ureotelism?
4. Define external respiration.
5. Mention the functions of semilunar valves.
6. Name any two enzymes present in Pancreatic juice.
7. What are unipolar neurons? Give one example.
8. Define a sarcomere.
9. What are transferases? Give two examples.
10. Define Carbohydrate.
11. What is rickets?
12. Define innate immunity.

PART-B

UNIT-I

- | | | | |
|------|----|--|----|
| II. | a) | Differentiate Osmoregulation in freshwater and marine teleosts. | 07 |
| | b) | Explain the scope of physiology. | 03 |
| III. | a) | With reference to Respiration. Explain transport of gases. | 07 |
| | b) | Give a schematic representation of Ornithine cycle. | 03 |
| IV. | a) | Explain the mechanism of ultrafiltration. | 05 |
| | b) | Give a comprehensive account of respiratory pigments in animals. | 05 |

UNIT-II

- V. a) Explain the ultrastructure of a striated muscle fibre with suitable diagrams. 07
b) What is the significance of double circulation? 03
- ~~VI. a) With a neat labelled diagram, explain the structure of human eye. 05
b) Write a note on role of HCl in digestion. 05~~
- VII. a) Draw the diagram of V.S. of human heart and label the parts. 05
b) Explain the fat digestion and its absorption. 05

UNIT-III

- VIII. a) Explain the chemistry of nucleic acids. 07
b) Define competitive inhibitors. Give two examples. 03
- IX. a) Explain the secondary lymphoid organs. 07
Explain the structure of primary proteins. 03
- X. a) What are the biochemical functions and deficiency disorders of Vitamin-C 05
b) Explain the antigen-antibody reaction. 05

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018

ZOOLOGY**CELL BIOLOGY, MOLECULAR BIOLOGY AND GENETIC ENGINEERING**

Duration: 3 hours

Max Marks: 80

Note: Answer any **TEN** Questions from Part-AAnswer **SIX** questions from Part-B choosing any two questions from each unit.**PART A****I. Answer any TEN of the following:****10x2=20**

1. Write any two functions of Golgi complex.
2. Write any two differences between euchromatin and heterochromatin.
3. What are cell junctions? Name the types of cell junctions.
4. What are intermediate filaments? Mention any one function.
5. Write any four characteristics of cancer cells.
6. Name the subphases of Prophase-I of meiosis.
7. What is nucleocytoplasmic interaction? Give an example.
8. Write any two significances of mitosis.
9. What is Wobble hypothesis?
10. Write the base pairing in a DNA double helix.
11. Define Transduction.

PART-B**UNIT-I**

- II. a) Explain the structure of plasma membrane based on fluid mosaic model. 07
 b) Enumerate any three branches of Cell Biology with definition for each. 03
- III. a) What are giant chromosomes? Give an account of the structure and functions of Lampbrush chromosomes. 07
 b) Write the functions of microfilaments. 03
- IV. a) Give a brief account of the organisation and functions of microtubules. 05
 b) Describe the nucleosome model. 05

UNIT-II

V.	a)	Define crossing over. Explain the mechanism of crossing over.	07
	b)	What are mitotic inhibitors? Give an example.	03
VI.	a)	What are carcinogenic agents? Explain the different types of carcinogenic agents with suitable examples.	05
	b)	Write a short note on heterokaryon.	05
VII.	a)	Explain the role of anti-oxidants as protective agents against cancer.	05
	b)	What are mitotic apparatus? Explain the role of mitotic apparatus in chromosomal movement.	05

UNIT-III

VIII.	a)	With reference to genetic engineering, describe the different techniques involved in the isolation of DNA.	07
	b)	Describe any three properties of genetic code.	03
IX.	a)	Describe the process of transcription with suitable illustrations.	07
	b)	Write a note on Plasmids.	03
X.	a)	Explain the components of protein biosynthesis.	05
	b)	Give a brief account on 'gene libraries'.	05

CREDIT BASED THIRD SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018

ZOOLOGY
DEVELOPMENTAL BIOLOGY

Duration: 3 hours

Max Marks: 80

Note: Answer any **TEN** Questions from Part-A
Answer **SIX** questions from Part-B choosing any two questions from each unit.

PART A

- I. Answer any **TEN** of the following: 10x2=20
1. What is the role of seminal vesicles in reproduction?
 2. Define cloning.
 3. What is a polar body?
 4. Define amphimixis.
 5. What is periblastula? Where do you find it?
 6. State Sach's law of cleavage.
 7. What is grey crescent? Mention its significance.
 8. What is coeloblastula? Give an example.
 9. List any four derivations of endoderm.
 10. What is diffused placenta? Give an example.
 11. What are gonadotropic hormones? Name them.
 12. Give the functions of amnion.

PART-B**UNIT-I**

- II. a) Explain cyclic parthenogenesis giving suitable example. 07
b) Explain briefly menstrual cycle. 03
- III. a) With the help of a neat labelled diagram explain the female reproductive system in human. 07
b) Explain the steps involved in cloning of Dolly the sheep. 03
- IV. a) What are accessory sex organs? Explain with reference to human males. 05
b) Describe IVF-ET. 05

UNIT-II

- V. a) Define organizer phenomenon. Explain the transplantation experiments of Spemann & Mangold on amphibian gastrula. 07
b) What is spiral cleavage? Give any two examples. 03
- VI. a) The amount and distribution of yolk will determine the type of cleavage – Elucidate. 05
b) Explain the cortical reaction with suitable illustrations. 05
- VII. a) Explain the process of invagination during gastrulation in frog. 05
b) Draw a labelled diagram representing the fate map of blastula in frog. 05

UNIT-III

- VIII. a) Draw the labelled diagram of hen's egg and explain its structure. 07
b) Describe the role of hormones produced by testis in humans. 03
- IX. a) Give an account of gastrulation in Chick. Illustrate your answer with suitable diagrams. 07
b) Write short note on yolk sac. 03
- X. a) Give an account of twins in human. 05
b) Write explanatory notes on Epitheliochorial Placenta. 05

CREDIT BASED FIRST SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018

MICROBIOLOGY- I
GENERAL MICROBIOLOGY

Duration: 3 Hours

Max Marks: 80

Note: Draw diagrams wherever necessary.

PART A

- I. Answer any **TEN** of the following: 10x2=20
- a) Edward Jenner
 - b) Sterilization by Halogens
 - c) Synthetic Media
 - d) Abiogenesis
 - e) Resolving Power
 - f) Liquid Nitrogen
 - g) Food Microbiology
 - h) Flagella
 - i) Pre reduced Media
 - j) Khorana
 - k) Sterilization by temperature below 100°C.
 - l) Stab Culture

PART-B**UNIT-I**

- Answer any **TWO** complete questions of the following: 2x10=20
- II. a) Explain Whittaker's five kingdom concept of Taxonomy. 06
b) Write a note on the contributions of Alexander Fleming. 04
 - III. a) Explain in detail the scope of Microbiology. 06
b) Write in brief on species concept. 04
 - IV. a) Discuss Bergey's Manual as a method of classification of Bacteria. 06
b) Write a short note on Felix De' Herelle. 04

UNIT-II

- Answer any **TWO** complete questions of the following: 2x10=20
- V. a) Explain filtration as a method of sterilization. 06
b) Write a short note on magnification in microscopy. 04
 - VI. a) Explain the principle, procedure and inference of Acid Fast Staining. 06
b) Write a note on Autoclave. 04
 - VII. a) Explain the construction and working of TEM. 06
b) Discuss capsule Staining Method. 04

UNIT-III

- Answer any **TWO** complete questions of the following: 2x10=20
- VIII. a) Discuss serial dilution as a method for isolating Microorganisms. 06
b) Write a brief note on anaerobic Jar. 04
 - IX. a) Explain Lyophilization in detail. 06
b) Write a short note on any two types of Special Media. 04
 - X. a) Define culture Media. Write a note on its classification based on Physical Nature. 06
b) Write a note on spread Plate Method. 04

CREDIT BASED THIRD SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018

MICROBIOLOGY
MICROBIAL GROWTH

Duration: 3 Hours

Max Marks: 80

Note: Draw diagrams wherever necessary.

PART A

- I. Answer any TEN of the following: 2x10=20.
- a) Budding
 - b) Endoenzymes
 - c) Activation Energy
 - d) Bioenergetics
 - e) Chemolithotrophs
 - f) Steroids
 - g) Growth Rate
 - h) Co-Factors
 - i) Microaerophiles
 - j) Ligases
 - k) mRNA
 - l) Monosaccharides

PART-BAnswer any **TWO** complete questions from each unit**UNIT-I**

- II. a) Explain the various modes of Asexual Reproduction in Bacteria. 06
b) Write a note on Turbidostat. 04
- III. a) Explain the nutritional classification of Bacteria. 06
b) Write a note on Active Transport. 04
- IV. a) Classify Bacteria according to their pH requirements. 06
b) Write a note on Micronutrients. 04

UNIT-II

- V. a) Explain the laws of thermodynamics. 06
b) Write a note on Tertiary structure of proteins. 04
- VI. a) Define Carbohydrates: Write a note on disaccharides with suitable examples. 06
b) Write a note on Protein Denaturation. 04
- VII. a) Explain the Watson and Crick model of DNA. 06
b) Write a note on saturated and unsaturated fatty acids. 04

UNIT-III

- VIII. a) Explain the classification of enzymes. 06
b) Write a note on ES complex. 04
- IX. a) Explain the general characteristics of enzymes based on heat sensitivity and enzyme specificity. 06
b) Write a note on Enzyme Reversibility. 04
- X. a) Explain Fischer's Lock and key Model. 06
b) Write a note on control of enzyme action. 04

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018

MICROBIOLOGY**IMMUNOLOGY AND MEDICAL MICROBIOLOGY**

Duration: 3 Hours

Max Marks: 80

Note: Draw diagrams wherever necessary.

PART A

- I. Answer any TEN of the following: 2x10=20
- a) Malaria
 - b) Hepatitis-B
 - c) Synthetic Drugs
 - d) Adjuvant
 - e) Antibiotic Resistance
 - f) Coombs test
 - g) Tetanus
 - h) *E.coli*
 - i) Chemotherapy
 - j) IgE
 - k) Hybridoma
 - l) Metronidazole

PART-B**UNIT-I**Answer any TWO complete questions of the following: 10x2=20

- II. a) Explain the theories of Immune Response. Add a note on cell mediated Immune Response. 06
- b) Write a note on the general features of Ag-Ab Reactions. 04
- III. a) Discuss the general structure of Immunoglobulin. 06
- b) Write a note on Delayed type Hypersensitivity. 04
- IV. a) Explain the precipitation reactions. Add a note on its applications. 06
- b) Write a note on factors influencing antibody production. 04

UNIT-IIAnswer any TWO complete questions of the following: 10x2=20

- V. a) Explain the pathogenesis, Lab diagnosis and treatment of *Staphylococcus*. 06
- b) Write a note on *Candida*. 04
- VI. a) Explain the Pathogenesis, Lab diagnosis and treatment of Salmonella. 06
- b) Write a note on *Plasmodium vivax*. 04
- VII. a) Explain the pathogenesis, lab diagnosis and treatment of *Giardia intestinalis*. 06
- b) Write a note on AIDS. 04

UNIT-IIIAnswer any TWO complete questions of the following: 10x2=20

- VIII. a) Explain about Penicillin and Gentamycin. 06
- b) Write a note on general mode of action of Antimicrobial Agents. 04
- IX. a) Discuss the Assay of Antibiotics by tube dilution method. 06
- b) Write a note on factors affecting Antimicrobial control. 04
- X. a) Explain any two Antiviral Agents. 06
- b) Write a note on Antifungal Agents. 04

**CREDIT BASED FIRST SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018
COMPUTER SCIENCE – I**

FUNDAMENTALS OF COMPUTERS AND PROGRAMMING IN C

Duration: 3 Hrs.

Max. Marks: 80

PART – A

1. Answer any TEN questions from the following: 10×2=20
- Write 1's and 2's complement of 10110.
 - Prove that $x + xy = x$
 - What is principle of duality? Write the dual of $x^1y + xy^1 = 1$
 - Write the truth table and logic symbol of AND gate.
 - Differentiate constant and variables.
 - What is explicit type conversion? Give example.
 - How is a variable declared? Why is it necessary to declare a variable?
 - What is the purpose of break and continue statements?
 - Write the C expressions for the following:

$$z = 5a^3 + xy \qquad Z = \frac{a+b}{a-b}$$
 - What is an array? Give an example.
 - What is the difference between structure and union?
 - What do you mean by scope and lifetime of a variable?

PART – B

Answer any Two questions from each unit:

UNIT – I

- Perform the following conversions.
 $(BCA.D)_{16} = (?)_2 = (?)_8 = (?)_{10}$
 - State and prove Demorgans theorem for 2 variables. [6 + 4]
- Explain the function $F(A_1B_1C) = B + A^1C$ as sum of minterms and product of maxterms.
 - Write the logic symbol & truth table for NOR gate. [6+ 4]
- Using K-map, simplify the following expression and draw the logic circuit for the simplified expression.
 $F(a, b, c, d) = \sum (0, 1, 2, 4, 5, 6, 8, 9, 12, 13, 14)$
 - State the postulates of Boolean Algebra. [6 + 4]

UNIT – II

- Explain the various relational and logical operators with examples.
 - With syntax and example explain while loop. [6 + 4]

6. a) With an example, explain the purpose of the following.
i) ceil () ii) sqrt () iii) pow ()
b) Explain how to declare and initialize one dimensional array with an example. [6 + 4]

7. a) Explain the basic structure of a C program.
b) Explain with an example the various basic data types supported in C. [5 + 5]

UNIT – III

8. a) What is a function? Write the general form of user-defined function. Give an example.
b) Explain any four string handling functions with syntax and example. [6 + 4]

9. a) Explain any three storage classes available in C.
b) What is recursion? Explain with an example. [6 + 4]

10. a) Explain in detail Array of structures with an example.
b) What is a Pointer? How do you declare, initialize and access pointer variables? Give an Example. [5 + 5]

CREDIT BASED THIRD SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018
COMPUTER SCIENCE – III
DBMS AND DATA STRUCTURES USING C

Duration: 3 Hrs.

Max. Marks: 80

PART – A

1. Answer any TEN questions from the following: 10×2=20
- a) Define Database Management System.
 - b) Define Meta data and system catalog.
 - c) What are mappings?
 - d) What is weak entity type? Give example.
 - e) How can you rename the table? Give an example.
 - f) Write syntax and example of ALTER command in SQL.
 - g) What is sub query?
 - h) Who is Database Administrator?
 - i) Write an algorithm to check for stack full.
 - j) How does STACK differ from QUEUE?
 - k) What is a doubly linked list?
 - l) What is tree? Give an example.

PART – B**Answer any Two questions from each unit:****UNIT – I**

2.
 - a) Compare DBMS approach over traditional file oriented system.
 - b) Define data independence. Explain. [5 + 5]
3.
 - a) Explain Relationship Type and structural constraints with an example.
 - b) What is an attribute? Explain single valued attribute, multi-valued attribute with an example. [5 + 5]
4.
 - a) Describe the various symbols used in an ER diagram using example.
 - b) Explain PROJECT operation with suitable example. [5 + 5]

UNIT – II

5.
 - a) List and explain any five data types used in oracle.
 - b) Consider the tables given below:
 PRODUCT_DETAIL (PRODUCT_No, PRODUCT_NAME, DESCRIPTION, QTYAVL, PRICE, PROFITINY)
 PURCHASED_DETAIL (CUSTNAME, PRODUCT NO, QTYSOLD)
 Write the following queries:
 i) List qtysold for each product
 ii) List products, which have been sold to 'Ivan'.

iii) List product no, and description of nonmoving products (ie products not being sold). [5 + 5]

6. a) What do you mean by primary key constraint? How can we create primary keys in a table? Explain with example.
b) List and explain any four clauses used in SELECT statement. [5 + 5]
7. a) Explain UNION and INTERSECT clause used in SQL, with example.
b) Explain any five aggregate functions available in oracle. [5 + 5]

UNIT - III

8. a) Write an algorithm for inserting node at the beginning and deleting from the end.
b) Write an algorithm to implement PUSH and POP operations of stack. [5 + 5]
9. a) Explain how linked list is implemented using array.
b) What is queue? Write an algorithm to insert and delete an item into/from a queue. [5 + 5]
10. a) What are the three standard ways of traversing tree T with root R? Write steps of each traversal using recursion.
b) Write a note on applications of binary trees. [5 + 5]

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018
COMPUTER SCIENCE – V
VISUAL PROGRAMMING USING VB.NET

Duration: 3 Hrs.

Max. Marks: 80

PART – A

1. Answer any TEN questions from the following: 10×2=20
- a) Write any two features of VB.NET.
 - b) Differentiate between arithmetic operators \ and /.
 - c) What are static and dynamic arrays?
 - d) What is the purpose of Common Language Runtime?
 - e) Explain the terms: method overload and method override.
 - f) Differentiate between combo box and list box.
 - g) Define inheritance. Give example.
 - h) List different ways of arranging MDI child forms.
 - i) Write the differences between label and textbox.
 - j) Mention any two advantages of ADO.
 - k) What is an exception? Give any two predefined exceptions.
 - l) List any two unique properties of a DataGridView control and write their purpose.

PART – B

Answer any Two questions from each unit:

UNIT – I

2.
 - a) Explain any five components available in VBIDE.
 - b) What is meant by operator precedence? Explain the precedence rules for arithmetical operators with examples [5 + 5]
3.
 - a) Explain the use of REDIM and PRESERVE keywords. Give examples.
 - b) Explain SELECT CASE statement with syntax, purpose and example. [5 + 5]
4.
 - a) Write the usage of Chr(), Ucase(), Cdate(), Val() and Dateserial().
 - b) Explain FOR.....NEXT and FOR EACH.....NEXT looping statements. Give an example. [5 + 5]

UNIT – II

5.
 - a) Explain InputBox() with syntax and example.
 - b) With example code, explain how to add a textbox to a form during runtime. [6 + 4]
6.
 - a) Explain the usage of following properties/methods.
 - i) Wordwrap and passwordchar of textbox.
 - ii) Windowstate and controlbox of form
 - iii) Multicolumn and RemoveAt of listbox.
 - b) Explain: i) Calendar Control 2) Date Time Picker [6 + 4]

7. a) What are classes and objects? How do you create them? Explain.
b) Write a note on Abstract Classes and abstract methods. [6 + 4]

UNIT – III

8. a) Explain Try.....Catch....Finally blocks used to handle exceptions with syntax and example.
b) List any six predefined exceptions available in VB.Net with their meaning. [7 + 3]
9. a) Explain any six ADO.Net objects.
b) Write a note on simple and complex binding. [6 + 4]
10. a) Write a note on DataAdapter and DataSet.
b) With example show how to create, retrieve and update data tables. [4 + 6]

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018
COMPUTER SCIENCE – VI
Operating System & Linux

Duration: 3 Hrs.

Max. Marks: 80

PART – A

1. Answer any TEN questions from the following: 10×2=20
- What is a hard real time system?
 - What is PCB? List any two fields of PCB.
 - Define the terms response time and throughput.
 - What is swapping?
 - Define fragmentation.
 - What is pure demand paging?
 - Name any four operations on a file.
 - Differentiate between preemptive and non preemptive scheduling.
 - Differentiate between logical and physical address space.
 - Mention any four attributes of files.
 - List the string operators and their meaning in Linux.
 - Give the syntax and meaning of sort command in Linux

PART – B

Answer any Two questions from each unit:

UNIT – I

2. a) Draw the process state diagram and explain the various states of a process.
 b) Explain priority scheduling. Given the following processes and their priority, determine the average waiting time using priority scheduling.

Process	P1	P2	P3	P4	P5
Burst time	10	1	2	1	5
Priority	3	1	3	4	2

3. a) What is segmentation? Explain segmentation with example. [4 + 6]
 b) Write a note on paging. [6 + 4]
4. a) Explain the following:
 i) Multiprogramming System
 ii) Time sharing systems.
 b) Explain any four services of an operating system. [6 + 4]

UNIT – II

5. a) What is a directory? Explain any two directory structures.
 b) Explain any two techniques used to improve the performance of disk systems. [5 + 5]

6. a) What are the necessary conditions for deadlock situation to occur? Explain.
b) Explain the data structures used in algorithm. [5 + 5]
7. a) Explain the following Disk scheduling algorithms.
i) SSTF ii) SCAN iii) C - SCAN
b) What is disk formatting? Why is it required? [6 + 4]

UNIT – III

8. a) Explain the following commands in Linux operating system with example.
i) cut ii) ls iii) chmod
b) Write a shell program to accept an Integer, find the sum of digits and reverse it. [5 + 5]
9. a) What are the redirection operators available in Linux? Explain.
b) Explain the following commands in Linux operating system with an example.
i) grep ii) cp iii) mkdir [4 + 6]
10. a) Explain the features of Linux OS.
b) Explain the general file structures of Linux. [5 + 5]

18STA101

Reg. No.....

**CREDIT BASED FIRST SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018
STATISTICS**

Paper I: Descriptive Statistics & Probability

Duration: 3 Hrs.

Max. Marks: 80

PART – A

Answer any TEN of the following:

10×2=20

1. a) Define Interval scale and Ratio scale.
- b) What do you mean by Cross-sectional data and Industrial data?
- c) Define correlation with an example.
- d) State any two properties of correlation coefficient.
- e) Write a note on intraclass correlation.
- f) Define mutually exclusive and independent events with an example.
- g) State axiomatic definition of probability.
- h) State and prove any two properties of distribution function.
- i) Define Moment generating function and Cumulant generating function.
- j) State any two limitations of Index numbers.
- k) Explain Factor Reversal Test.
- l) State Pareto's law of income distribution.

PART – B

Answer any TWO of the following:

2×10=20

2. a) Derive the formula for spearman's rank correlation coefficient when there are no ties for the ranks. (06)
- b) If $z = ax + by$ and ' r ' is the coefficient correlation between x and y , show that
$$\sigma_z^2 = a^2 \sigma_x^2 + b^2 \sigma_y^2 + 2abr \sigma_x \sigma_y.$$
 (04)
3. a) State and prove any two properties of regression coefficients. (05)
- b) Obtain an expression for the angle between two regression equations and interpret the values $r = 0$ and $r = 1$. (05)
4. a) Show that $0 \leq R_{1.23} \leq 1$. (05)
- b) Derive the regression equation of X_1 on X_2 and X_3 . (05)

Answer any TWO of the following:

2×10=20

5. a) Prove that conditional probability satisfies the axioms of probability. (05)
- b) State and prove addition theorem of probability. (05)

6. a) If A and B are two independent events, show that (i) A^c and B^c (ii) A^c and B are also independent. (05)
b) State and prove Bayes theorem of probability. (05)
7. a) Find β_1 and β_2 of the distribution $f(x) = \frac{1}{3}$, $1 \leq x \leq 4$. (05)
b) If $f(x, y) = 2 - x - y$, $0 \leq x \leq 1$, $0 \leq y \leq 1$ verify whether x and y are independent. (05)
- Answer any TWO of the following:** 2×10=20
8. a) Explain the applications of Pareto and Lognormal as income distribution. (05)
b) Explain the steps in the construction of Price Index Numbers. (05)
9. a) What do you mean by Base shifting? How do you construct
i) A chain base index number?
ii) Fixed base index number? (05)
b) "Fisher's Index Number is an ideal index number". Comment. (05)
10. a) Explain the objectives of demand forecasting. (05)
b) Explain Engel's law and critically comment on it. (05)

STA 301.1

Reg. No.

CREDIT BASED THIRD SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018
STATISTICS
DISTRIBUTIONS AND ESTIMATION THEORY

Time: 3 Hrs

Max. Marks: 80

PART - A

Answer any TEN of the following:

2x10=20

1. a) Write down the m.g.f. of U (0, 1) distribution.
- b) Write down the distribution function of Cauchy variate with parameter θ .
- c) Define beta distribution of the first kind.
- d) If X is a normal variate with mean - 20 and variance 9. Obtain the points of inflections of this distribution.
- e) If $F \sim F(n_1, n_2)$ write down the p.d.f. of $\frac{1}{F}$.
- f) State the relation between F & students t.
- g) Write down the p.d.f. of the n^{th} order statistic.
- h) If t is a t - variate with 6 df what is its mean and variance?
- i) State the conditions for an estimator to be consistent estimator of a parameter.
- j) Show that if T_n is unbiased for θ , T_n^2 is biased for θ .
- k) State any two properties of moment estimators.
- l) What is meant by confidence interval.

PART - B

Answer any TWO of the following:

10x2=20

2. a) For a rectangular distribution $f(x) = \frac{1}{b-a}$; $a \leq x \leq b$ derive the mean and variance.
b) Obtain the m.g.f. of gamma distribution with parameter λ . (6+4)
3. a) Find the median and mode of Cauchy distribution.
b) State and prove the memory less property of exponential distribution. (6+4)
4. a) Derive an expression for even order central moments of normal distribution.
b) Find the M.G.F. of normal distribution. (6+4)

Answer any TWO of the following:

10x2=20

5. a) If X and Y are two independent gamma variates with parameters m & n respectively, show that $U = X + Y$ and $V = \frac{X}{Y}$ are independent. Also identify the distribution of U & V.
- b) If X has the density function $f(x) = \frac{1}{\theta} e^{-x/\theta}$; $x \geq 0$, $\theta > 0$, find the p.d.f. of $X_n = \max(x_1, \dots, x_n)$ (6+4)
6. a) Obtain the variance of t-distribution.
- b) Derive the p.d.f. of a χ^2 variate with 'n' degrees of freedom. (4+6)
7. a) Derive the expression for even order central moments of 't' distribution.
- b) Assuming the expression for the mean, find the variance of F-distribution. (6+4)

Answer any TWO of the following:

10x2=20

8. a) $x_j (j=1 \text{ to } n)$ are random observations from Bernoulli (θ) distribution. Show that $\frac{T_n(T_n - 1)}{n(n-1)}$ is an unbiased for θ^2 when $T_n = \sum_{j=1}^n X_j$
- b) X_1, X_2, \dots, X_n is a random sample from $U(0, \theta)$, $\theta \in (0, \infty)$. If $X_n = \max(X_1, X_2, \dots, X_n)$, show that X_n is consistent for θ . (6+4)
9. a) Let x_1, x_2, \dots, x_n be a random sample from Beta distribution of first kind with parameters μ and 1. Find the m.l.c. of $\theta = \frac{\mu}{\mu+1}$
- b) Derive the moment estimators of the parameters α and θ when a sample of size 'n' is drawn from a gamma distribution with p.d.f.
- $$f(x) = \frac{\theta^\alpha x^{\alpha-1} e^{-\theta x}}{\Gamma \alpha}; \quad x > 0 \quad (5+5)$$
10. a) Obtain 100(1- α)% central confidence interval for the variance of normal population with unknown mean.
- b) Derive 100(1- α)% central confidence interval for the difference in proportions of two independent populations based on 2 samples of large sizes. (6+4)

STA 501

Reg. No.

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2018

STATISTICS

PAPER V - SAMPLING THEORY

Time: 3 Hrs

Max. Marks: 80

PART - A

Answer any TEN of the following:

2X10=20

1. a) Define sampling design.
- b) What do you mean by Pilot survey?
- c) Define efficiency of one design as compared to the other.
- d) How do you obtain standard error of population total in case of SRSWR?
- e) From a population containing 3 units Y_1, Y_2 and Y_3 draw all possible SRSWR samples of size 2.
- f) Explain SRSWOR.
- g) Give one example for stratified sampling.
- h) Explain proportional allocation in case of stratification.
- i) Define systematic sampling.
- j) Give one example for cluster sampling.
- k) What do you mean by multistage sampling?
- l) Distinguish between Quota and PPS sampling.

PART - B

Answer any TWO of the following:

10x2=20

2. a) Explain non-sampling errors. What are its sources?
- b) Discuss the steps involved in planning and execution of sampling survey. (4+6)
3. a) Explain the method of selecting a random sample from a contingency table.
- b) What are the limitations of sampling? (5+5)
4. a) State and explain the principles of sample survey?
- b) Briefly discuss the advantages of sampling. (6+4)

Answer any TWO of the following:

10x2=20

5. a) Under SRSWOR find the variance of estimated population mean.
b) Show that variance of estimated mean under stratified sample is minimum for fixed total sample size of the sample if $n_h \propto N_h S_h$ (5+5)
6. a) Compare SRSWR with SRSWOR
b) With usual notations prove that $E(s^2) = \sigma^2$ under SRSWR (5+5)
7. a) With usual notations prove that
$$V(\bar{Y}_{st})_{OA} = \frac{(\sum W_h S_h)^2}{n} - \frac{\sum W_h S_h^2}{N}$$

b) Estimate the sample size under SRSWOR for specified precision (5+5)

Answer any TWO of the following:

10x2=20

8. a) Explain circular systematic sampling.
b) Show that with usual notations.
$$V(\bar{Y}_{st})_{sys} = \frac{N-1}{N} S^2 - \frac{(n-1)}{n} S_{sys}^2$$
 (5+5)
9. a) What are the advantages of systematic sampling?
b) For a population with linear trend show that $V(\bar{y}_{st}) < V(\bar{y})_{sys}$. (5+5)
10. a) Show that with usual notations $V(\bar{y}_{sys}) = \frac{nk-1}{nk} \frac{s^2}{n} \{1 + (n-1)\rho\}$ where ρ is the intraclass correlation co-efficient between the units of the same systematic sample.
b) Find relative efficiency of estimate of the population mean of systematic sampling over SRSWOR and comment on your findings. (5+5)

STATISTICS**OPERATIONS RESEARCH - I**

Time: 3 Hrs

Max. Marks: 80

PART - A

Answer any TEN of the following:

2X10=20

1. a) What is meant by formulation of LPP?
- b) In an LPP define (i) solution (ii) optimal solution
- c) Define Slack Variable. Give an example.
- d) What is the indicator of unbounded solution in the optimal simplex table?
- e) How is the case of unrestricted Variables tackled in Simplex Method?
- f) Briefly state the Dual Simplex Method.
- g) State any two Properties of Dual LPP.
- h) What is Sensitivity Analysis?
- i) State the assignment problem as an LPP.
- j) Define present value and depreciation value in replacement theory.
- k) How are the entering variable and departing variable identified in a Transportation algorithm?
- l) Define feasible and optimal solution of a T.P.

PART - B

Answer any TWO of the following:

10x2=20

2. a) Describe the Models in OR with examples.
- b) Give the simplex algorithm of solving an LPP. (5+5)
3. a) Standardize the following LPP

$$\text{Min. } Z = x_1 + x_2$$
 subject to

$$x_1 + 2x_2 \leq 4$$

$$3x_1 + x_2 \leq -6$$

$$2x_1 + x_2 \leq 5$$

$$x_1, x_2 \geq 0$$
- b) Explain Charne's Big M method of solving an LPP. (4+6)
4. a) Define LPP. Give a practical example of LPP with an objective function
 - (i) to be maximized
 - (ii) to be minimised
- b) Explain the Two Phase method of solving an LPP. (4+6)

Answer any TWO of the following.

10x2=20

5. a) Write the dual of the following LPP.

$$\text{Min. } Z = x_1 - 3x_2 + 2x_3$$
 subject to

$$3x_1 - x_2 + 2x_3 \leq 7$$

$$2x_1 - 4x_2 \leq 12$$

$$-4x_1 + 3x_2 + 8x_3 = 10$$

$$x_1, x_2 \geq 0 \quad x_3 \text{ unrestricted}$$

b) Explain the Dual Simplex Method.

(5+5)

6. a) Consider the following LPP.

$$\text{Min. } Z = 2x_1 + 4x_2 + 4x_3 + 2x_4 - 3x_4$$

$$\text{subject to } x_1 + x_2 + x_3 = 4$$

$$x_1 + 4x_2 + x_4 = 8$$

$$x_1, x_2, x_3, x_4, \geq 0$$

By using x_3 and x_4 as the starting variables, the optimum tableau is given by:

C_B	Basis	X_1	X_2	X_3	X_4	Solution
4	X_3	$\frac{3}{4}$	0	1	$-\frac{1}{4}$	2
4	X_2	$\frac{1}{4}$	1	0	$\frac{1}{4}$	2
$\Delta_j = Z_j - C_j$		+2	0	0	+3	16

Write the dual problem and find its solution from the optimal primal tableau.

b) Describe the role of duality for sensitivity analysis of LPP.

(5+5)

7. a) Briefly explain how the following changes in an LPP will affect the optimality or feasibility of the current solution:

a) Changes in the requirement vector b , the cost vector c and the elements of the coefficient matrix A .

b) Structural changes due to addition/ deletion of some variables or constraints. (10)

Answer any TWO of the following.

10x2=20

8. a) Explain Vogel's approximation method of finding an initial basic feasible solution to a T.P.

b) Explain $U-V$ or MODI method of solving a T.P.

(3+7)

9. a) Describe a method of solving an assignment problems when the objective function is to be maximized.

b) Show that in an A.P. optimal assignment remains unchanged when we add/subtract a constant to/from each row or column.

(5+5)

10. Derive and distinguish between individual replacement and group replacement. What are the advantages of Group replacement? (10)
