

## CHOICE BASED CREDIT SYSTEM

B.Sc. FOURTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023

## MATHEMATICS

## Mathematics Theory IV

Duration:3 Hours

Max Marks:80

## I. Answer any EIGHT of the following :

(8×3= 24 Marks)

- a. Let  $G$  be a group and  $a \in G$ . Prove that the set  $H = \{a^n | n \in \mathbb{Z}\}$  is a subgroup containing  $a$ .
- b. Define subgroup. Prove that the set  $Q$  of all rational numbers form a subgroup of  $(\mathbb{R}, +)$  where  $\mathbb{R}$  is the set of all real numbers.
- c. Define inverse element . Find the inverse element of  $A = \begin{bmatrix} -2 & 3 & 4 \\ 4 & 10 & -1 \end{bmatrix}$  in the group of all  $2 \times 3$  matrices with respect to addition.
- d. Define isomorphism of groups. Let  $G$  and  $G'$  be isomorphic . then if  $G$  is abelian prove that  $G'$  is abelian.
- e. Let  $\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \end{pmatrix}$  and  $\tau = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 2 & 1 & 4 \end{pmatrix}$ . Find  $\tau\sigma$  and  $\sigma\tau$ . Write whether they are equal?
- f. Find the exponential form of  $z = -1 + \sqrt{3}i$
- g. Find the derivative of  $f(z) = z^2$  by using definition.
- h. Find the singular points of  $f(z) = \frac{z^2+1}{(z+2)(z^2+2z+2)}$ .
- i. Find all values of  $z$  such that  $e^z = -2$ .
- j. Prove that  $\sin(iy) = i \sin hy$  and  $\cos(iy) = \cos hy$

## II. Answer any EIGHT of the following :

(8×7= 56 Marks)

- a. Let  $G$  be a group and  $a$  and  $b$  be elements in  $G$ .  
Prove that the equations  $ax = b$  and  $ya = b$  have unique solutions in  $G$ .
- b. Let  $H$  be a finite subset of group  $G$  such that  $a \cdot b \in H$  whenever  $a, b \in H$ . Prove that  $H$  is a subgroup of  $G$ .
- c. Prove that a subgroup  $H$  is normal in  $G$  iff  $xH = Hx, \forall x \in G$

- d. Let  $G$  be a group and  $H$  be a subgroup of  $G$ . Prove that  $G$  is the union of all left cosets of  $H$  in  $G$ , and any two distinct left cosets of  $H$  in  $G$  are either disjoint or identical.
- e. Let  $\theta : G \rightarrow G'$  be a homomorphism of groups. Show that
- (i)  $\theta(e) = e'$
  - (ii)  $\theta(a^{-1}) = \{\theta(a)\}^{-1}$ .
- f. Find the values of  $(\sqrt{3} + i)^{1/2}$ .
- g. Prove that  $f'(z)$  does not exist at any point for  $f(z) = e^{(x-iy)}$ .
- h. Prove that the function  $u(x, y) = 2x - x^3 + 3xy^2$  is harmonic and find its harmonic conjugate.
- i. Show that  $\text{Log}(1 + i)^2 = 2\text{Log}(1 + i)$ .
- j. Prove that  $-i \sin(iz) = \sin hz$  and  $\cos(iz) = \cos hz$ .

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21STAC401

Reg No : .....

**CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME**  
**B.Sc. FOURTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023**  
**STATISTICS**

**Statistics Theory - IV: Statistical Inference - I**

**Duration: 2 Hours**

**Max Marks: 60**

**Answer any THREE of the following :**

**(3×2= 06)**

1. Distinguish between Parameter and a Statistic.
2. Define MVB Estimators.
3. Describe the method of Maximum Likelihood.
4. State the properties of Likelihood Ratio Test Procedure.
5. What are confidence coefficient and confidence Interval?

**Answer any FOUR of the following in not more than a page each :**

**(4×6= 24)**

6. If  $x_1, x_2, \dots, x_n$  is a random sample from  $N(\theta, \sigma^2)$ , show that sample mean and sample variance are jointly sufficient for  $\theta$  and  $\sigma^2$ .
7. Briefly explain method of moments for estimation of parameters with its principles.
8. Find the size and power of the test for testing  $H_0: \theta = \theta_0$  against  $H_1: \theta = \theta_1$  for a random sample drawn from an exponential population with parameter  $\theta$  when the critical region is  $X > 4$ .
9. If  $x_1, x_2, \dots, x_n$  is a random sample of size  $n$  drawn from an exponential distribution with parameter  $\theta$ . Obtain BCR for testing  $H_0: \theta = \theta_0$  against  $H_1: \theta = \theta_1$ . Derive null distribution of the test statistic.
10. Discuss the test procedure for testing the difference in the population proportions of two populations.
11. Derive  $100(1-\alpha)\%$  Confidence Interval for the Population Variance of a Normal population when the mean is unknown.

**Answer any THREE of the following in not more than two page each : (3×10= 30)**

12. If  $x_1, x_2, \dots, x_n$  is a random sample of size  $n$  from  $U(-\theta, \theta)$  distribution. Show that  $X(n)$  is biased for  $\theta$ . Find a function of  $X(n)$  which is unbiased for  $\theta$ . Is  $X(n)$  asymptotically unbiased?
13. For a random sampling from Normal Population  $N(\Theta, \Theta^2)$  find the maximum likelihood estimator for the parameter  $\Theta$ .
14. Derive LRTP for testing equality of variances of two Normal populations whose means are unknown.
15. Obtain UMP test procedure for testing  $H_0: \mu = \mu_0$  against  $H_1: \mu \neq \mu_0$  based on a random sample of size  $n$  drawn from a Normal population with an unknown variance  $\sigma^2$ .
16. Obtain  $100(1-\alpha)\%$  central confidence interval for the difference in means of two independent normal population with common unknown variance.

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**CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME**  
**B.Sc FOURTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023**  
**MICROBIOLOGY**

**Microbiology Theory - IV: Microbial Enzymology and Metabolism**

Duration: 2 Hours

Max Marks: 60

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**SECTION - A**

Answer the following strictly observing the internal choice provided:

4×5=20

**UNIT 1**

- 1) List the pathways resulting in breakdown of carbohydrates and write briefly on homolactic acid fermentation.

OR

- 2) Define fermentation and write briefly about fermentation balance.

**UNIT 2**

- 3) Write about the free living nitrogen fixing bacteria.

OR

- 4) Define Glyoxylate Cycle and write briefly on the steps involved.

**UNIT 3**

- 5) Write any 5 characters of enzyme catalysis.

OR

- 6) Write a short note on transition state.

**UNIT 4**

- 7) Write a note on pH sensitivity of enzymes.

OR

- 8) Write a note on Eadie-Hofstee plot.

**SECTION - B**

Answer the following strictly observing the internal choice provided:

4×10=40

**UNIT 1**

- 9) Define Chemoheterotroph and write in detail about fermentation.

OR

- 10) Define Chemolithotrophs, Chemoheterotrophs and explain about the oxidation of Hydrogen and Sulphur.

**UNIT 2**

11) Define Biomass and Write in detail about Biogas plants.

OR

12) Explain in detail the Metabolic Mill.

**UNIT 3**

13) Differentiate Oligomeric and Monomeric enzymes.

OR

14) Describe Hydrolases, Ligases and Isomerases with examples.

**UNIT 4**

15) Describe regulation of enzymes by proteolytic cleavage.

OR

16) Explain competitive inhibition and add a note on its applications.

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**CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME**  
**B.Sc. FOURTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023**  
**MATHEMATICS**

**Partial Differential Equations and Integral Transforms**

Duration: 2 Hours

Max Marks: 60

**PART - A**

**I. Answer any 6 questions. Each question carries 2 marks: (2×6= 12 Marks)**

- a. Eliminate arbitrary function from  $z = (x + y)f(x^2 - y^2)$  to form a partial differential equation.
- b. Solve:  $pq = k$ .
- c. Solve :  $r = a^2t$
- d. Solve :  $(D^3 D'^2 + D^2 D'^3)z = 0$  .
- e.  $L\{e^{kt}\}$
- f. Find  $L\{\sin^3 2t\}$  .
- g. Find  $L^{-1}\left\{\frac{20}{s^6}\right\}$ .
- h. Find  $L^{-1}\left\{\frac{1}{s^2+2s+5}\right\}$  .

**PART - B**

**2. Answer any 2 questions. Each question carries 6 marks: (6×2= 12 Marks)**

- a. Find the complete integral of  $z = pq$ .
- b. Solve:  $p^2 + q^2 = x^2 + y^2$ .
- c. Solve:  $\sqrt{p} + \sqrt{q} = x$  .
- d. Solve:  $x - p = y - q$ .

**PART - C**

**3. Answer any 2 questions. Each question carries 6 marks: (6×2= 12 Marks)**

- a. Reduce  $3\frac{\partial^2 z}{\partial x^2} + 10\frac{\partial^2 z}{\partial x \partial y} + 3\frac{\partial^2 z}{\partial y^2} = 0$  to canonical form.

- b. Reduce  $x \frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = x^2$  to canonical form.
- c. Reduce  $r + 2xs + x^2t = 0$  to canonical form.
- d. Solve :  $u_{xx} - u = 0$

**PART - D**

**4. Answer any 2 questions. Each question carries 6 marks: (6×2= 12 Marks)**

- a. Derive the formula for  $L\{\sin kt\}$ .
- b. Find  $L\{t^n e^{kt}\}$  where  $n$  is a positive integer.
- c. Define Gamma function and prove that  $\Gamma(x + 1) = x\Gamma(x)$  for  $x > 0$ .
- d. Find the Laplace Transform of the function

$$\Psi(t, c) = \begin{cases} 1, & 0 < t < c \\ -1, & c < t < 2c \end{cases}, \Psi(t + 2c, c) = \Psi(t, c).$$

**PART - E**

**5. Answer any 2 questions. Each question carries 6 marks: (6×2= 12 Marks)**

- a. Find (i)  $L\{\int_0^t (t - \beta)^2 e^\beta d\beta\}$  (ii)  $L\{(t - 2)^3 \alpha(t - 2)\}$
- b. Find and sketch  $F(t) = L^{-1}\left\{\frac{(1 - e^{-2s})(1 - 3e^{-2s})}{s^2}\right\}$ . Also find  $F(1), F(3), F(5)$ .
- c. Solve:  $y''(t) + 6y'(t) + 9y(t) = 6t^2 e^{-3t}$  with  $y(0) = 0, y'(0) = 0$  using Laplace transforms.
- d. Find the Fourier series of the function  $f(x) = x^2, 0 < x < 2\pi$  with period  $2\pi$ .

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**CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME**  
**B.Sc. FOURTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023**  
**ZOOLOGY**

**Gene Technology, Immunology and Computational Biology**

Duration:2 Hours

Max Marks:60

**SECTION - A**

Answer the following strictly observing the internal choice provided:

4×5=20

**UNIT 1**

- 1) Write any five characteristics of Transgenic plants.

OR

- 2) Describe the structure of Human Insulin.

**UNIT 2**

- 3) Explain humoral Immunity.

OR

- 4) Explain the role of Thymus and Bone marrow in Immune system.

**UNIT 3**

- 5) Define sequence analysis. Explain the types.

OR

- 6) Explain the scope and applications of Bioinformatics.

**UNIT 4**

- 7) Write a short note on t-Test.

OR

- 8) Explain time series graph with one variable.

**SECTION - B**

Answer the following strictly observing the internal choice provided:

4×10=40

**UNIT 1**

- 9) Give an account of isolation of DNA.

OR

- 10) Explain the process of screening of recombinants by blotting techniques.

**UNIT 2**

11) What are Immunoglobulins? Explain the structure of IgG.

OR

12) What are antigens? Explain the properties of Antigens.

**UNIT 3**

13) Explain Transplantation immunology. Add a note on Immuno-suppressors.

OR

14) Define vaccines. Explain their uses. Add a note on Immunization schedule for children.

**UNIT 4**

15) Give a detailed account on collection of data.

OR

16) The owner of the Ches Tahoe restaurant is interested in how much people spend at the restaurant. He examines 10 randomly selected receipts for parties of four and writes down the following data.  $X=44, 50, 38, 96, 42, 47, 40, 39, 46, 50$ . Calculate the Standard Deviation, Variance and Coefficient of Variation.

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## CHOICE BASED CREDIT SYSTEM

B.Sc FOURTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023

## ZOOLOGY

## Zoology Theory IV

Duration:3 Hours

Max Marks:80

**I. Answer any FIVE of the following :****(5×2= 10 Marks)**

1. Name any two cells present in the gastric glands and mention their functions.
2. What are liver sinusoids?
3. Name any two animals which exhibit parental care.
4. List the individuals of termite colony.
5. What is vermiculture?
6. List the aspects to be considered in Inland fisheries.

**II. Answer any FIVE of the following :****(5×6= 30 Marks)**

7. Explain the structure of Adenohypophysis.
8. Give an account of hyposecretion of adrenal cortical hormones.
9. Describe the nesting behaviour in wasps.
10. Explain the concept of insight learning.
11. With reference to housing management explain individual cage system in poultry.
12. Explain the utility of dairy in agriculture and Transport.

**III. Answer any FOUR of the following :****(4×10= 40 Marks)**

13. Describe the histology of T.S of Spleen of a mammal.
14. Explain the process of formation of Graafian follicle in ovary.
15. Explain catadromous migration with an example.
16. Explain the methods of studying bird migration.
17. Write explanatory note on milk and its use.

21BOTC401

Reg No : .....

**CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME**  
**B.Sc. FOURTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023**  
**BOTANY**

**Botany Theory IV: Ecology and Conservation Biology**

Duration:2 Hours

Max Marks:60

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

**(5×2= 10 Marks)**

1. What is hydrosere? Give an example.
2. Define thermoperiodicity. Mention its types.
3. What is climax community?
4. What are Mangrooves? Give exmple.
5. What is Bioremediation?
6. Define Phytogeography. Mention its significance.
7. Mention any two important environmental protection acts.
8. What is SDG's? Mention any two goals of SDG's.

**II. Answer any FOUR of the following :**

**(4×5= 20 Marks)**

9. Write the morphological characters of hydrophytes.
10. What is humus? Explain their types.
11. What is food web? Give an example.
12. Explain survivorship curve.
13. Write a note on (i) Zoo (ii) Botanical Garden
14. Schematically represent phosphorus cycle.
15. Name an five endemic plant species of western ghat.
16. Write the scientific name, family, parts used and uses of any two timber yielding plants.

**III. Answer any THREE of the following :**

**(3×10= 30 Marks)**

17. Describe the morphological adaptaions and anatomical characters of Xerophytes.
18. Explain in detail about the biotic and abiotic components of the ecosystem.
19. Explain pyramid of number and energy in detail.
20. Give a detailed account of water quality indicators.

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19BOT401

Reg No : .....

**CHOICE BASED CREDIT SYSTEM**  
**B.Sc. FOURTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023**  
**BOTANY**  
**Botany Theory IV**

**Duration:3 Hours**

**Max Marks:80**

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**I. Answer any FIVE of the following :** **(5×2= 10 Marks)**

1. Name the non-membrane bound cell organell.
2. Define Cisternae. Where is it found?
3. What is aerenchyma? Mention its significance.
4. Differentiate between Test Cross and Back Cross.
5. Write the features of stele in monocot stem.
6. What are nexine and sexine?

**II. Answer any FIVE of the following :** **(5×6= 30 Marks)**

7. Explain incomplete linkage with a plant example.
8. Explain in detail about the types of trichomes and their functions.
9. What are meristematic tissues? Mention their characters.
10. List out the differences between trachea and sieve tubes.
11. What is microsporogenesis? Explain its types.
12. Explain the feature of cross pollination and its types.

**III. Answer any FOUR of the following :** **(4×10= 40 Marks)**

13. With a neat labelled diagram explain the structure of Metaphasic chromosome.
14. Explain Karyokinesis of Mitotic Phase.
15. Describe Masking gene action in Barley seed coat.
16. Describe the Fluid Mosaic model to explain the ultrastructure of plasma membrane.
17. With the help of neat labelled sketches explain the development of embryo in dicotyledons.

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**CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME**  
**B.Com. FOURTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023**  
**COMPUTER SCIENCE**

**Computer Science Theory - IV: Database Management Systems**

**Duration: 2 Hours**

**Max Marks: 60**

**PART A**

**Answer any FIVE questions:**

**(5×2= 10)**

- 1) Define Data Model.
- 2) List the operations used in TCL.
- 3) Draw the notations of attributes in E-R modeling.
- 4) What is the use '%' character in selecting a tuple?
- 5) Define 3NF Relation.
- 6) What is atomicity?

**PART B**

**Answer any FIVE questions :**

**(5×6= 30)**

- 7) Explain the main categories of database users.
- 8) Explain the different types of relationships.
- 9) Explain foreign key constraint with example.
- 10) Explain any four aggregate functions with example.
- 11) Explain the temporary update problem.
- 12) a) What is single-user system?  
b) What is multi-user system?

**PART C**

**Answer any TWO questions :**

**(2×10= 20)**

- 13) What is DBMS? Explain its advantages.
- 14) Explain the various ER diagram notations.
- 15) Create table productmaster with productno, description, sellprice, qoh. Write the PL/SQL procedure for an application using cursors.

21PHYC401

Reg No : .....

**CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME  
B.Sc. FOURTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023**

**PHYSICS**

**Thermal Physics and Electronics**

**Duration:2 Hours**

**Max Marks:60**

**PART - A**

**Answer any five questions, selecting minimum of one question from every unit: 5×9=45**

**UNIT I**

1. a) Give the Kelvin's statement of the second law of thermodynamics.  
b) Derive an expression for the work done by a gas during an isothermal and adiabatic expansion. (2+7)
2. a) With graphical representation, show the criteria for a system to gain or lose entropy.  
b) Arrive at an expression for the change of entropy in an irreversible process.(2+7)

**UNIT II**

3. a) What is the principle of cooling by adiabatic demagnetisation?  
b) Give the theory of Joule-Kelvin effect and hence get the expression for the temperature of inversion for a real gas. (2+7)
4. a) Draw the graphical representation of an energy distribution in the spectrum of a black body.  
b) Write the four thermodynamical relations. Explain the concept of internal energy and Helmholtz free energy. (2+7)

**UNIT III**

5. a) Write a note on ripple factor.  
b) Draw and explain the characteristics of a Zener diode. (2+7)
6. a) Explain in brief CC configuration of a transistor.  
b) Draw the output characteristics of a transistor in CE mode and explain the significance of different regions. (2+7)

## UNIT IV

7. a) Define virtual grounding in OPAMP.  
b) Convert the following hexadecimal numbers into binary numbers B36E, E2C (2+7)
8. a) Write the logic expression and diagram for D'Morgan's second theorem.  
b) Construct OR, AND and NOT gates using NAND gates. (2+7)

## PART - B

Answer any three questions

3×5= 15

9. Calculate the change in entropy when 11 g of ice at -24 °C is converted into water at 0 °C. Given latent heat of ice =  $3.35 \times 10^5$  J/kg, specific heat of ice =  $2.1 \times 10^3$  J/kg K
10. Calculate the surface temperature of the sun and moon given that  $\lambda_m = 4753 \text{ \AA}$  and  $14 \mu\text{m}$  respectively,  $\lambda_m$  being wavelength of maximum intensity of emission.
11. In an OP AMP if  $V_1 = 1\text{mV}$ ,  $V_2 = -0.5 \text{ mV}$  and  $V_0 = 8\text{V}$ , find CMRR in decibels.
12. Simplify the Boolean expression and draw the logic diagram for  
$$Y = \bar{A}BC + AB\bar{C} + A\bar{B}\bar{C} + ABC$$

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**CHOICE BASED CREDIT SYSTEM**  
**B.Sc. FOURTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023**  
**PHYSICS**  
**Physics Theory IV**

Duration:3 Hrs

Max Marks: 80

**PART - A**

Answer any TWELVE from the following:

(12×1= 12 Marks)

1. State Gauss theorem.
2. Define a vector field.
3. What is a level surface in a scalar field?
4. State the law of conservation of energy for the electromagnetic field.
5. Give the relation for energy density stored in the electric field.
6. State Kirchhoff's voltage law.
7. What is a passive circuit element?
8. What is the limitation of superposition theorem?
9. Give the condition for oscillatory discharge of a LCR circuit.
10. Why is a pure inductance is a short for a steady current?
11. Define half-power frequency.
12. What is a band stop filter?
13. Give the expression for power consumed in star configuration.
14. Give the relation between line and phase currents in a delta configuration.
15. Give the expression for the ratio of capacitance using de Sauty bridge.

**PART - B**

Answer any TWO from the following:

(2×8= 16 Marks)

**UNIT I**

16. a) Evaluate  $\text{div grad } \phi$ , so that  $\phi(x, y, z)$  is a scalar function.  
b) Define gradient of a scalar field and give its physical significance. Write its expression in Cartesian co-ordinate system. Show that gradient of a scalar field is a vector. (2+6)
17. a) Explain in detail Laplacian operator.  
b) State and explain Stoke's theorem. Express them in vector form. (2+6)
18. a) State Ampere's circuital law in vector form and explain the symbols used.  
b) Derive the wave equation for the field vector  $\vec{E}$  and  $\vec{B}$ . Hence arrive at the equation for the velocity of electro-magnetic waves in a medium. (2+6)

**UNIT II**

Answer any TWO from the following:

(2×8= 16 Marks)

19. a) How do you convert a voltage source into a current source?

- b) State and explain Norton's theorem by considering a general network. (2+6)
20. a) Derive current divider formula for an electrical circuit.  
b) State and prove Maximum power transfer theorem. (2+6)
21. a) Sketch the transient current and voltages of LR circuit.  
b) Describe with the necessary theory the method of obtaining high resistance by leakage method. (2+6)

### UNIT III

Answer any TWO from the following:

(2×8= 16 Marks)

22. a) Write any two differences between alternating current and direct current.  
b) Explain a series LCR circuit. Assuming the expression for the impedance in the circuit, obtain expressions for resonant frequency and quality factor in the circuit. (2+6)
23. a) Give any two advantages of star configuration over the delta configuration in power transmission system.  
b) With relevant diagram explain generation of three phase EMF. (2+6)
24. a) Draw the labeled circuit diagram for Charge sensitivity of BG.  
b) Draw the diagram of Anderson's bridge and give its theory. (2+6)

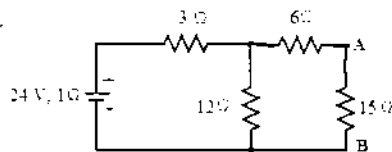
### PART - C

Answer any FOUR from the following:

(4×5= 20 Marks)

25. Prove that  $\nabla \cdot (\nabla \times \vec{A}) = 0$ , where  $\vec{A}$  is a vector function.
26. Electric potential at a region of space  $V(x,y,z) = 50x^2 + 75y$ , find  
(i) the components and magnitude of electric field at a point (1,-1,1).  
(ii) Charge density ( $\epsilon_0 = 8.86 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$ ).

27.



By applying Thevenin's theorem,

- (i) Find the equivalent emf of the network when viewed from terminals A and B  
(ii) The equivalent resistance of the network when looked into from terminals A and B  
(iii) Current in the resistance 15 Ω .
28. A 0.18 μF capacitor is first charged and then discharged through a high resistance. If it takes 0.5 s for the charge to reduce 25% of its initial value, find the value of the resistance.
29. A parallel circuit consists of a 2.5 μ F capacitor and a coil whose resistance and inductance are 15 Ω and 260 m H. Determine a) the resonant frequency  
b) Q factor at resonance c) dynamic impedance of the circuit.
30. Calculate the cut off frequency for a high pass filter consisting of an 82 pF capacitor connected in series with a 240 KΩ resistor. Also design a RC high pass filter for a cut off frequency 1 kHz using a capacitor of 0.2 μF.

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CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME  
B.Sc. FOURTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023

CHEMISTRY

Chemistry Theory IV: Inorganic and Physical Chemistry - II

Duration:2 Hours

Max Marks:60

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PART - A

I. Answer any Six from the following: (2×6= 12 Marks)

1. State Radius ratio rule.
2. Mention the characteristics of covalent compounds.
3. What are the limitations of Electron sea model?
4. Give one example for ionic compounds of AX and AX<sub>2</sub> type each.
5. What is Adsorption ?
6. Give the differential and integrated rate equation for first order reaction.
7. Write and explain the terms in Gibb's Helmholtz equation.
8. State second law of Thermodynamics.

PART - B

II. Answer any SIX of the following choosing at least one question from each unit: (6×8= 48 Marks)

UNIT I

9. a) Explain sp<sup>2</sup> hybridisation in case of tri iodomercurate ion.(4)  
b) Explain the concept of resonance in CO molecule. (4)
10. a. Derive Born Lande equation for lattice energy (5)  
b. Calculate the lattice energy of NaCl crystal from the following data by use of Born Haber cycle.  
Sublimation energy (S) = 108.7 kJ/mol  
Dissociation energy (D) = 225.9 kJ/mol  
Ionization energy (I) = 489.5 kJ/mol  
Electron affinity (E) = -351.4 kJ/mol  
Heat of formation of NaCl = -414.2 kJ/mol (3)

## UNIT II

11. Using Molecular orbital configuration indicate (i) paramagnetic nature of  $B_2$  and (ii) non existence of  $He_2$  molecule. (8)
12. a) Write a note on Enthalpy or heat content of a system.  
b) Calculate the final volume of 1 mole of an ideal gas at STP if it absorbs 4000 J of heat during a reversible Isothermal process. (4 +4)

## UNIT III

13. a) Derive the Joule Thomson coefficient for a real gas.  
b) Draw the MO diagram for NO molecule. (4+4)
14. a) Write a short note on Third law of thermodynamics.  
b) Explain concept of residual entropy. (4 +4)

## UNIT IV

15. a) Explain Unimolecular surface reactions.  
b) Explain Autocatalysis with an example. (5+3)
16. a) Mention any two methods of determination of order of a reaction.  
b) Write a short note on temperature dependence on reaction rate. (4 +4)

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19CHE401/CHE401.2

Reg No : .....

**CHOICE BASED CREDIT SYSTEM**  
**B.Sc. FOURTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023**

**CHEMISTRY**  
**General Chemistry IV**

**Duration:3 Hours**

**Max Marks:80**

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**PART - A**

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

**(2×5= 10 Marks)**

- 1 Chromium exhibits  $3d^54s^1$  configuration instead of  $3d^44s^2$ . Give reason.
- 2 Write the bond angle and shape of ammonia molecule.
- 3 Give two applications of Nernst distribution law.
- 4 Give the expression for Freundlich adsorption isotherm.
- 5 How is BuNa-N formed?
- 6 How is benzene diazonium chloride formed?

**PART - B**

**II. Answer any SEVEN of the following choosing at least TWO from each Unit.**

**(10×7= 70 Marks)**

**UNIT I**

- 7 a. With the help of molecular orbital energy level diagrams explain why  $O_2$  is paramagnetic.  
b. Draw the structures of the complexes of d block elements with co-ordination number 6.  
c. Explain the conditions for the linear combination of atomic orbitals. (4+3+3)
- 8 a. Write the postulates of valence bond theory.  
b. Explain the geometry, hybridisation and shape of ammonia molecule using VBT. (5 +5)
- 9 a. Explain catalytic property and magnetic property of d block elements.  
b. Explain the complexation tendencies of 3d-series elements.  
c. With a suitable example explain sp hybridisation. (4+3+3)

## UNIT II

- 10 a. What is an ideal solution? Explain boiling point-composition curve for Phenol-water system.  
b. State and explain Raoult's law.  
c. Explain the factors affecting adsorption of gases by solids. (4+3+3)
- 11 a. Explain nicotine- water system.  
b. Write a note on the effect of impurities on consolute temperature.  
c. Write BET equation. How is it applied in the determination of the surface area of the adsorbents. (4+3+3)
- 12 a. Draw and explain the boiling point - composition curve for an ideal system.  
b. Explain desilverisation of lead.  
c. What are azeotropic mixtures? Explain with suitable example. (4+3+3)

## UNIT III

- 13 a. Explain the separation of amines by Hoffmann's method.  
b. Write short notes on Zeigler- Natta catalysts.  
c. How is benzene converted to phenol and benzene?(4+3+3)
- 14 a. Explain the mechanism of free radical addition polymerisation.  
b. Explain Gomberg- Bachmann reaction with example.  
c. How is benzene diazonium chloride converted to benzene. (4+3+3)
- 15 a. Write the preparation and two applications of epoxy resins.  
b. Explain the action of nitrous acid on various amines?  
c. Explain the synthesis of polyurethanes. (4+3+3)

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## CHOICE BASED CREDIT SYSTEM

B.Sc. FOURTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023

## COMPUTER SCIENCE

## Computer Science Theory IV

Duration:3 Hours

Max Marks:80

**I. Answer any FIVE of the following :****(5×2= 10 Marks)**

1. What are the hardware and software requirements in Java?
2. What is the difference between print() and println()?
3. List the steps involved in creating your own package.
4. What is an interface? Write syntax to define it.
5. Distinguish between data abstraction and data encapsulation.
6. Draw the state transition diagram of an applet.

**II. Answer any FIVE of the following :****(5×6= 30 Marks)**

7. Explain Arithmetic and Relational operators with an example each.
8. Explain i) Increment and Decrement operators ii) Bitwise operators
9. Explain switch statement with syntax, flowchart and an example.
10. What is an array? Explain different types of arrays with examples.
11. How do you create, declare and implement a thread? Explain.
12. Explain the different ways of accessing the class members.

**III. Answer any FOUR of the following :****(4×10= 40 Marks)**

13. a) How do you implement a Java program? Explain.  
b) Explain constants and variables.
14. Explain Java tokens.
15. Explain the following i) labelled loops ii) nesting of for loops
16. What is inheritance? Explain hybrid inheritance with a programming example.
17. What is an exception? Explain exception handling mechanism in Java.

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