CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. SECOND SEMESTER DEGREE EXAMINATION AUGUST 2022
PHYSICS
Electricity and Magnetism

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) Write a note on conductors.

   b) Define capacitance. Derive an expression for capacitance of a parallel plate capacitor. **(2+7)**

2   a) What is a circuit? Define circuit element.

   b) Obtain an expression for the charge on the capacitor when it is discharged through series LCR circuit. **(2+7)**

UNIT II

3   a) What is an equipotential surface? Can two equipotential surfaces intersect?

   b) Explain the potential associated with infinite plane sheet of charges. **(2+7)**

4   a) What are magnetic substances? Name the type of force present in them.

   b) Derive an expression for coefficient of mutual inductance of two solenoids. **(2+7)**

UNIT III

5   a) Define quality factor of a series LCR circuit and write an expression for the same.

   b) What is current magnification in a parallel LCR circuit? Arrive at an expression for the current magnification and show that it is equal to the quality factor at resonance. **(2+7)**

6   a) Obtain the phase relation between current and voltage in an ac circuit containing pure capacitance.

   b) What is a high pass filter? Explain how a CR circuit can be used as a high pass filter and obtain the expression for cut-off frequency. **(2+7)**

UNIT IV

7   a) State and explain Gauss' divergence theorem in electrostatics.

   b) Write Ampere's circuital law in vector form and show that it is inconsistent with the equation of continuity when displacement current is considered. **(2+7)**

8   a) What is paramagnetism? Give an example for paramagnetic material.

   b) What is normal dispersion? Derive Cauchy's constants for normal dispersion.

                                                                    (2+7)

PART - B

Answer any three questions: 3×5= 15

9   A capacitor of capacitance of 2μF is first charged and then discharged through a resistance of 1MΩ. Calculate the time in which the charge on the capacitor will fall to 50% of its initial value.

10   Two positive point charges of 12×10^{-10} C and 8×10^{-10} C are placed 10cm apart. Find the work done in bringing the two charges 4cm closer.

11   Calculate the cut off frequency for a simple high pass filter consisting of an 100 pF capacitor connected in series with a 280 KΩ resistor. Also design a RC high pass filter for a cut off frequency 1.5 kHz using a capacitor of 0.2 μF.

12

$Show \ that \ \phi = x^2 - 2y^2 + z^2 \ and \ F = x^2 + y^2 - 2z^2 \ satisfy \ Laplacian \ equation.$

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21CHEC201   Reg No   :   ....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. SECOND SEMESTER DEGREE EXAMINATION AUGUST 2022
CHEMISTRY
Inorganic and Physical Chemistry - I

Duration:3 Hours   **Max Marks:60**

PART - A

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

1. What is shielding effect? Which orbitals show greatest shielding effect?

2. State Hund's rule of maximum multiplicity.

3. Define Van der Waal radius.

4. Give example for an acidic oxide and a basic oxide.

5. State the law of equipartition of energy.

6. What is Boyle temperature? Give its expression.

7. Draw a unit cell and label it.

8. Give two applications of liquid crystals.

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. What is quantum number? Name the different quantum numbers and give their significance.
   b. Explain why orbitals like 1p, 2d and 3f are not possible.
   c. Draw radial probabity distribution curves for 1s, 2s and 3s orbitals. (4+3+3)

10 a. Write the postulates of Bohr's atomic theory. What are its limitations?
   b. Derive de Broglie equation and give its significance.
   c. Write Schrodinger's wave equation and explain each of the terms. (4+3+3)

UNIT II

11. a. How does the ionisation energy vary along the period and down the group in p block elements.

b. What are the factors affecting ionisation energy?

c. Write a note on interstitial carbides. (4+3+3)

12 a. What are the applications of electronegativity?

b. Give an account of halides of Group 13.

c. What is Paulings scale of electronegativity? (4+3+3)

UNIT III

13. a. Derive expressions for critical constants T_c, P_c and V_c in terms of van der Waals constants a and b.

b. The critical temperature and critical pressure of oxygen are -118^0C and 49.7 atm. If R= $0.082 dm^3 atm/K/mol$, Calculate van der Waal's parameters.

c. How is refractive index determined by Abbe's refractometer? (4+3+3)

14 a. Write Van der waal's equation of state for n moles of real gas and write the significance of the van der waal constants a and b.

b. The reduced volume and temperature of a gas are 12.5 and 0.8. What will be its pressure if its critical pressure is 44 atm?

c. Write a short note on Parachor. (4+3+3)

UNIT IV

15. a. Define Miller indices. Calculate the Miller indices of a plane which makes intercepts 3a and is parallel to the y and z axis.

b. Define plane of symmetry and centre of symmetry.

c. Name the different Bravais lattices of a cube. (4+3+3)

16 a. Derive Bragg's equation.

b. State and explain Nernst distribution law.

c. Explain the application of liquid crystals in LCD. (4+3+3)

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CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. SECOND SEMESTER DEGREE EXAMINATION AUGUST 2022
MATHEMATICS
Number Theory-II, Algebra-II, Calculus-II

Duration:2 Hours   **Max Marks:60**

PART - A

I. Answer any SIX of the following: **6×2= 12**

   a. Find the value of $\phi(36000)$.

   b. Find the sum of positive integers less than 210 and relatively prime to 210.

   c. Let $G = Z$. Define $*$ by $a * b = a + b - ab$. Check whether $*$ is commutative and associative.

   d. Show that for any subset A of G, the normalizer $N(A)$ of A is a subgroup of G.

   e. Find the domain of definition of the functions:
$$\text{(i)}\ z = f(x, y) = \sqrt{x^2 + y^2 - 4} \qquad \text{(ii)}\ z = f(x, y) = \log(x + y)$$

   f. If $u = x^2 - y^2, x = 2r - 3s + 4, y = -r + 8s - 5$, then find $\frac{\partial u}{\partial r}$.

   g. Evaluate $\int_0^4 \int_0^y dxdy$.

   h. Evaluate $\iiint\limits_S xy\,dV$ if S is the rectangular parallelopiped in the first octant bounded by the co-ordinate planes and the planes $x = 2, y = 3$ and $z = 4$.

PART - B

II. Answer any TWO of the following: **2×6= 12**

   a. If p is a prime and $p \nmid a$ then prove that $a^{p-1} \equiv 1(mod\,p)$.

   b. Determine whether 13 is a prime by deciding whether $12! \equiv -1(mod\,13)$.

   c. Represent $\frac{170}{53}$ as a simple continued fraction.

PART - C

III. Answer any TWO of the following: **2×6= 12**

   a. Let G be a finite group of even order. Prove that there exists an element in G other than the identity element whose inverse is itself.

b. Prove that a non-empty subset H of a group G is a subgroup of G if and only if whenever $a, b \in H \implies a \cdot b^{-1} \in H$.

c. Prove that any subgroup of a cyclic group is cyclic.

PART - D

IV. Answer any TWO of the following: 2×6= 12

a. If $u = \frac{x^2 y^2}{x^2 + y^2}$, show by Euler's theorem that $x \frac{\partial^2 u}{\partial x^2} + y \frac{\partial^2 u}{\partial y \partial x} = \frac{\partial u}{\partial x}$.

b. Find the second order partial derivative of $\tan \left(\tan^{-1} x + \tan^{-1} y \right)$.

c. Determine the relative extrema of $f(x, y) = x^2 - 4xy + y^3 + 4y$ if there are any.

PART - E

V. Answer any TWO of the following: 2×6= 12

a. Evaluate $\iint\limits_{R} x^2 \sqrt{9 - y^2} \, dA$, where R is the region bounded by the circle $x^2 + y^2 = 9$.

b. Find the area of the surface cut from the plane $2x + y + z = 4$ by the planes $x = 0, x = 1, y = 0$ and $y = 1$.

c. Evaluate $\int\limits_{C} 4xy \, dx + (2x^2 - 3xy) dy$, if the curve C is the line segment from $(-3, -2)$ to $(1, 0)$.

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CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. SECOND SEMESTER DEGREE EXAMINATION AUGUST 2022
STATISTICS
Probability and Distributions - I

Duration:2 Hours   Max Marks:60

Answer any THREE of the following :   **(3×2= 06)**

1. Define Bernoulli distribution and give an example for it.

2. If X has Uniform distribution over the range (0,1), find the mean and the variance.

3. What is the difference between positive and negative frequencies?

4. Explain ultimate classes.

5. What is the use of following functions: (i) sort(x) (ii) cumsum(x)

Answer any FOUR of the following in not more than a page each :   **(4×6= 24)**

6. Obtain the mean and variance of Negative Binomial distribution.

7. Define Binomial distribution. Find the variance assuming mean.

8. Obtain the CGF of Normal distribution.

9. Define Beta distribution of the second kind. Find its mean and variance.

10. If $X_1=Y_1+Y_2$, $X_2=Y_2+Y_3$ and $X_3=Y_1+Y_3$ where Y_1, Y_2 and Y_3 have zero mean, having variance=1 and they are uncorrelated variables, then find $R_{3.12}$.

11. Write a programme to obtain the Karl Pearson's coeffcient of skewness from the following data:

Size of item	6	7	8	9	10	11	12
Frequency	3	6	10	14	8	5	4

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

12. Find the mode of Poisson distribution.

13. Define Exponential distribution with parameter θ and obtain the first four central moments of this distribution and comment on the kurtosis.

14. Define Gamma distribution with parameter n and obtain the first four central moments of this distribution and comment on the skewness and kurtosis.

15. Derive the regression equation of X_1 on X_2 and X_3.

16. Define partial correlation between X_1 and X_2 and derive its formula.

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CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. SECOND SEMESTER   DEGREE EXAMINATION AUGUST 2022
COMPUTER SCIENCE
Computer Science Theory II: Data Structures using C

Duration:2 Hours   **Max Marks:60**

PART A

Answer any FIVE questions: **(5×2= 10)**

1) What is a Data Structure?

2) What is a memory efficient Doubly Linked List?

3) What is the advantage of using Stacks?

4) What is an input restricted queue with respect to a deque?

5) What do you understand by degree of a node?

6) What is an acyclic graph? Give example.

PART B

Answer any FIVE questions :   **(5×6= 30)**

7) What is a recursive function? Explain the factorial calculation problem using recursion.

8) How can you alter the size of a block in memory? Explain with an example.

9) Write the algorithm for insertion sort .

10) Explain the array representation of a Queue.

11) Define a Complete Binary Tree. How is it different from a Complete Binary Tree? Explain.

12) Write a program to implement stack using arrays.

PART C

Answer any TWO questions :   **(2×10= 20)**

13) (a) What is a linked list? Explain different types with a diagram.
    (b) Explain queue as a linked list.

14) (a) Write an algorithm for solving matching of nested parenthesis.
    (b) Convert the infix string : (A+(B+C*(D+E))+F/G) to postfix.

15) (a) Write the rules for In-order and Post-order traversal.
    (b) Construct a binary search tree using the following traversal.
       Pre-Order : ABDGEHIJCF
       In-order : DGBEIHJACF

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CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. SECOND SEMESTER DEGREE EXAMINATION AUGUST 2022
ZOOLOGY
Biochemistry and Physiology

Duration:2 Hours   **Max Marks:60**

SECTION - A

Answer the following strictly observing the internal choice provided: **4×5=20**

UNIT 1

1) Write short note on Zwitter ion.

OR

2) DefineTriglyceride. Explain the structure of Triglycerides.

UNIT 2

3) Explain breifly the process of Gluconeogenesis.

OR

4) Explain Omega oxidation of fatty acids.

UNIT 3

5) Give a comprehensive account of respiratory pigments in animals.

OR

6) Explain protein digestion in small intestine.

UNIT 4

7) With respect to humans explain ornithine cycle.

OR

8) Describe the anatomy of Pineal gland.

SECTION - B

Answer the following strictly observing the internal choice provided: **4×10=40**

UNIT 1

9) Explain in detail the Tertiary structure of proteins.

OR

10) Give a detailed account on Enzyme inhibition.

UNIT 2

11) Write a detailed account on Metabolism of Nucleotides.

OR

12) Give a detailed account on Citric acid cycle.

UNIT 3

13) With a neat labeled diagram describe the internal structure of human heart.

OR

14) Write an account on MNS blood group system.

UNIT 4

15) Explain the ultra structure of striated muscle fibre with suitable diagram.

OR

16) Define action potential. Explain the characteristic behaviour of a neuron during resting potential.

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CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. SECOND SEMESTER DEGREE EXAMINATION AUGUST 2022
MICROBIOLOGY
Microbial Biochemistry and Physiology

Duration:2 Hours   Max Marks:60

SECTION - A

Answer the following strictly observing the internal choice provided: 4×5=20

UNIT 1

1) Comment on non-covalent bond.

OR

2) Comment on the hydrophilic interactions of water.

UNIT 2

3) Write the structure of sucrose.

OR

4) Explain the functions of proteins.

UNIT 3

5) Explain MPN.

OR

6) Classify bacteria on the basis of hydrogen ion concentration.

UNIT 4

7) Write short notes on any one photosynthetic pigment of prokaryotes.

OR

8) Explain oxidation-reduction reactions with a suitable example.

SECTION - B

Answer the following strictly observing the internal choice provided: 4×10=40

UNIT 1

9) Give a detailed account of the different elements that are major to life.

OR

10) Explain in detail about hydrogen ion concentration and pH.

UNIT 2

11) Describe the structure of Vitamin D.

OR

12) Give a detailed account of lipids.

UNIT 3

13) Explain active transport. Add a note on its significance.

OR

14) Explain $Na^+ K^+$ ATPase.

UNIT 4

15) Explain dark reaction with a suitable example.

OR

16) Give a detailed account of glycolysis.

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CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. SECOND SEMESTER DEGREE EXAMINATION AUGUST 2022
BOTANY
Diversity of Non-flowering Plants

Duration:2 Hours   Max Marks:60

SECTION - A

Answer the following strictly observing the internal choice provided: **4×5=20**

UNIT 1

1) Describe the thallus structure in Nostoc.

OR

2) Write a note on algal bloom and toxins.

UNIT 2

3) Describe asexual reproduction in Riccia.

OR

4) Describe the structure of of T.S of Marselia rhizome.

UNIT 3

5) Write the ecological and economic importance of pteridophytes.

OR

6) Give the account of classification of gymnosperm by Sporne.

UNIT 4

7) Write a note on any two methods used to study fossils.

OR

8) What are   a) Compressions   b) Impressions.

SECTION - B

Answer the following strictly observing the internal choice provided: 4×10=40

UNIT 1

9) Write a note on carpogonium in Polysiphonia.

OR

10) Explain pigmentation in algae.

UNIT 2

11) Explain in detail about the capsule structure of Funaria.

OR

12) Describe the structure of sporophyte of Pteris and explain its sex organs.

UNIT 3

13) Explain the primary structure of Gnetum stem with a neat labeled diagram.

OR

14) Explain the economic importance of gymnosperms.

UNIT 4

15) How do plants get evolved through geological time scale? Explain.

OR

16) Write a note on fossil bryophytes.

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