CHE 201.2 Reg. No. ....

CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

CHEMISTRY

PAPER II: GENERAL CHEMISTRY

Duration: 3 hours **Max marks: 80**

Note: 1. Write question numbers and subdivisions clearly.
2. Write chemical equations and diagrams wherever necessary.

PART A

1. Answer any TEN of the following: **2x10=20**

a) Name the raw materials required for the manufacture of soda ash.
b) Write any two applications of Chlorine.
c) Beryllium does not impart characteristic colour to the flame. Why?
d) Explain why alkali metal hydrides are good reducing agents.
e) Write Vant Hoff's equation. Explain the terms.
f) What is Pseudo first order reaction? Give an example.
g) Give the green synthesis of citral.
h) What is percentage atom utilization and percentage atom economy?
i) What is peroxide effect?
j) What are activating and deactivating groups? Give one example for each.
k) Write IUPAC names of

(i) $CH_3-CH(OH)-CH_3$ (OH on the middle carbon)

(ii) $CH_3-CH_2-CH(Cl)-CH_2-OH$ (Cl on the third carbon)

l) What is Kolbe's reaction?

PART-B

UNIT-I

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

2.	a)	How is cement manufactured?	04
	b)	Explain the manufacture of Ammonium Phosphate.	03
	c)	Compare the hydration of alkali metals and alkaline earth metals.	03
3.	a)	Explain the manufacture of Sodium hydroxide with a labeled sketch.	04
	b)	What are the functions of the following in the biosystem (i) Na (ii) K (iii) Ca	03
	c)	Compare the reducing property of alkali metals and alkaline earth metals.	03
4.	a)	Discuss the diagonal relationship between lithium and magnesium.	04
	b)	Explain the manufacture of sodium carbonate.	03
	c)	Lithium is a good reducing agent in aqueous solution. Why?	03

UNIT-II

Answer any **TWO** of the following. **10x2=20**

5. a) Derive Clayperon-Clausius equation. 04

   b) The vapour pressure of a liquid at $98^{\circ}C$ is 750 mm. What will be the vapour pressure at $90^{\circ}C$? The heat of the reaction at this temperature is 40.5KJ mol^{-1} 03

   c) Mention any three modes of supplying energy to a green reaction. 03

6. a) The decomposition of a substance found to be second order, takes 50 minutes for 30% completion. Initial concentration of the reactants was $4 \times 10^{-2} mol\ dm^{-3}$ Calculate the specific reaction rate. 04

   b) Derive Vant Hoff's reaction isotherm. 03

   c) Explain the green synthesis of Adipic acid. 03

7. a) Write the four principles of green chemistry. 04

   b) How is the order of a reaction determined by differential method? 03

   c) The vapour pressure of water $90^{\circ}C$ and $97^{\circ}C$ are 600mm and 700mm respectively. Calculate the molar heat of vaporization of water between $90^{\circ}C$ and $97^{\circ}C$. 03

UNIT-III

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

8. a) Give the mechanism of Fries rearrangement reaction. 04

   b) Explain the method of manufacture of methanol from water gas. 03

   c) Explain the orientation effect of $-CH_3$ group in toluene. 03

9. a) Explain the mechanism of Gattermann reaction. 04

   b) Explain Lucas test for distinguishing different types of alcohols. 03

   c) Explain the mechanism of addition of hydrogen bromide to propene. 03

10. a) How is glycerol manufactured from spent bye? 04

    b) Explain the acidic character of phenols. 03

    c) Explain the mechanism of reaction of alcoholic KOH with t-butyl bromide. 03

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MAT 201.2 Reg. No. ....

CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

MATHEMATICS

PAPER II: NUMBER THEORY AND 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) Show that 41 divides $2^{20}-1$

b) Using divisibility test, find whether the number 1571724 is divisible by 11 or not.

c) For arbitrary integers a and b if $a \equiv b(\bmod n)$ then prove that a and b leave the same non-negative remainder when divided by n.

d) For $n > 2$, prove that $\phi(n)$ is an even integer.

e) If p and q are distinct primes such that $a^p \equiv a(\bmod q)$ and $a^q \equiv a(\bmod p)$ then prove that $a^{pq} \equiv a(\bmod pq)$

f) Find $\phi(5040)$

g) Prove that the Fibonacci number u_{mn} is divisible by u_m.

h) Find the rational number represented by the continued fraction [0; 2, 1, 2, 5,1].

i) If x, y, z is a Pythagorean triple, then prove that one of the integers x, y is even while the other is odd.

j) Find the integrating factor of the equation $y(x+y)dx+(x+2y-1)dy=0$

k) Check the exactness of the equation $\left(y^2-2xy+6x\right)dx-\left(x^2-2xy+2\right)dy=0$

l) Find the orthogonal trajectories of the family of curves $x-4y=c$

m) Solve $p^2-x^2y^2=0$

n) Solve the differential equation $p^2-xp+y=0$

o) For the quadratic equation $f=Ap^2+Bp+C=0$ show that the p-discriminant equation is $B^2-4AC=0$

PART - B

UNIT-I

2. a) State and prove fundamental theorem of Arithmetic. **(6)**

   b) If $N=\sum_{k=0}^{n} a_k 10^k$ is the decimal representation of a positive integer N, $0 \le a_k < 10$ and $S = a_0 + a_1 + ... + a_m$, then show that $9 \mid N$ if and only if $9 \mid S$ **(6)**

   c) Solve the simultaneous linear congruences

   $x \equiv 1 \pmod 3$

   $x \equiv 2 \pmod 5$

   $x \equiv 3 \pmod 7$ **(6)**

3. a) Let $n_1, n_2, ...n_r$ be positive integers such that $\gcd(n_i, n_j) = 1$ for $i \ne j$. Then prove th the system of linear congruences

   $x \equiv a_1 \pmod{n_1}$

   $x \equiv a_2 \pmod{n_2}$

   .

   .

   .

   $x \equiv a_r \pmod{n_r}$

   has a simultaneous solution which is unique modulo the integer $n_1\, n_2 ......n_r$ **(6)**

   b) If $ca \equiv cb \pmod n$ then prove that $a \equiv b \left(\bmod \dfrac{n}{d}\right)$ where $d = \gcd(c, n)$ **(6)**

   c) For $n \ge 1$, show that $(-13)^{n+1} \equiv (-13)^n + (-13)^{n-1} \pmod{181}$ **(6)**

UNIT-II

4. a) If n is a positive integer and $\gcd(a, n) = 1$, then prove that $a^{\phi(n)} \equiv 1 \pmod n$ **(9)**

   b) State and prove Wilson theorem. **(9)**

5. a) If p is a prime and p does not divide a then prove that $a^{p-1} \equiv 1 \pmod p$ **(9)**

   b) Given integers a, b, c prove that $\gcd(a, bc) = 1$ if and only if $\gcd(a, b) = 1$ and $\gcd(a, c) = 1$ **(9)**

UNIT-III

6. a) Prove that the radius of the inscribed circle of a Pythagorean triangle is always an integer. **(6)**

b) For the Fibonacci sequence $\{u_n\}$, prove that $\gcd\{u_m, u_n\} = u_d$ where $d = \gcd(m, n)$ **(6)**

c) Express $\frac{187}{57}$ as a simple continued fraction. **(6)**

7. a) If $m = qn + r$ then prove that $\gcd(u_m, u_n) = \gcd(u_r, u_n)$ **(6)**

b) If $C_k = \frac{p_k}{q_k}$ is the k^{th} convergent of the simple continued fraction $[a_0; a_1, a_2, ..., a_n]$ then prove that $p_k\, q_{k-1} - q_k p_{k-1} = (-1)^{k-1}, 1 \le k \le n$. **(6)**

c) Prove that any rational number can be written as a finite simple continued fraction. **(6)**

UNIT-IV

8. a) Solve $(2xy - \tan y)dx + (x^2 - x\sec^2 y)dy = 0$ **(6)**

b) Solve $y(x + y + 1)dx + x(x + 3y + 2)dy = 0$ **(6)**

c) A thermometer reading $75^\circ F$ is taken out where the temperature is $20^\circ F$. The reading is $30^\circ F$ four minutes later. Find the thermometer reading seven minutes after the thermometer was brought out side. **(6)**

9. a) Solve $\sin y\left(x + \sin y\right)dx + 2x^2 \cos y\, dy = 0$ **(6)**

b) Solve $(x + 2y - 4)dx - (2x + y - 5)dy = 0$ **(6)**

c) Find the orthogonal trajectories of the family of curves given by $r^2 = a \sin 2\theta$ **(6)**

UNIT-V

10. a) Solve $x^2 p^2 + xp - y^2 - y = 0$. **(6)**

b) Find the general and singular solution of $2xp^3 - 6yp^2 + x^4 = 0$ **(6)**

c) Solve $xy'' - (y')^3 - y' = 0$ **(6)**

11. a) Solve $x^2p^2 - 5xyp + 6y^2 = 0$ **(6)**

b) Find the general and singular solution of $p^2 + x^3p - 2x^2y = 0$ **(6)**

c) Solve $yy'' + (y')^2 + 1 = 0$ **(6)**

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MAT 202 Reg. No. ....

CREDIT BASED SECOND SEMESTER B.C.A. DEGREE EXAMINATION APRIL 2017

MATHEMATICS

PAPER II: FUNDAMENTALS OF MATHEMATICS

Duration: 3 hours **Max Marks: 80**

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

PART A **2x6=12**

1. a) If $A=\{1,2,3,4\}$ and $B=\{2,3,7\}$ and $C=\{1,2,5,7\}$ Find $(A\cup B)\cap(A\cup C)$.

b) Define power set of a set. Write the number of elements in the power set of a set of 6 elements.

c) Find $f\,o\,g$ if $f(x)=x+2$ and $g(x)=x-2$

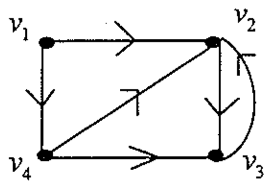
d) Prove that the function $f(x)=x+4$ is a Bijective function on R.

e) Write the following statement in symbolic form "Mark is poor or he is both rich and unhappy".

f) Construct the truth table for $P\vee\neg Q$.

g) Define path of a graph.

h) Write the indegree and outdegree of all nodes in the following graph.



PART - B

UNIT-I

2. a) If $A=\{1,2,3\}$ and $B=\{2,3,4\}$ find $(A\cap B)\times B$ **(5)**

b) Define the following with one example each.
(i) Equivalence relation
(ii) Antisymmetric relation **(6)**

c) Given the relation matrices $M_R=\begin{bmatrix}1&0&1\\1&1&0\\1&1&1\end{bmatrix}$ and $M_S=\begin{bmatrix}1&0&0&1&0\\1&0&1&0&1\\0&1&0&1&0\end{bmatrix}$

Find M_{RoS}, $M_{\bar{R}}$, $M_{\bar{S}}$ and $M_{\overline{RoS}}$ and show that $M_{\overline{RoS}}=M_{\bar{R}o\bar{S}}$ **(6)**

3. a) Let X = {1, 2, 3, 4} and
R = {<1, 1>, <1, 4>, <4, 1>, <4, 4>, <2, 2>, <2, 3>, <3, 2>, <3, 3>}
write the matrix of R and sketch its graph. (5)

b) Let A be the set of all factors of a particular positive integer m and let '$\leq$' be the relation 'divides'. That is $\leq = \{<x, y> / x \in A \wedge y \in A \wedge (x \text{ divides } y)\}$. Draw Hasse diagrams for $m = 12$ and $m = 45$. (6)

c) Define compatibility relation. Find the maximal compatibility blocks of the following relation. Also draw the corresponding graph.

2	0			
3	1	1		
4	1	0	1	
5	0	1	0	1
	1	2	3	4

(6)

UNIT-II

4. a) If f, g, h are three functions defined on the set of real numbers by
$f(x) = x + 2$, $g(x) = x - 2$ and $h(x) = 3x$ then find the following.
(i) $f o g$ (ii) $g o h$ (iii) $f o g o h$ (iv) $f o g o g$ (v) $h o h o h$ (5)

b) Define identify element under a binary operation $*$ If e_l is the left identity element and e_r right identity element with respect to $*$, then prove that $e_l = e_r$ (6)

c) Let $g : Z \times Z \to Z$, where Z is the set of integers and $g(x, y) = x * y = x + y - xy$. Show that the binary operation $*$ is commutative and associative. Find the identity element under the operation $*$. (6)

5. a) Define a bijection. If $f : R \to R$ be the function defined by $f(x) = x^2 - 2$ then find f^{-1} (6)

b) Define characteristic function of a set. Show that $\sim\sim A = A$. (6)

c) Let X be a set and $*$ be a binary operation on X. If $*$ is associative and $e \in X$ where e is the identity element under $*$, then prove that the left inverse and right inverse of an element 'a' of X are equal if it is invertible. (5)

UNIT-III

6. a) Prove that $\neg(P \wedge Q) \rightleftarrows (\neg P \vee \neg Q)$ is a tautology. (6)

b) Construct the truth table for the following statement.

$$\neg(P \vee (Q \wedge R)) \rightleftarrows (P \vee Q) \wedge (P \vee R)$$ (6)

c) Find the truth values of the following statements if the truth values of P, Q are T and that of R, S are F.

(i) $(P \rightleftarrows R) \wedge (\neg Q \to S)$

(ii) $P \vee (Q \to (R \wedge \neg P)) \rightleftarrows (Q \vee \neg S)$ **(5)**

7. a) Prove the following (i) $(P \to Q) \Leftrightarrow (\neg P \vee Q)$

(ii) $P \to (Q \to R) \Leftrightarrow P \to (\neg Q \vee R)$ **(6)**

b) Write the truth table for the following
(i) Disjunction (ii) Conditional (iii) Biconditional **(5)**

c) Determine whether the following is a tautology, contradiction or neither.

(i) $(\neg Q \wedge \neg P) \wedge Q$

(ii) $P \to (P \vee Q)$

(iii) $(P \to Q) \wedge (Q \to P)$ **(6)**

UNIT-IV

8. a) Define the following in a graph.

(i) Adjacent nodes

(ii) Selfloop

(iii) Path

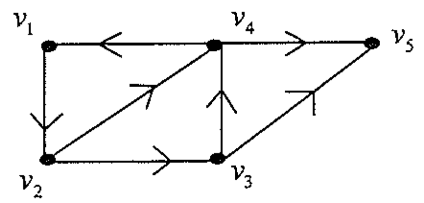
(iv) Leaf

(v) Isolated vertex

(vi) Parallel edges **(6)**

b) In a simple digraph $G = \langle V, E \rangle$, prove that every node of the digraph lies in exactly one strong component. **(5)**

c) Find the reachable sets of $\{v_1, v_4\}$, $\{v_4, v_5\}$ and $\{v_3\}$ for the following graph. **(6)**

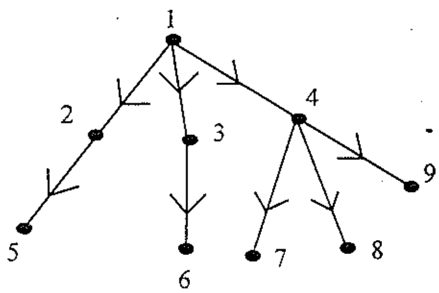


9. a) Define adjacency matrix of the graph G.
Let $S = \{a, b, c, d\}$ and let R be the relation on S represented by the matrix. **(6)**

$$A = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \end{bmatrix}$$

Construct the digraph of R. Find $A \cdot A^T$ and A^2.

b) Convert the following tree into a binary tree.



(5)

c) In a directed graph, define the following

1) Strongly connected

2) Weakly connected

3) Unilaterally connected

(6)

MIC 201.1 Reg. No. ....

CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION – APRIL 2017

MICROBIOLOGY

GENERAL MICROBIOLOGY

Duration: 3 Hours **Max Marks: 80**

Note: Draw diagrams wherever necessary.

PART A

I. Answer any TEN of the following: **2x10=20**

a) Chlamydia
b) Gram Negative Bacteria
c) Nostoc
d) PPLO
e) Baker's Yeast
f) Malarial Parasite
g) Bacteriophage
h) Spheroplast
i) Penicillium
j) Ribosomes
k) Endospores
l) TMV

PART-B

Answer any TWO complete questions from each unit

UNIT-I

II. a) Explain the Cell Membrane of Bacteria. 06
b) Write a note on Pili and Stalk. 04

III. a) Differentiate between Gram positive and Gram negative bacterial cell walls. 06
b) Write a note on Mesosomes and Nuclear material. 04

IV. a) Explain the ultra structure of bacterial flagella. 06
b) Write a note on Sporulation in bacteria. 04

UNIT-II

V. a) Explain the classification of viruses. 06
b) Write a note on the cell structure of Rickettsia. 04

VI. a) Explain the culture and economic importance of Mycoplasma. 06
b) Write a note on Rabies viruses. 04

VII. a) Explain the Lytic cycle in viruses 06
b) Write a note on economic importance of Actinomycetes. 04

UNIT-III

VIII. a) Explain the morphology and economic importance of Aspergillus and Rhizopus. 06
b) Write a brief note on *Entamoeba histolytica.* 04

IX. a) Explain the modes of reproduction in fungi. 06
b) Write a note on Oscillatoria. 04

X. a) Explain the life cycle of *Balantidium coli.* 06
b) Write a note on economic importance of yeast. 04

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PHY 201.2 Reg No................................

CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

PHYSICS

PAPER II: MECHANICS AND THERMAL PHYSICS

Duration: 3 Hours **Max Marks: 80**

PART –A

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

- i) On what factors the radius of gyration depends upon?
- ii) What is a flywheel?
- iii) What is a compound pendulum?
- iv) Write the expression for acceleration due to gravity using Kater's pendulum.
- v) What is the advantage of multistage rockets?
- vi) Define angular momentum.
- vii) What are the uses of Kepler's third law?
- viii) What is a conservative force field?
- ix) Define an adiabatic process.
- x) How does the melting point of ice vary with pressure?
- xi) Define entropy.
- xii) Define inversion temperature.

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

- i) State and prove the theorem of perpendicular axes of moment of inertia.
- ii) What are the advantages of a compound pendulum over a simple pendulum?
- iii) Distinguish between elastic and inelastic collision.
- iv) Prove that simple harmonic motion is an example for central motion.
- v) Entropy increases in a natural process. Why?
- vi) What is Meissner effect?

PART-B

UNIT-I

Answer any TWO of the following: **2X10=20**

2. (a) Deduce an expression for the MI of a circular disc about an axis perpendicular to its plane and hence derive the expressions for the MI of the disc about an axis passing through its diameter.

   (b) A uniform rectangular plate has mass 1.2 kg , length 15 cm and breadth 10 cm. Calculate MI about an axis passing through (i) its C.G. and perpendicular to plane and (ii) its one-end breadth. **(6+4)**

3. (a) What is a simple pendulum? Derive an expression for the time period of a simple pendulum.

   (b) A thin uniform bar of length 1.2m is made to oscillate about an axis through its end. Find the period of oscillation and also find the other points about which it can oscillate with the same period. **(6+4)**

4. (a) What is torsion pendulum? Derive an expression for the period of oscillation of a torsion pendulum.

(b) The period of a bar pendulum is 1.53s when the center of suspension is 0.3m from one end and 1.49s when it is 0.2m from the same end. If the bar is 1m long, find acceleration due to gravity. **(6+4)**

UNIT-II

Answer any <u>TWO</u> of the following. **10x2=20**

5. (a) Derive an expression for the final velocity of a rocket.

   (b) A rocket is designed to attain a maximum speed of 4.6km/s. Mass of the rocket without fuel is 100kg. What should be the mass of the fuel if the velocity of the escaping gas is 2km/s. **(6+4)**

6. (a) Define uniform circular motion. Show that in a central motion the areal velocity is a constant.

   (b) If the mass of a body is 10kg and position vector $\vec{r} = 2\,t^2\,\hat{\imath} + 5\,t\,\hat{\jmath}$ at any instant of time. F find the magnitude of the angular momentum about the origin at t=3s. **(6+4)**

7. (a) Derive an expression for the period of vertical oscillation of a light loaded spring using the law of conservation of energy.

   (b) A vertical spring is stretched by 0.1m when a load at 10kg is attached to it. What will be the period of oscillation when a load of 6kg is attached to it? **(6+4)**

UNIT-III

Answer any <u>TWO</u> of the following. **10x2=20**

8. (a) Deduce Clausius-Claperon latent heat equation and discuss the variation of boiling point of a liquid.

   (b) Calculate the work done when 1litre of a monatomic perfect gas at NTP is compressed adiabatically till the temperature is increased to 100^0 C. Gas constant is 8.314 J/mol/K, γ = 1.67. **(6+4)**

9. (a) Explain the term entropy. Represent the heat engine on a T-S diagram and prove the area represents the available energy.

   (b) Calculate the change in entropy when 0.02kg of ice at 273K melts into water at 313K. Given latent heat of fusion of ice=$3.36\text{x}10^5$J/kg. Specific heat of water=4200J/kg/K. **(6+4)**

10. (a) Describe the Joule-Kelvin porous plug experiment and state the results of the experiment.

    (b) Calculate the temperature of inversion of Helium gas given

    Given: a = $3.44 \text{ X } 10^{-3}\text{Nm}^4/\text{mol}^2$

    b = $0.0237\text{X } 10^{-3}\text{m}^3/\text{mol}$

    R = 8.31J/mol^{-1} **(6+4)**

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STA 201.1 Reg. No. ....

CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION

APRIL 2017

STATISTICS

PAPER I – DESCRIPTIVE STATISTICS & DISTRIBUTION THEORY

Time: 3 Hrs **Max. Marks: 80**

PART - A

Answer any TEN of the following: **10X2=20**

1. a) For a binomial distribution, mean is 6 and standard deviation is 2. Write down the p.m.f.

   b) Find the mode of a Poisson distribution with mean 5.

   c) What is the relationship between negative binomial distribution and geometric distribution?

   d) What do you mean by a Hyper geometric variate? Give one example.

   e) Give the normal equations for fitting a curve of the form $y = ae^{bx}$.

   f) Mention any two properties of regression lines.

   g) Show that GM of the regression coefficients is the correlation coefficient.

   h) Explain perfect positive correlation with an example.

   i) State any 2 properties of correlation coefficient.

   j) Distinguish between multiple and partial correlation coefficient.

   k) If $r_{12} = r_{13} = r_{23}$ find $R_{1.23}$.

   l) Show that $R_{1.23} \geq 0$ with usual notation.

PART – B

Answer any TWO of the following: **10x2=20**

2. a) Explain the principle of least squares in curve fitting.

   b) Show that two independent variables are uncorrelated but the converse is not true. **(4+6)**

3. a) Show that correlations between observed and estimated value obtained from the equation Y on X is equal to the correlation between X and Y.

   b) Derive an expression for Spearman's rank correlation coefficient when there are no ties. **(4+6)**

4. a) Show that the A.M. of regression coefficients is greater than or equal to the correlation coefficient provided correlation coefficient is non-negative.

   b) Derive the regression equation of Y on X. **(4+6)**

Answer any TWO of the following: **10x2=20**

5. a) State and prove any one property of residuals in a trivariate distribution.

   b) In a trivariate data, derive the equation for the plane of regression of X_1 on X_2 & X_3.

(4+6)

6. a) With usual notation, prove that $b_{12.3}\, b_{23.1}\, b_{31.2} = r_{12.3}\, r_{23.1}\, r_{31.2}$

   b) With usual notation, prove that $R_{1.23}^2 = \dfrac{r_{12}^2 + r_{13}^2 - 2r_{12}r_{13}r_{23}}{(1 - r_{23}^2)}$ **(4+6)**

7. a) Show that $1 - R_{1.23}^2 = (1 - r_{12}^2)(1 - r_{13.2}^2)$

   Deduce that

   (i) $R_{1.23} \geq r_{12}$

   (ii) $R_{1.23}^2 = r_{12}^2 + r_{13}^2$ if $r_{23} = 0$

   (iii) $1 - R_{1.23}^2 = \dfrac{(1-\rho)(1+2\rho)}{(1+\rho)}$, provided all the coefficients of zero order are equal to ρ.

(10)

Answer any TWO of the following: **10x2=20**

8. a) Derive the m.g.f. of Poisson variate and hence obtain its Mean & Variance.

   b) Stating the conditions show that Binomial distribution is a limiting form of Hyper geometric distribution. **(5+5)**

9. a) Obtain the recurrence relation for central moments of Negative Binomial distribution.

   b) Derive mode of Binomial distribution. **(5+5)**

10. a) What do you mean by a Geometric Variate? State and prove its lack of memory property.

    b) Obtain the C.G.F. of Binomial distribution and hence comment on Skewness and Kurtosis of the distribution. **(5+5)**

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ZOO 201.2 Reg. No. ....

CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

ZOOLOGY

ZOOMORPHOLOGY - II

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. Define Telotroch. Where is it found?
2. What are Tunicates? Give an example.
3. Give any two examples each for Agnatha and Gnathostomata.
4. Distinguish between homocercal and heterocercal fin.
5. Mention any two orders of class Amphibian with an example each.
6. Draw a labelled diagram of procoelous vertebra of frog.
7. Write any two general characters of the order Chelonia.
8. Give two examples each for Indian poisonous and Non-poisonous snakes.
9. What is a Wish bone? Mention its function.
10. Write the generic name of i) House sparrow ii) Kingfisher
11. What is diastema? Where is it found?
12. Write any two distinctive features of order Cetacea.

PART-B

UNIT-I

II. a) Describe metamorphosis in Ammocoetes larva. 07

b) Write a note on accessory respiratory organ in *Anabas.* 03

III. a) Enumerate the differences between Chondrichthyes and Osteichthyes. 07

b) Enumerate the affinities of tornaria larva with Echinodermata. 03

IV. a) Describe the external features of *Balanoglossus*. 05

b) Write any eight general characters of Phylum Chordata, with any two examples. 05

UNIT-II

V. a) Explain the general characters of class Amphibia. 07

b) Write any six salient features of Order Rhynchocephalia. 03

VI. a) Explain the biting mechanism in poisonous snakes with a neat labelled diagram. 07

b) Write a note on hyoid apparatus in frog. 03

VII. a) Explain the external features of *Hoplobatrachus tigrinus*. 05

b) Write any eight distinctive characters of order Crocodilia with two examples. 05

UNIT-III

VIII. a) Give an account of flight adaptation in birds. 07

b) Write any four distinctive features of Chiroptera with two examples. 03

IX. a) Give an account of the salient features of Order Carnivora. Mention the suborders with one example each. 07

b) Write any four general characters of super order Palaeognathae and give two examples. 03

X. a) Compare subclass Archaeornithes with subclass Neornithes with any eight characters. Give an example for each subclass. 05

b) Describe the digestive system of Rat. 05

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CHE 401.1 Reg. No. a..

CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

CHEMISTRY

PAPER IV: GENERAL CHEMISTRY

Duration: 3 hours **Max Marks: 80**

Note: 1. Write question numbers and subdivisions clearly.
2. Write chemical equations and diagrams wherever necessary.

PART A

1. Answer any TEN of the following: **2x10=20**

a) What is ionisaton isomerism? Give an example.

b) What are d block elements? Write its general electronic configuration.

c) Cu_2O is colourless where as CuO is coloured. Why?

d) Write the formula of sodium ethylenediamminetetraacetatochromate (III).

e) State Boyle-van't Hoff's and Avogadro van't Hoff's law.

f) Give reason: Equimolar solution of NaCl and glucose do not have the same osmotic pressure.

g) Mention different types of liquid crystals.

h) How do you convert acetone to propane? Write the chemical equation.

i) Why is monochloro acetic acid stronger than acetic acid?

j) Write the IUPAC name of the following compounds

i) $\begin{matrix} CH_2COOH \\ | \\ CH_2COOH \end{matrix}$ ii) $CH_3(OH)CHCH_2COOH$

k) State law of constancy of interfacial angle.

l) How is acetamide converted into methyl amine?

PART-B

UNIT-I

Answer any **TWO** of the following. **10x2=20**

2. a) On the basis of valenc bond theory explain the formation of $[Co(CN)_6]^{3-}$. 04

b) Explain hydrate isomerism with suitable example. 03

c) Write a note on variable oxidation state of d-block elements. 03

3. a) Compare the 3d series elements with their 4d & 5d analogues with respect to ionic radii and magnetic properties. 04

b) Give IUPAC name of the following complex compounds. 03

(i) $[Cu(H_20)_2(NH_3)_2]Cl_2$ (ii) $[Ag(NH_3)_2]Br$ (iii) $K[Au(CN)_4]$

c) Explain the formation of coloured compounds by transition elements. 03

4. a) Describe the geometrical isomerism in a complex compounds with co-ordination number-6. 04

b) Write the structures of cis and trans diammine dichloro platinum(II). 03

c) Calculate the magnetic moment of Fe^{+2} using spin only formula. 03

UNIT-II

Answer any **TWO** of the following. **10x2=20**

5. a) How is crystal structure of NaCl determined by Bragg's method. 04

b) Write a note on nano materials. 03

c) Calculate the osmotic pressure of 10% solution of glucose at $25^{\circ}C$. 03

6. a) Derive thermodynamic relationship between depression in freezing point and molecular mass of the solute. 04

b) Write a note on Swarm theory of liquid crystals. 03

c) A crystal plane intercept on the three axes of a crystal are 3, 2 and 1 respectively. Calculate the Miller indices of the plane. 03

7. a) Descrive Ostwald – Walker dynamic method of determination of relative lowering of vapour pressure. 04

b) Explain plane of symmetry. How many planes of symmetric are possible in a cubic crystal. 03

c) 1.575g of oxalic acid crystals are dissolved in 250 cm^3 of the solution. Calculate the normality and molarity of the solution. 03

UNIT-III

Answer any TWO of the following. **10x2=20**

8. a) Explain the mechanism of aldol condensation. 04

b) What is the action of heat on adipic acid and oxalic acid. 03

c) Explain carbylamine reaction with a suitable example. 03

9. a) How is the mixture of primary, secondary and tertiary amines separated by Hoffmann's method. 04

b) Explain the mechanism of hydrolysis of an ester in the acidic medium. 03

c) How does acetaldehyde react with
(i) ammonia (ii) phenyl hydrazine 03

10. a) Explain the use of acetal as protecting group with an illustration. 04

b) Give the method of preparation of monocarboxylic acid from alcohols and Grignard reagent. 03

c) Discuss the relative basic character of methyl amine and aniline. 03

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CHE 401.2 Reg. No. ....

CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

CHEMISTRY

PAPER IV: GENERAL CHEMISTRY

Duration: 3 hours **Max Marks: 80**

Note: 1. Write question numbers and subdivisions clearly.
2. Write chemical equations and diagrams wherever necessary.

PART A

1. Answer any <u>TEN</u> of the following: **2x10=20**

a) Transition elements and their ions are paramagnetic. Give reasons.

b) Give an example for a complex with coordination number 6 and draw the structure.

c) Give the molecular orbital configuration of O_2^- molecule.

d) Predict hybridization and geometry in PF_5.

e) State Nernst Distribution law.

f) What is an azeotropic mixture? Give one example.

g) Write **B. E. T.** equation and explain the terms.

h) Write any two applications of adsorption.

i) Aniline is a weaker base than ammonia. Give reason.

j) Write the equation for the synthesis of benzene from benzene diazonium chloride.

k) What is Vulcanization?

l) What are the monomers used in the synthesis of Nylon 6, 6.

PART-B

UNIT-I

Answer any **TWO** of the following. **10x2=20**

2. a) Explain the properties of 3d transition elements with respect to colour and oxidation state. 04

b) Explain structure and geometry of BeF_2. 03

c) Calculate the magnetic moment of Cr^{+3} ion using spin only formula. 03

3. a) Based on VSEPR theory explain hybridization and shape of NH_3. 04

b) Transition metal ions form stable complexes. Give reasons. 03

c) Diatomic helium molecule does not exist. Give reasons. 03

4. a) Explain on the basis of Molecular Orbital theory why O_2 is paramagnetic and N_2 is diamagnetic. 04

b) Give three differences between Bending Molecular orbital and Antibonding Molecular orbital. 03

c) Iron, Cobalt and Nickel are ferromagnetic. Explain. 03

UNIT-II

Answer any <u>TWO</u> of the following. **10x2=20**

5. a) Deduce Langmuir isotherm equation. 04

   b) Write a note on Nicotine – H_2O system. 03

   c) Describe the effect of dissolved substances on the surface tension of a liquid. 03

6. a) What is the principle of steam distillation? How can it be used in calculating the molecular mass of a liquid? 04

   b) Explain the factors influencing the adsorption of gases by solids. 03

   c) When benzoic acid was shaken with H_2O and benzene at 298 K and 101.3kPa, following results were obtained

conc. of acid in benzene	0.24	0.55	0.93
conc. of acid in H_2O	0.015	0.22	0.029

   Show that benzoic acid is associated into double molecules in benzene layer. 03

7. a) Distinguish between physical and chemical adsorption. 04

   b) Discuss the boiling point composition curves of a liquid mixtures which form non ideal solutions. 03

   c) An immiscible mixture of water and quinoline boils at $98.9^{\circ}C$ under a pressure of 740 torr. Distillate contains 77.9g. of quinoline and 1 kg. of water. At the given boiling point, vapour pressure of quinoline is 7.96 torr. Calculate molar mass of quinoline.

   03

UNIT-III

Answer any <u>TWO</u> of the following. **10x2=20**

8. a) Explain Hoffmann method of separating a mixture of primary, secondary and tertiary amines. 04

   b) How is Buna-S manufactured? Give two applications. 03

   c) Explain why methylamine is a stronger base than ammonia. 03

9. a) Explain the mechanism of cationic vinyl polymerisatoin. 04

   b) Give one method for the synthesis of diazonium chloride. 03

   c) Explain the synthesis of Dacron. 03

10. a) Arrange the following in increasing order of basicity and give reasons. Ethyl amine, triethyl amine, diethyl amine. 04

    b) Write the preparation and application of epoxy resin. 03

    c) Explain Sandmeyer reaction with an example. 03

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MAT 401.2 Reg. No. ....

CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

MATHEMATICS

PAPER IV: ANALYTICAL GEOMETRY, RING THEORY AND COMPLEX VARIABLES

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 an equation of the graph of xy = 8 with respect to $\bar{x}$ and $\bar{y}$ axes after a rotation of axes through an angle of radius measure $\frac{\pi}{4}$.

b) Find the eccentricity and directrices of the ellipse $4x^2 + 9y^2 = 36$.

c) Find the eccentricity of the conic $r = \frac{3}{1-\cos\theta}$ and identify the conic.

d) Define i) Field ii) Integral domain.

e) Prove that any field is an integral domain.

f) If U is an ideal of R and $1 \varepsilon U$, prove that U = R.

g) In (Z,+,·) prove that P = pZ (where p is a prime) is a prime ideal.

h) Find all units in J[i]

i) Prove that $f(x) = x^2 + 1$ is irreducible over the field of integers mod 7

j) Find the principal argument Argz when $z = \frac{i}{-2-2i}$

k) Sketch the set $|z-2+i| \le 1$

l) i) Find the domain of definition of $f(z) = \frac{1}{z^2+1}$

ii) Show that $f'(z)$ does not exist anywhere for $f(z) = z - \overline{z}$

m) Find the singular points of the function $f(z) = \frac{z^3+i}{z^2-3z+2}$

n) Show that $f(z) = e^{-y}\sin x - ie^{-y}\cos x$ is an entire function.

o) Show that $f(z) = 2xy + i(x^2 - y^2)$ is nowhere analytic.

PART - B

UNIT-I

2. a) If (x, y) represents a point P with respect to a given set of axes and $(\overline{x}, \overline{y})$ is a representation of P after the axes have been rotated through an angle α then prove that $x = \overline{x}\cos\alpha - \overline{y}\sin\alpha$ and $y = \overline{x}\sin\alpha + \overline{y}\cos\alpha$ (6)

   b) Simply the equation $x^2 + xy + y^2 - 3y - 6 = 0$. Draw a sketch of the graph of the equation and show the three sets of axes. (6)

   c) A parabola has its focus at the pole and its vertex at $(4, \pi)$. Find an equation of the parabola in polar form and an equation of the directrix. Draw a sketch of its parabola and the diretrix. (6)

3. a) If $B \neq 0$ then prove that the equation $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$ can be transformed into the equation $\overline{A}\,\overline{x}^2 + \overline{C}\,\overline{y}^2 + \overline{D}\,\overline{x} + \overline{E}\,\overline{y} + \overline{F} = 0$ where $\overline{A}$ and $\overline{C}$ are not both zero, by a rotation of axes through an angle α for which $Cot2\alpha = \dfrac{A-C}{B}$ (6)

   b) Simply the equation $17x^2 - 12xy + 8y^2 - 80 = 0$ by a rotation of axes. Draw a sketch of the graph of the equation and show both sets of axes. (6)

   c) An equation of a conic is $r = \dfrac{5}{3 + 2\sin\theta}$

   Find the eccentricity, identify the conic, write an equation of the directrix corresponding to the focus at the pole, find the vertices, and draw a sketch of the curve. (6)

UNIT-II

4. a) Prove that every finite integral domain is a field. (6)

   b) If R is a commutative ring and $a \in R$ show that $Ra = \{xa \mid x \in R\}$ is an ideal of R. (6)

   c) If F is a field prove that its only ideals are (o) and F itself. (6)

5. a) Show that the commutative ring D is an integral domain if and only if for $a, b, c, \in D$ with $a \neq 0$, the relation $ab = ac$ implies that $b = c$ (6)

   b) Let $J(\sqrt{2}) = \{m + n\sqrt{2} \mid m, n \in Z\}$ be a ring. Define $\phi : J(\sqrt{2}) \to J(\sqrt{2})$ by $\phi(m + n\sqrt{2}) = m - n\sqrt{2}$. Show that ϕ is a homomorphism. Find its kernel. (6)

   c) If U is an ideal of R, let $r(U) = \{x \in R \mid xu = 0 \text{ for all } u \in U\}$. Prove that $r(U)$ is an ideal of R. (6)

UNIT-III

6. a) Let R be a Euclidean ring and let A be an ideal of R. Then prove that there exists an element $a_0 \in A$ such that $A = \{a_0\, x \mid x \in R\}$ (6)

b) Let R be a Euclidean ring and $a, b \varepsilon R$. Then prove that any two greatest common divisions of a and b are associates. (6)

c) Let $A=(a_0)$ be an ideal of Euclidean ring R. If a_0 is a prime element of R, then prove that A is a maximal ideal of R. (6)

7\. a) In a Euclidean ring R, prove that any two elements a and b have a greatest common divisor d and $d=\lambda a+\mu b$ where $\lambda, \mu \in R$ (6)

b) Let R be a Euclidean ring and $a, b \varepsilon R$. If $b \neq 0$ is not a unit in R, then prove that $d(a)<d(ab)$. (6)

c) If $f(x)$ and $g(x)$ are two nonzero elements of the polynomial ring $F(x)$, prove that $\deg(f(x)\cdot g(x))=\deg f(x)+\deg g(x)$ (6)

UNIT-IV

8\. a) Find all the values of $(-8i)^{\frac{1}{3}}$. (6)

b) Suppose that $f(z)=u(x,y)+iv(x,y)$ and $f'(z)$ exists at a point $z_0=x_0+iy_0$ Show that the first order partial derivatives of u and v must exist at (x_0, y_0) and they satisfy the Cauchy Riemann equations $u_x=v_y$ and $u_y=-v_x$ (6)

c) Show that $f'(z)$ & $f''(z)$ exist everywhere and find $f''(z)$ when $f(z)=iz+2$. (6)

9\. a) Suppose that $f(z)=u(x,y)+iv(x,y)$, $z_0=x_0+iy_0$ and $w_0=u_0+iv_0$ then prove that $\lim_{z\to z_0} f(z)=w_0$ if and only if $\lim_{(x,y)\to(x_0 y_0)} u(x,y)=u_0$ and $\lim_{(x,y)\to(x_0 y_0)} v(x,y)=v_0$ (6)

b) If $f(z)=\frac{z}{\overline{z}}$ then show that $\lim_{z\to 0} f(z)$ does not exist. (6)

c) If $f(z)=3\sqrt{r}\, e^{\frac{i\theta}{3}}$, $(r>0)$ find $f'(z)$ by using C.R. equations in Polar form. (6)

UNIT-V

10\. a) If $u(x,y)=\sinh x \sin y$, then show that $u(x,y)$ is harmonic in some domain and find its harmonic conjugate. (6)

b) If a function $f(z)=u(x,y)+iv(x,y)$ is analytic in a domain D then prove that its components u and v are harmonic in D. (6)

c) Find $\int_C \overline{z}\, dz$ where C is the right-hand half $z=2e^{i\theta}$, $\left(-\frac{\pi}{2}\leq\theta\leq\frac{\pi}{2}\right)$ of the circle $|Z|=2$ from $z=-2i$ to $z=2i$ (6)

11. a) If $u(x,y) = y^3 - 3x^2y$ show that $u(x,y)$ is harmonic in some domain and find its harmonic conjugate. **(6)**

b) If m and n are integer find the value of $\int_0^{2\pi} e^{im\theta} \cdot e^{-in\theta} d\theta$ (6)

c) Evaluate $\int_C (z-1)dz$ where C is the arc from $z=0$ to $z=2$ consisting of the semicircle $z = 1 + e^{i\theta}$ where $\pi \le \theta \le 2\pi$ (6)

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MAT 401.1 Reg. No. ....

CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

MATHEMATICS

PAPER IV: MULTIPLE INTEGRALS, FUNCTIONS OF SEVERAL VARIABLES 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) Evaluate $\int_{2}^{3}\int_{0}^{y} x^2 y\, dx\, dy$

b) Find by double integration the area of the region in the xy plane bounded by the curves $y = x^2$ and $y = 4x - x^2$.

c) Evaluate $\int_{\pi/2}^{\pi}\int_{0}^{\pi} \sin(4x - y)dy\, dx$

d) Evaluate the line integral $\int_c 3x\, dx + 2xy\, dy + zdz,$ if the curve C is the circular helix defined by $x = \cos t \quad y = snt \quad z = t, \quad 0 \le t \le 2\pi$

e) Evaluate $\int_c F.dR; F(x, y) = yi + xj; C : R(t) = ti + t^2 j \quad 0 \le t \le 1$

f) Evaluate $\int_{0}^{\pi/4}\int_{0}^{a}\int_{0}^{r\cos\theta} r\sec^3\theta\, dz\, dr\, d\theta$

g) Show that $\lim_{(x,y)\to(0,0)} f(x, y)$ does not exist if $f(x, y) = \dfrac{x^2 y}{x^4 + y^2}$

h) Given $f(x, y, z) = 3x^2 + xy - 2y^2 - zy + z^2$, find the rate of change of $f(x, y, z)$ at $(1, -2, -1)$ in the direction of the vector $2i - 2j - k$

i) Find an equation of the tangent plane to the elliptic paraboloid $4x^2 + y^2 - 16z = 0$ at (2, 4, 2).

j) If H and K are subgroups of G and $O(H) > \sqrt{O(G)} \quad O(K) > \sqrt{O(G)}$ then prove that $H \cap K \ne (e)$.

k) If N is a normal subgroup of G, then prove that for every $g \in G\ gNg_{-1} = N$

l) If G is a finite group whose order is a prime number p, then prove that G is a cyclic group.

m) If ϕ is a homomorphism of G into $\overline{G}$, then prove that $\phi(e) = \overline{e}$, the unit element of $\overline{G}$.

n) Define Kernel of homomorphism.

o) Compute $a^{-1}ba$, where $a = (1\,3\,5)\,(1\,2)$ and $b = (1\,5\,7\,9)$

PART - B

UNIT-I

2. a) Find an approximate volume of the solid bounded by the surface $f(x,y)=4-\frac{1}{9}x^2-\frac{1}{16}y^2$ and the planes $x=3,\ y=2$ and the three coordinate planes by taking the partition of the region in the xy – plane by drawing the lines $x = 1$, $x = 2$, and $y = 1$ and the values of the function at the centres of each subregion. (6)

   b) Use double integrals to find the area of the region inside the cardioid $r=2(1+\sin\theta)$ (6)

   c) Find the area of the surface in the first octant that is cut from the cylinder $x^2+y^2=9$ by the plane $x=z$ (6)

3. a) Find the exact value of the double integral $\iint_R x^2\sqrt{9-y^2}\,dA$, where R is the region bounded by the circle $x^2+y^2=9$. (6)

   b) Find the area of the paraboloid $z=x^2+y^2$ below the plane z = 4. (6)

   c) Evaluate $\iint_R e^{-(x^2+y^2)}$ dA, where the region R is in the first quadrant bounded by the circle $x^2+y^2=a^2$ and the coordinate axes. (6)

UNIT-II

4. a) Evaluate the iterated integral $\int_0^1\int_0^{1-x}\int_{xy}^{1+y^2} x\,dz\,dy\,dx$ (6)

   b) A homogeneous solid in the shape of a right circular cylinder has a radius by 2m and an attitude of 4m. Find the moment of inertia of the solid with respect to its axis. (6)

   c) Evaluate the line integral over the curve $\int_C F\cdot dR;\quad F(x,y)=y\sin xi-\cos xj;\quad C:$ the line segment from $\left(\frac{\pi}{2},0\right)$ to $(\pi,1)$. (6)

5. a) Find the valume of the solid bounded by the cylinder $x^2+y^2=1$ in the first octant and the plane z = x. (6)

   b) Evaluate the iterated integral $\int_{-1}^{0}\int_{e}^{2e}\int_{0}^{\pi/3} y\ln z\tan x\,dx\,dz\,dy$. (6)

   c) A particle traverses the twisted cubic $R(t)=ti+t^2j+t^3k;\ 0\le t\le 1$. Find the total work done if the motion is caused by the force field $F(x,y,z)=e^xi+xe^zj+x\sin\pi y^2k$. (6)

UNIT-III

6. a) Using $\varepsilon-\delta$ definition prove that $\lim_{(x,y)\to(1,2)} 3x^2+y=5$ (6)

b) Using chain rule find $\frac{\delta u}{\delta r}$ if $u=xy+xz+yz,\ x=r,\ y=r\cos t,\ z=r\sin t$. (6)

c) Find the equation of the tangent plane and equation of the normal line to the surface $x^2+y^2+z^2=17$ at $(2,-2,3)$ (6)

7. a) Given $f(x,y)=\begin{cases}\frac{xy(x^2-y^2)}{x^2+y^2} & if (x,y)\neq(0,0)\\ 0 & if (x,y)=(0,0)\end{cases}$

Show that $f_1(0,y)=y$ for all y. (6)

b) If $f(x,y)=\frac{3x^2y}{x^2+y^2}$, find $\lim_{(x,y)\to(0,0)} f(x,y)$ if it exists. (6)

c) Determine the relative extrema of $f(x,y)=x^3+y^2-6x^2+y-1$, if there are any. (6)

UNIT-IV

8. a) If G is a finite group and $a\in G$. Then prove that $O(a)\mid O(G)$. (6)

b) If H is a non-empty finite subset of a group G and H is closed under multiplication, then prove that H is a subgroup of G. (6)

c) Define normal subgroup. Prove that a subgroup N of G is a normal subgroup of G if and only if every left cosets of N in G is a right coset of N in G. (6)

9. a) If H and K are finite subgroup of G of orders O(H) abd O(K) respectively, then prove that $O(HK)=\frac{O(H)O(K)}{O(H\cap K)}$ (6)

b) If N and M are normal subgroups of G, prove that NM is also a normal subgroup of G. (6)

c) For all $a\in G$, prove that $Ha=\{x\in G\mid a\equiv x(\text{mod } H)\}$ (6)

UNIT-V

10. a) If ϕ is a homomorphism from G into $\overline{G}$ with Kernel K. Prove that $\frac{G}{K}=\overline{G}$ (6)

b) Prove that the set of all automorphisms of a group G is a group. (6)

c) Prove that S_n has as a normal subgroup of index 2 the alternating group A_n of all even permutations. (6)

11. a) Prove that Kernel of a homomorphism is a normal subgroup. (6)

b) Let G be the group of all real numbers under addition and let $\overline{G}$ be the group of non-zero real numbers under multiplication. Define $\phi : G \rightarrow \overline{G}$ by $\phi(a) = 3^a$ for every $a \in G$. Show that ϕ is a homomorphism and find its Kernel. (6)

c) Express (1 2 3) (4 5) (1 6 7 8 9) (1 5) as the product of disjoint cycles and state whether it is odd or even. Also find its order. (6)

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MIC 401.1 Reg. No. ....

CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION – APRIL 2017

MICROBIOLOGY

MICROBIAL PHYSIOLOGY AND METABOLISM

Duration: 3 Hours Max Marks: 80

Note: Draw diagrams wherever necessary.

PART A

I. Answer any TEN of the following: 2x10=20

a) Algal Bloom
b) Fermentation
c) Photophoshorylation
d) Biocorrosion
e) ETC
f) Chemoautotrophs
g) Amphibolism
h) Bacteriochlorophylls
i) Stroma
j) Biofilms
k) Cellulase
l) Chromatophore

PART-B

UNIT-I

Answer any TWO complete questions of the following: 10x2=20

II.	a)	Explain the EMP pathway.	06
	b)	Write a note on Butanediol Fermentation.	04
III.	a)	Explain Gluconeogenesis. Add a note on its significance.	06
	b)	Write a note on Proton Motive Force.	04
IV.	a)	Explain the enzymatic steps involved in lactic acid fermentation.	06
	b)	Write a note on ED pathway.	04

UNIT-II

Answer any TWO complete questions of the following: 10x2=20

V.	a)	Explain the Cyclic Photo Phosphorylation.	06
	b)	Write a note on ultrastucture of chloroplast.	04
VI.	a)	Explain Calvin cycle.	06
	b)	Differentiate between bacterial photosynthesis and plant photosynthesis.	04
VII.	a)	Explain Non- Cyclic Photophosphorylation.	06
	b)	Write a note on Photosynthetic Pigments.	04

UNIT-III

Answer any TWO complete questions of the following: 10x2=20

VIII.	a)	Explain the microbes involved in corrosion. Add a note on their detection.	06
	b)	Write a short note on global warming.	04
IX.	a)	Explain the Nitrogen Cycle.	06
	b)	Write a note on oxidation of Hydrogen by Chemoautotrophs.	04
X.	a)	Explain the Carbon Cycle.	06
	b)	Write a note on Acid Rain.	04

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PHY 401.2 Reg No..................................

CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

PHYSICS

PAPER IV: ELECTROMAGNETISM AND ELECTRICITY

Duration: 3 Hours Max Marks: 80

PART –A

1. (A) **Answer any <u>TEN</u> of the following.** 10X1=10

   i) What is a level surface in a scalar field?
   ii) What is Laplacian operator?
   iii) State Faraday's Law of electro-magnetic induction.
   iv) What is anomalous dispersion?
   v) What is an ideal voltage source?
   vi) What is meant by linear circuit?
   vii) What is a transient current?
   viii) Define time constant of LR circuit.
   ix) What is a wattless current?
   x) What is band stop filter?
   xi) Draw the diagram for star configuration.
   xii) What are eddy currents?

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

   i) State Gauss theorem and express it in vector form.
   ii) Show that $\vec{\nabla}.\vec{B} = 0$ with usual symbols.
   iii) Define active circuit elements. Give one example.
   iv) Show that $L/_R$ has the dimension of time.
   v) Distinguish between series resonance and parallel resonance.
   vi) Draw the labelled diagram for Anderson's bridge.

PART-B

UNIT-I

Answer any TWO of the following: 2X10=20

2. (a) Deduce Maxwell's field equation $\vec{\nabla}.\vec{E} = -\frac{\rho}{E}$ with usual symbols.

   (b) If $\phi = x^2 - y^2 + 2z$, find div grad ϕ. (6+4)

3. (a) Define gradient of a scalar field and give its physical significance. Show that gradient of a scalar field is a vector.

   (b) If $\vec{A} = \frac{\vec{z}}{r}$, find grad div $\vec{A}$ (6+4)

4. (a) Using Maxwell's field equations show that electromagnetic waves are transverse in nature.

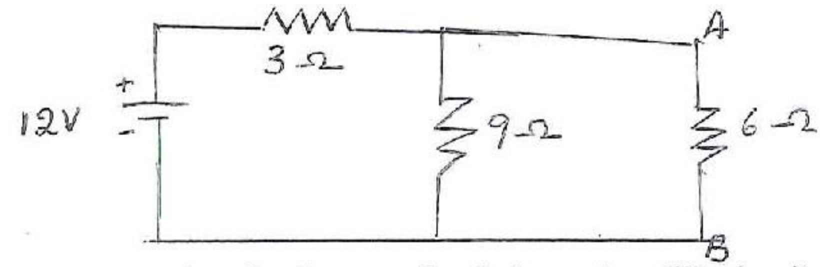
   (b) Show that the function $\phi = x^2 - y^2 + z^2$ satisfies Laplace's equation. (6+4)

UNIT-II

Answer any <u>TWO</u> of the following. **10X2=20**

5. (a) State and prove Thevenin's theorem by considering a general network.

   (b) Determine the Norton's equivalent circuit of the network given below and calculate the current flowing through 6Ω resistors. (6+4)



6. (a) Derive an expression for the growth of charge in a CR circuit and define time constant.

   (b) A 50mH inductor is in series with a 10 Ω resistor and a battery with an emf of 25 V. Find a) the time constant of the circuit b) how long it takes the current to rise 90% of its final value. (6+4)

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

   (b) Find whether the discharge of the capacitor through the inductive circuit is oscillatory? Given: C=0.2μF, L=10mH, R=250 Ω. If so, calculate the frequency. Calculate the maximum value of resistance so as to make it oscillate. (6+4)

UNIT-III

Answer any <u>TWO</u> of the following. **10X2=20**

8. (a) Explain a series LCR circuit. Assuming the expressions for the impedance in the circuit, obtain expressions for resonant frequency, quality factor and phase angle in the circuit.

   (b) A parallel LCR circuit consists of 100 Ω resistance, 1H inductance and 0.05 μF capacitance with a line current of 0.2mA. Determine the resonant frequency, quality factor, lower and upper cutoff frequency and band width of the circuit. (6+4)

9. (a) 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.

   (b) A balanced Delta-connected load of (8+j6) Ω per phase is supplied from a 3-phase 440V source. Find the line current, power factor, power per and total power. (6+4)

10. (a) Obtain the expression for charge passing through B.G.

    (b) In a balanced Anderson's bridge, find the value of R and L if P = 100 Ω, Q = 100 Ω , S = 50 Ω, r = 20 Ω and C = 0.9 μF.

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STA 401.1 Reg. No. ....

CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

STATISTICS

STATISTICAL INFERENCE

Time: 3 Hrs **Max. Marks: 80**

PART - A

Answer any TEN of the following: **2X10=20**

1. a) Define a null hypothesis and alternative hypothesis.
   b) Define level of significance and power of the test.
   c) State Neyman Pearson's fundamental Lemma.
   d) Briefly explain unbiasedness and consistency of a test.
   e) State any two applications of 't' distribution.
   f) Write the test statistic for testing equality of means.
   g) State any two properties of Likelihood Ratio Tests.
   h) Briefly explain the large sample test procedure for testing mean of a normal population.
   i) State the need for sequential tests.
   j) State the assumption of nonparametric tests.
   k) Write the large sample approximation for run test.
   l) Briefly explain Mann Whitney U test.

PART – B

Answer any TWO of the following: **10x2=20**

2. a) Define i) Critical region ii) Type I and II errors in testing of hypothesis

   b) Let $(x_1, x_2, ... x_n)$ be a random sample from $N(\theta, \sigma^2)$ where σ^2 is known. Obtain the BCR for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1 (> \theta_0)$. **(6+4)**

3. a) Derive a MP test of size α for testing $H_0 : \lambda = \lambda_0$ against $H_1 : \lambda = \lambda_1 (> \lambda_0)$, in Poisson with parameter λ.

   b) Show that MP tests obtained using Neyman Pearson Lemma are unbiased. **(5+5)**

4. Derive LRTP for testing equality of means of two independent normal populations whose variances are common and unknown. **(10)**

Answer any TWO of the following: **10x2=20**

5. a) Explain the statistical basis of large sample tests.

   b) Explain large sample test procedure for testing equality of proportions. **(5+5)**

6. a) Stating the assumptions describe Chi-square test of goodness of fit. Identify the degrees of freedom.

   b) Obtain the large sample test for testing $H_0 : \rho_1 = \rho_2$ where ρ_1 and ρ_2 are the correlation coefficients between the variates in two independent bivariate normal populations. **(5+5)**

7. a) Write a note on Yate's correlation for continuity.

   b) Derive Brandt-Snedecor's formula for Chi-square test statistic for testing the independence of attributes in a $2 \times k$ contingency table. **(5+5)**

Answer any TWO of the following: **10x2=20**

8. a) State the merits and demerits of nonparametric tests.

   b) Derive SPRTP for testing $H_1 : \lambda = \lambda_0$ against $H_1 : \lambda = \lambda_1 (> \lambda_0)$ in Poisson with parameter λ. **(5+5)**

9. a) Derive SPRTP for testing $H_0 : \sigma = \sigma_0$ against $H_1 : \sigma = \sigma_1 (< \sigma_0)$ in Normal population with a known mean μ.

   b) Explain Run test for randomness. **(5+5)**

10. a) Describe two sample median test by deriving the distribution of the test statistic

    b) Explain one sample sign test. **(6+4)**

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STA 402.1 Reg. No. ....

CREDIT BASED FOURTH SEMESTER B.C.A. DEGREE EXAMINATION APRIL 2017

STATISTICS-II

PROBABILITY

Time: 3 Hrs **Max. Marks: 80**

Note: Normal Distribution Tables will be provided on request.

PART - A

Answer any TEN of the following: **2X10=20**

1. a) Define disjoint events with an example.

b) Give the relative frequency definition of probability.

c) Given $P(A)=\frac{1}{3}$, $P(B)=\frac{1}{4}$ and $P(A\cap B)=\frac{1}{6}$, find $P(A^1 \cap B^1)$.

d) State the axioms of probability.

e) Define a discrete random variable with an example.

f) Let X be a random variable such that $E[X]=1$ and $V[X]=5$. Compute $E[3X+4]$ and $V[3X+4]$

g) Let X be discrete random variable with mean 5 and standard deviation 3. Compute mean and variance of $[3-7X]$

h) Mention the mean and variance of Bernoulli distribution with parameter p.

i) Let X be a Binomial random variable with parameters n and p. If $n = 10$ and $E(X) = 6$ find p and $V(X)$.

j) The monthly worldwide average number of airplane crashes of commercial airlines is 3.5. Identify the distribution of number of airplane crashes. Also find the mean and variance of no. of airplane crashes.

k) Mention any 2 properties of normal distribution.

l) State the conditions for the independence of 2 events.

PART – B

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

2. a) Four cards are drawn at random from a pack of 52 playing cards. Find the probability that (i) They are spades (ii) They belong to different suits.

b) Suppose A and B are mutually exclusive events for which $P(A) = 0.3$, $P(B) = 0.5$. what is the probability that (i) Either A or B occurs (ii) Both A and B occurs. **(5+5)**

3. a) A card is drawn at random from a pack of playing cards and it is an ace. What is the probability that it is the ace of diamonds?

b) If $P(A) = 0.3$, $P(B) = 0.4$ and $P(A \mid B) = 0.32$ find $P(A\cup B)$. **(5+5)**

4. a) The probability that A can shoot at a target is $5/7$ and the probability that B can shoot the same target is $3/5$. A and B shoot independently, find the probability that 's target is

(i) Not shoot at all (ii) shoot by at least one of them

b) There are 2 bags. The first bag contains 2 red and 1 white balls whereas the second bag has only 1 red and 2 white balls. One ball is taken out random from the first bag and put in the second. Then a ball is drawn at random from the second bag. What is the probability that it is Red? **(5+5)**

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

5. a) Find the value of K in the following distribution and then find the mean.

x	1	2	3	4	5
P(X = x)	3k	5k	2k	K	k

b) A box has 5 red and 5 blue marbles. Two marbles are drawn randomly. If they are of the same colour, then you win Rs. 10. If they are of different colours, then you win Rs. -5. Calculate the expected value of the amount you win. **(5+5)**

6. a) Let X be a random variable with probability distribution

x	2	3	4	5	6
P(X = x)	0.1	0.2	0.4	0.2	0.1

Find E(2X+3) and V(2X-1)

b) A person throws a fair die. If the number obtained is divisible by 3 he gets Rs. 10/- otherwise he loses Rs. 6. Find his expectation.

(5+5)

7. For the following bivariate probability distribution find k and hence obtain its correlation coefficient r_{xy}. **(10)**

x \ y	-1	0	1	2
1	0	0.1	0.2	0
2	0.2	0.1	0	0
3	0.1	K	0	0.1

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

8. a) In a garden there are 1000 trees of which 400 are coconut trees. If 625 samples of 4 trees each are taken, in how many samples do you expect to get (i) exactly 2 coconut trees (ii) at least one coconut tree.

b) One fifth percent of the blades produced by a manufacturing company turn out to be defective. The blades are supplied in packets of 10. Use P.D. to calculate approximate no. of packets containing one defective blade in a consignment of 10000 packets. **(5+5)**

9. a) Fit a Poisson distribution and find the expected frequencies for the following data. **(10)**

Mistakes per page	0	1	2	3	4	5
No. of pages	142	156	69	27	5	1

10. a) Average IQ of a group of 800 children is 98. The S.D. is 8. Assuming normality of IQ find the probability that IQ of a child is more than 120.

b) The time until next earthquake occurs in a particular region is assumed to be exponentially distributed with mean ½ per year. Find the probability that the next earthquake happens (i) within 2 years (ii) after one and half year **(5+5)**

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ZOO 401.2 Reg. No. ....

CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION , APRIL 2017

ZOOLOGY

Histology, Animal Behaviour and Applied Zoology

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. Mention the four categories of endocrine glands.
2. Mention any two functions of MSH.
3. Name the hormones produced by thyroid gland.
4. Name the emergency hormone, where it secreted from?
5. What is biological clock?
6. Define catadramous migration. Give an example.
7. What is social behaviour?
8. Write a short note on Oviparity in animals.
9. Define colostrum.
10. What are the advantages of Giriraja breed?
11. Name any two species of earthworms used in Vermicomposting.
12. Name any two Exotic major carps.

PART-B

UNIT-I

II.	a)	Describe the functions of gonadial hormones.	07
	b)	Write a short note on splenic red pulp.	03
III.	a)	Describe the histology of intestine of a mammal.	07
	b)	Write a note on Addison's disease.	03
IV.	a)	Draw a neat labeled diagram of T.S of testis of a mammal.	05
	b)	List the functions of Liver.	05

UNIT-II

V.	a)	Comment on social organization in Honey bees?	07
	b)	Write a note on instinct behaviour.	03

VI.	a)	Write an essay on methods of studying bird migration.	07
	b)	Write a note on foraging behaviour.	03
VII.	a)	Write explanatory note on i) Imprinting ii) Habituation	05
	b)	Explain the nesting behaviour in wasps.	05

UNIT-III

VIII.	a)	What are desi breeds? Give an account of desi breeds of cows.	07
	b)	Write a short note on vermiwash.	03
IX.	a)	Explain different types of tanks used in aquaculture.	07
	b)	Write a short note on candidiasis.	03
X.	a)	Give an account of stages of Vermicomposting.	05
	b)	Give an account of economic importance of poultry.	05

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CHE 601.1 Reg. No. ....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017
CHEMISTRY
PAPER VII: GENERAL CHEMISTRY

Duration: 3 hours **Max Marks: 80**

PART A

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

a) Give the relationship between μ_s and $\mu_{effective}$.

b) Calculate and write the spectroscopic ground state for d^7 and d^2 systems.

c) Give reason: Mononuclear carbonyls are stable organometallic compounds.

d) Write any two applications of metal complexes in qualitative analysis.

e) What is overvoltage?

f) Explain the term congruent melting point.

g) Explain liquid junction potential.

h) What is a freezing mixture? Give an example.

i) Explain why electrophilic substitution in pyridine takes place at position-3.

j) What are bathochromic and hypsochromic shifts?

k) How is carbonyl group identified in I.R. spectrum?

l) Explain Paal-Knore synthesis with an example.

PART-B
UNIT-I

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

2. a) What are organometallic compounds? How are they classified? Give one example for each class. 04

   b) Explain with example crystal field splitting in tetrahedral complexes. 03

   c) Explain Laporte selection rule for d-d transition. 03

3. a) Explain Gouy's method of determination of magnetic moment of a complex. 04

   b) Explain different types of electronic spectra. 03

   c) Give one method on preparation of organomercury compound and mention any five applications. 03

4. a) Explain the application of magnetic moment data in deducing the structure of complexes. 04

   b) Explain crystal field splitting in square planar complexes. 03

   c) Explain the structure and bonding in organoaluminium compounds. 03

UNIT-II

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

5. a) How is pH of a solution determined using glass electrode? 04
   b) Discuss the phase diagram of water systems. 03
   c) Calculate the electrode potential of $zn^{+2} \mid zn$ electrode at 298K, concentrating of zn^{+2} is 0.8M $\left(E^0_{Zn^{2+}/Zn} = -0.76V\right)$ 03

6. a) Explain the construction and working of calomel electrode. 04
   b) What is decomposition potential? Explain its importance. 02
   c) Explain the phase diagram of $Mg - Zn$ system. 04

7. a) Explain Pattinson's process for the desilverisation of lead. 03
   b) Explain concentration cells with and without transport. 04
   c) Calculate the number of degrees of freedom in the following system -
   $CaCo_3(s) \rightleftharpoons Cao(s) + CO_2(g)$ 03

UNIT-III

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

8. a) Give the applications of UV spectroscopy and IR spectroscopy. 04
   b) Explain the reactions of heterocyclic compounds
      (i) Diels Alder reaction
      (ii) Chichibabin reaction 03
   c) How is IR spectrum of ethane different from that of ethylene? 03

9. a) Explain (i) Nuclear shielding and deshielding
      (ii) Spin spin splitting. 04
   b) Explain the IR spectra of ethyl alcohol and benzaldehyde. 03
   c) Explain the effect of conjugation on UV absorption. 03

10. a) Explain aromaticity of thiophene using molecular orbital picture. 04
    b) Explain the mechanism of electrophilic substitution in Furan. 03
    c) How do you distinguish between ethyl alcohol and acetaldehyde using IR spectroscopy? 03

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CHE 601.2 Reg. No. ....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

CHEMISTRY

PAPER VII: GENERAL CHEMISTRY

Duration: 3 hours **Max Marks: 80**

Note: 1. Write question numbers and subdivisions clearly.
2. Write chemical equations and diagrams wherever necessary.

PART A

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

a) What are mixed organo metallic compounds? Give an example.

b) What is trans effect? Among Cl and NH_3 which has more trans directing effect?

c) Give the relationship between μ_s and μ_{eff}. Explain the terms involved in it.

d) Calculate the number of microstates for d^2 system.

e) Why quinhydrone electrode cannot be used in alkaline solution?

f) State Stark – Einstein's law.

g) Give the relationship between free energy change and equilibrium constant for a cell reaction and explain the terms.

h) What is nuclear fusion? Give one example.

i) Which of the following does not absorb U.V. radiation?
acetone, water, benzene and ethyl alcohol

j) Give the IUPAC names of (i) thiophene (ii) pyrrole

k) What is the condition for a molecule to show IR spectrum.

l) What is the effect of shielding and deshielding on chemical shift?

PART-B

UNIT-I

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

2. a) Explain crystal field splitting in octahedral complexes. 04
b) What are the conditions for the orbital contribution to the magnetic moment? 03
c) Explain any three properties of organo mercury compound. 03

3. a) How do you obtain the following compounds from organo lithium compounds?
(i) isopropyl alcohol (ii) acetone 04
b) Write a note on thermodynamic stability of complexes. 03
c) Explain the applications of magnetic moment data for 3d complexes. 03

4. a) Discuss the applications of complexes in metallurgy. 04
b) Give the selection rule on electronic transition in metal complexes. 03
c) Explain any two methods of preparation alkyl aluminium. 03

UNIT-II

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

5. a) How is pH of a solution determined by EMF measurement using glass electrode. 04

   b) Explain fluorescence and phosphorescence with an example each. 03

   c) Give the principles of a solar photo voltaic cell. 03

6. a) Explain the construction and working of a hydrogen – oxygen fuel cell. 04

   b) Write a note on liquid junction potential. 03

   c) During the photo chemical reaction $A \to B, 1\times10^{5}$ moles of B were formed on absorption of 6.624 Joules at 360 nm. Calculate the quantum efficiency. Given $N = 6.022\times10^{23}, h = 6.626\times10^{-34} Js, c = 3\times10^{8} m/s$ 03

7. a) What is a concentration cell? How is it used to determine the valency of an ion. 04

   b) Describe photo sensitization with an example. 03

   c) Explain the principle of a nuclear reactor. 03

UNIT-III

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

8. a) What are Woodward Fieser rule? What is their importance. 04

   b) Give the mechanism of electrophilic substitution reaction in pyridine. 03

   c) Describe the mass spectrum of methane. 03

9. a) With the help of molecular orbital picture explain the aromatic character of furan. 04

   b) Explain IR spectrum of acetaldehyde. 03

   c) What are the different steps in analyzing an NMR spectrum. 03

10. a) Give any two general methods of synthesis of Indole. 04

    b) Describe the NMR spectrum of bromoethane. 03

    c) Explain the term Bathochromic shift, hypsochromic shift and hyper chromic shift. 03

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CHE 602.3 Reg. No. ....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

CHEMISTRY

ELECTIVE PAPER I: ANALYTICAL AND INDUSTRIAL CHEMISTRY

Duration: 3 hours **Max Marks: 80**

Note: **1. Write question numbers and subdivisions clearly.**
2. Write chemical equations and diagrams wherever necessary.

PART A

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

a) How many significant figures are there in
(i) 6.023×10^{23} (ii) 0.02670

b) What are the indicators used in the titration of strong acid vs strong base and weak acid vs strong base

c) Explain the significance of R_f value.

d) Write the expression for Beer-Lamberts Law.

e) The Ellingham diagram of carbon giving carbon dioxide is horizontal. Why?

f) What is froth floatation process?

g) Explain electrolytic refining of gold.

h) How is butadiene prepared from n-butane?

i) What is homogenization of milk and its advantage?

j) What are food preservatives? Give an example.

k) Why is soap stone added during the preparation of CAN?

l) What is COD? Mention its significance.

PART-B

UNIT-I

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

2. a) Write a note on determinate errors and how it can be minimized? 03

b) Write a note on organic precipitating agents in gravimetric analysis. 03

c) What is the difference between TGA and DTA? 04

3. a) Calculate the standard deviation for an element whose percentage in a sample has been calculated as follows
(i) 26.8% (ii) 27.6% (iii) 28.1% (iv) 28.0% (v) 29.2% 03

b) Explain electrogravimetry. 03

c) Write a note on gas-liquid chromatography. 04

4. a) Explain complexometric titrations. 04

b) Write any three applications of AAS. 03

c) What is the difference between absolute and relative error? 03

UNIT-II

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

5.	a)	What is electro chemical series? Explain its importance.	03
	b)	Explain desilverisation of lead by Parke's process.	03
	c)	Explain the synthesis of vinyl chloride from C-2 petrochemicals.	04
6.	a)	What is Ellingham diagram? How it is useful in explaining carbon as the reducing agent in the metallurgy of Iron.	03
	b)	Explain Baeyer's method for purification of Aluminium.	03
	c)	How is acrylonitrile manufactured from propene?	04
7.	a)	Using redox potential data explain why oxygen is necessary in the cyanide process of extraction of silver.	03
	b)	Explain Bett's process for refining lead.	03
	c)	Explain the synthesis of acetone from C-3 petrochemicals.	04

UNIT-III

Answer any TWO of the following. 2x10=20

8.	a)	Write a note on sweeteners.	04
	b)	What is BHC? How is it prepared?	03
	c)	What are the industrial sources of water pollution?	03
9.	a)	What is the role of magnesium and calcium as a nutrient?	03
	b)	How are the adulterants present in ghee detected.	03
	c)	What is BOD? How it is determined?	04
10.	a)	What is (a) PFA Act (b) AGMARK Standard	03
	b)	Explain the manufacture of (i) Parathion (ii) Urea	03
	c)	Explain the primary treatment process and the sewage water treatment.	04

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MAT 602.3 Reg. No. ....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2017

MATHEMATICS

PAPER VIII: GRAPH 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.

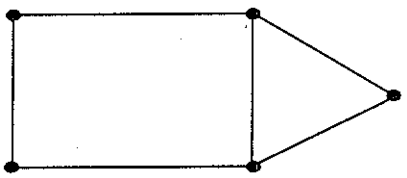
PART A 3x10=30

1. a) Prove that the maximum number of edges in a simple graph is $\frac{n(n-1)}{2}$

b) Derive an expression for number of pendent vertices in a binary tree of n vertices.

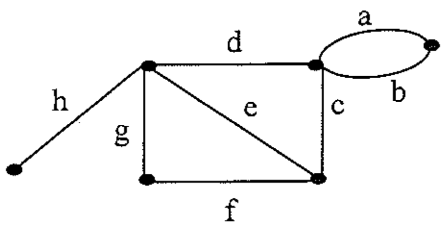
c) Find the nullity of a connected graph G with 15 edges and 10 vertices.

d) Write the vertex connectivity and edge connectivity of the graph.



e) In a simple planar graph, with f regions, n vertices and e edges prove that $e \geq \frac{3}{2}f$

f) List any 3 fundamental cutsets of the following graph with respect to the spanning tree {b, c, e, g, h}



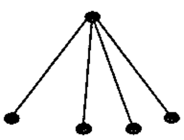
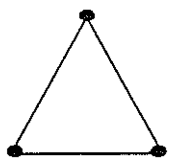
g) Draw the graph whose adjacency matrix is

$$\begin{array}{c} \\ v_1 \\ v_2 \\ v_3 \\ v_4 \end{array} \begin{array}{c} \begin{array}{cccc} v_1 & v_2 & v_3 & v_4 \end{array} \\ \begin{pmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{pmatrix} \end{array}$$

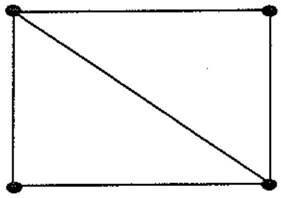
h) Define path matrix for the vertex pair (x, y) of a graph G

i) Write a basis for the vector space of a graph G having exactly 4 edges e_1, e_2, e_3 and e_4.

j) Write the chromatic number of the following graphs.

i)  ii) 

k) Write chromatic polynomial of the following graph.



l) Define arborescence and give an example.

m) Draw an Euler digraph.

n) Define the term 'Properly colouring' in a graph.

o) Define symmetric digraph. Give an example.

PART - B

UNIT-I

2. a) Prove that a given connected graph is an Euler graph if and only if all vertices are of even degree. (6)

   b) Prove that a tree with n vertices has $n-1$ edges. (6)

   c) Prove that a connected graph has at least one spanning tree. (6)

3. a) Define distance between 2 vertices in a graph and show that distance between the vertices in a connected graph is a metric. (6)

   b) Show that the graph is a tree if and only if it is minimally connected. (6)

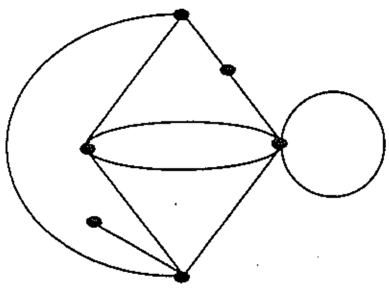
   c) Prove that the number of vertices of odd degree in a graph is always even. (6)

UNIT-II

4. a) With respect to a given spanning tree T, prove that a branch b_i that determines a fundamental cutset S is contained in every fundamental circuit associated with the chords in S and in no other. (6)

   b) Prove that a regular graph of six vertices $K_{3,3}$ is non planar. (6)

   c) Draw the geometrical dual of the following graph. (6)



5. a) If n, e, f, r and μ denote the number of vertices, edges, regions, rank and nullity of a connected planar graph G and if n^*, e^*, f^*, r^* and μ^* are the corresponding numbers in the dual graph G^*, then prove that $n^* = f$, $e^* = e$. (6)

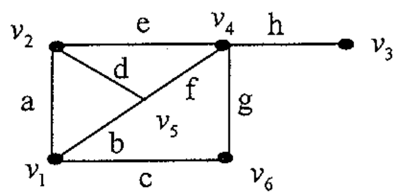
b) Prove that a connected planar graph with n vertices and e edges has $e - n + 2$ regions. (6)

c) Prove that the graph K_5 has no dual. (6)

UNIT-III

6\. a) Prove that ring sum of two circuits in a graph G is either a circuit or an edge disjoint union of circuits. (6)

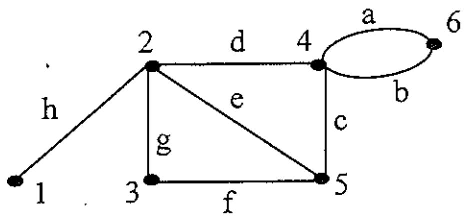
b) Write the adjacency matrix of the following graph (6)



c) Prove that the rank of the circuit matrix of a connected graph with n vertices and e edges is $e - n + 1$ (6)

7\. a) Show that in a vector space of a graph the circuit subspace W_Γ and the cutset subspace W_S are orthogonal to each other. (6)

b) Write a path matrix of the following graph (6)



c) If A(G) is the incident matrix of a connected graph G with n vertices, show that rank of A(G) $= n - 1$ (6)

UNIT-IV

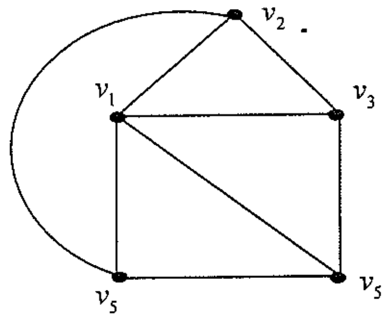
8\. a) Prove that a graph with at least one edge is 2-chromatic if and only if it has no circuit of odd length. (6)

b) Prove that if a graph with n vertices is a tree then its chromatic polynomial is $P_n(\lambda) = \lambda(\lambda - 1)^{n-1}$. (6)

c) Prove that a graph with n vertices is a complete graph if and only if its chromatic polynomial is $P_n(\lambda) = \lambda(\lambda-1)(\lambda-2)........(\lambda-n+1)$. (6)

9. a) Let a and b be two non adjacent vertices in a graph G. Let G' be a graph obtained by adding an edge between a and b. Let G'' be the simple graph obtained from G by fusing the vertices a and b together and replacing sets of parallel edges with a single edge. Prove that $P_n(\lambda)$ of $G = P_n(\lambda)$ of $G' + P_{n-1}(\lambda)$ of G''. **(6)**

b) Find the chromatics polynomial of the following graph. **(6)**

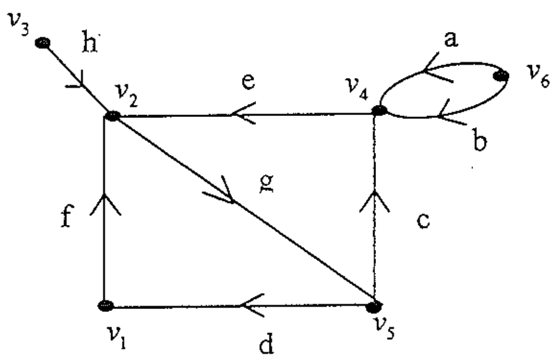


c) Prove that every tree with two or more vertices is 2 – chromatic. **(6)**

UNIT-V

10. a) Prove that a digraph G is an Euler digraph if an only if it is connected and balanced. **(6)**

b) Write the incidence matrix of the following digraph. **(6)**



c) Show that determinant of every square submatrix of the incidence matrix of a digraph is 1, – 1, or 0. **(6)**

11. a) Prove that arborescence is a tree in which every vertex other than the root has an in-degree of exactly one. **(6)**

b) Explain the method of construction of directed Euler line in an Euler digraph G. **(6)**

c) Let A_f be the reduced incidence matrix of a connected digraph. Then prove that the number of spanning trees in the graph equals the value of $\det(A_f \cdot A_f^T)$. **(6)**

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MAT 602.2 Reg. No. ....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

MATHEMATICS

PAPER VIII: NUMERICAL METHODS

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) Round off the number 2.3285 and 4.3075 correct to 3 decimal places.

b) If E_a and E_b are the errors in a and b respectively, find the error in the product ab.

c) i) What must be the sign of $f(a)\cdot f(b)$ if a root of $f(x)=0$ lies in $a \le x \le b$.

ii) Write the formula for finding the root using the method of false position.

d) Derive a formula for $\Delta^3 y_0$ in terms of y_0, y_1, y_2, y_3.

e) Evaluate $\Delta^2 2^x$ with $h=1$.

f) i) What is the degree of the interpolating polynomial which interpolates a given function at 6 distinct points.

ii) Write the error formula in polynomial interpolation.

g) i) Write the formula for divided difference $[x_1, x_2, x_3, x_4]$

ii) What is the bound for the error in Trapezoidal rule to evaluate $\int_a^b f(x)\, dx$?

h) i) Write the Newton's forward difference formula to find $\frac{dy}{dx}$ at $x = x_0$.

ii) Write Simpson's $\frac{3^{th}}{8}$ rule for $\int_a^b f(x)\, dx$

i) Evaluate $\int_0^1 \frac{1}{1+x}\, dx$ by trapezoidal rule taking $h = 0.5$.

j) Find the row norm of the matrix $\begin{bmatrix} 5 & -2 & 4 \\ -2 & 1 & 3 \\ 1 & 0 & -1 \end{bmatrix}$

k) i) What is the rank of the matrix $\begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$?

ii) Which method is also known as method of successive displacement?

l) i) When do we say that the system AX = B is inconsistent?

ii) Under what condition Gauss-Seidel method converges?

m) If $y' = x + y,\ y(0) = 0$ find $y(0.2)$ using Euler's method with $h = 0.2$

n) Write n^{th} approximation in Picard's method to the solution of

$$\frac{dy}{dx} = f(x, y), \; y(x_0) = y_0$$

o) i) Write Adam's Bashforth predictor formula.

ii) What is the value of k_2 in Runge-Kutta second order formula $y_1 = y_0 + \frac{1}{2}[k_1 + k_2]$?

PART - B
UNIT-I

2. a) Using the method of bisection find a real root of the equation $x^3 - 4x - 9 = 0$, correct to 3 decimal places. **(6)**

b) Explain the method of false position to find the root of the equation f(x)=0. **(6)**

c) Using the method of iteration find the root of the equation $2x = \cos x + 3$ correct to 3 decimal places. $\left[Take\ x_0 = \pi/2\right]$ **(6**

3. a) Find the real root of the equation $f(x) = x^3 - 2x - 5 = 0$ using the method of false position correct to 2 decimal places. **(6)**

b) Using Newton-Raphson method obtain the real root correct to 3 decimal places of the equation $x^3 + 5x + 1 = 0$ **(6)**

c) Using the generalized Newton's formula find the double root of the equation $x^3 - x^2 - x + 1 = 0$ (choose $x_0 = 0.8$). **(6)**

UNIT-II

4. a) Derive Newton's forward difference formula for interpolation. **(6)**

b) Estimate the population for the year 1895 using following data and using Newton's forward difference formula. **(6,**

Year	1891	1901	1911	1921	1931
Population in thousands	46	66	81	93	101

c) Using Lagrange's interpolation formula resolve into partial fractions

$$\frac{3x^2 + x + 1}{(x-1)(x-2)(x-3)}$$ **(6)**

5. a) From the following table, find the number of students who obtained less than 45 marks. **(6)**

Marks	30-40	40-50	50-60	60-70	70-80
No. of Students	31	42	51	35	31

b) Using Lagrange's interpolation formula, find the form of the function $y(x)$ from the following table. **(6)**

x	0	1	3	4
y	-12	0	12	24

c) Find the value of $\tan(0.40)$ using Newton's Backward difference formula from the following data. **(6)**

x	0.10	0.15	0.20	0.25	0.30
$y = \tan x$	0.1003	0.1511	0.2027	0.2553	0.3093

UNIT-III

6. a) Given the set of tabulated points $(1,-3), (3,9), (4,30)$ and $(6,132)$. Obtain the value of y when $x = 2$ using Newton's divided difference formula. **(6)**

b) From the following table of values of x and y, obtain $\frac{dy}{dx}$ for $x = 1.2$ **(6)**

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

c) The velocities of a car (running on a straight road) at intervals of 2 minutes are given below. **(6)**

Time in Minutes	0	2	4	6	8	10	12
Velocity in Km/hr	0	22	30	27	18	7	0

Using Simpson's rule, find the distance covered by the car.

7. a) Derive trapezoidal rule to evaluate $\int_a^b f(x)dx$ **(6)**

b) Evaluate $\int_0^1 \frac{1}{1+x}dx$ correct to 3 decimal places, using Simpson's $\frac{1}{3}$ rule with 8 equal subintervals. **(6)**

c) Find $\frac{d^2y}{dx^2}$ at $x = 1$ for the following data. **(6)**

x	0	1	2	3	4	5	6
y	6.9897	7.4036	7.7815	8.1291	8.4510	8.7506	9.0309

UNIT-IV

8. a) Find whether the following system is consistent or not.

$$5x-3y+7z=4$$
$$3x+26y+2z=9$$
$$7x+2y+10z=5$$
(9)

b) Using Gauss-Seidel method solve the system.

$$10x_1-2x_2-x_3-x_4=3$$
$$-2x_1+10x_2-x_3-x_4=15$$
$$-x_1-x_2+10x_3-2x_4=27$$
$$-x_1-x_2-2x_3+10x_4=-9$$
Carry out 2 iterations. (9)

9. a) Solve the system of equations by Gauss Elimination method

$$2x+4y+z=3$$
$$3x+2y-2z=-2$$
$$x-y+z=6$$
(6)

b) Explain Jacob's method to solve a system of linear equations in n unknowns. (6)

c) Express the matrix $\begin{pmatrix} 3 & 9 & 10 \\ 8 & 4 & 11 \\ 7 & 6 & 5 \end{pmatrix}$ as a sum of symmetric and skew symmetric matrix. (6)

UNIT-V

10. a) Given $\frac{dy}{dx}-1=xy$, with $y(0)=1$, obtain Taylor series expansion for $y(x)$ and find $y(0.1)$ correct to 4 decimal places. (6)

b) Using Euler's method find $y=(0.4)$ for the differential equation $\frac{dy}{dx}=x+y,\ y(0)=0$, (take $h=0.2$) (6)

c) Given $\frac{dy}{dx}=1+y^2,\ y(0)=0,\ y(0.2)=0.2027,\quad y(0.4)=0.4228,\quad y=(0.6)=0.6841$. Compute $y(0.8)$ by using Adams-Bashforth predictor formula. (6)

11. a) Using modified Euler's formula, estimate $y(0.1)$. If $y'=x^2+y,\ y(0)=1$. Take $h = 0.1$ (6)

b) Solve the equation $10\frac{dy}{dx}=x^2+y^2,\quad y(0)=1$ find $y(0.1)$ with $h = 0.1$ by 4^{th} order Runge Kutta formula. (6)

c) Derive Adam Moulton corrector formula. (6)

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MAT 601.1 Reg. No. ....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

MATHEMATICS

PAPER VII: PARTIAL DIFFERNTIAL EQUATIONS, VECTOR SPACES AND SERIES

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) Verify the condition of integrability of the differential equation $(y+z)dx+(z-x)dy=(x+y)dz$

b) Assuming the condition of integrability, solve $(yz+xyz)dx+(zx+xyz)dy+(xy+xyz)dz=0$

c) Solve $q(p-\sin x)=\cos y$

d) If V is a vector space over a field F then prove that for $\alpha \in F$ and $v \in V$ if $v \neq 0$ and $\alpha v=0$ then $\alpha=0$.

e) If F is the field of real numbers, prove that the vectors (1, 1, 0, 0), (0, 1, -1, 0) and (0, 0, 0, 3) in F^4 are linearly independent over F.

f) If S is a non empty subset of a vector space V over a field F then prove that L(S), the linear span of S is a subspace of V.

g) Prove that product of two linear transformations is linear.

h) Find the matrix which represents linear transformation T, defined by $(x,y)=(x+y,2x-y)$

i) Find an eigen vector of the matrix A = $\begin{pmatrix} 5 & 4 \\ 1 & 2 \end{pmatrix}$

j) Prove that the series $\sum_{n=1}^{\infty}\frac{n^2+1}{n^2}$ is divergent.

k) Determine whether the sequence $\left\{\frac{3-2n^2}{n^2-1}\right\}$ is convergent or divergent.

l) Test for the convergence of the series $\sum_{n=1}^{\infty}\frac{4}{3^n+1}$.

m) Find whether the series $\sum_{n=1}^{\infty}\frac{n^2}{n!}$ is convergent of divergent.

n) Prove that the alternating series $\sum_{n=1}^{\infty}(-1)^{n+1}\frac{1}{n}$ is convergent.

o) Use the root test to determine if the series $\sum_{n=1}^{\infty}(-1)^n\frac{3^{2n+1}}{n^{2n}}$ is convergent or divergent.

PART - B

UNIT-I

2. a) Assuming the condition of integrability solve
$(y^2+yz)dx+(xz+z^2)dy+(y^2-xy)dz=0$ (6)

b) Solve using Lagrange's method $(a-x)p+(b-y)q=c-z$ (6)

c) Solve $p(1+q^2)=q(z-1)$ (6)

3. a) Assuming the condition of integrability solve
$(2xz-yz)dx+(2yz-zx)dy-(x^2-xy+y^2)dz=0$ (6)

b) Eliminate the arbitrary function from $z=f\left(\frac{xy}{z}\right)$ (6)

c) Solve $q=xp+p^2$ (6)

UNIT-II

4. a) If V is a vector space over a field F and $v_1, v_2, ..., v_n$ are non zero vectors in V then prove that either they are linearly independent or some v_k is a linear combination of the preceding ones $v_1, v_2, ..., v_{k-1}$ (6)

b) If $v_1, v_2, ..., v_n$ is a basis of V over F and $w_1, w_2 ..... w_m$ in V are linearly independent over F then prove that $m \le n$. (6)

c) If V is an inner product space over F then for any $u, v \varepsilon V$, prove that $|(u,v)| \le \|u\| \; \|v\|$ (6)

5. a) If V is a finite dimensional vector space over a field F and W is a subspace of V then prove that W is finite dimensional and $\dim W \le \dim V$. (6)

b) Prove that any orthonormal set of vectors in an inner product space V over F is linearly independent. (6)

c) Prove that the set $S=\{(3,-6),(4,3)\}$ forms a basis in R^2. Using Gram-Schmidt orthogonalisation process find an orthonormal basis for R^2 from S. (6)

UNIT-III

6. a) Prove that a linear transformation T of a vector space V with finite basis $\alpha_1, \alpha_2, ... \alpha_m$ is non singular if and only if the vectors $\alpha_1 T, \alpha_2 T, ... \alpha_m T$ are linearly independent in V. (6)

b) Find the inverse of the matrix $\begin{pmatrix} 0 & 1 & 2 \\ 1 & 0 & 2 \\ 1 & 2 & 0 \end{pmatrix}$ using elementary row operations. (6)

c) If V is a finite dimensional vector space, and $T: V \to W$ is any linear transformation, then prove that rank T + nullity T = dim V. (6)

7. a) Express $\begin{pmatrix} 3 & 6 \\ 2 & 1 \end{pmatrix}$ as a product of elementary matrices. (6)

b) Define Null space and Range of a linear transformation $T: V \to W$. Prove that they are subspaces. (6)

c) Prove that there is a one to one correspondence between the linear transformations $T: V_m(F) \to V_n(F)$ and the mxn matrices with entries in the field F. (6)

UNIT-IV

8. a) Prove that a bounded monotonic sequence is convergent. (6)

b) Prove that if $\sum_{n=1}^{\infty} u_n$ is convergent, then $\lim_{n\to\infty} u_n = 0$. Is the converse true? Justify your answer. (6)

c) Prove that the sequence $\left\{ \frac{n^2}{(2n+1)} \sin \frac{\pi}{n} \right\}$ is convergent. (6)

9. a) Using $\varepsilon - \delta$ definition of limit prove that the sequence $\left\{ \frac{n}{2n+1} \right\}$ has limit $\frac{1}{2}$. (6)

b) Prove that a convergent monotonic sequence is bounded. (6)

c) Determine whether the infinite series $\sum_{n=1}^{\infty} u_n = \sum_{n=1}^{\infty} \frac{1}{n(n+1)}$ is convergent or divergent. (6)

UNIT-V

10. a) If $\sum_{n=1}^{\infty} v_n$ is a series of positive terms that is known to be convergent and $u_n \le v_n$ for all positive integers n, then prove that $\sum_{n=1}^{\infty} u_n$ is convergent. (6)

b) Determine if the series $\sum_{n=1}^{\infty} (-1)^n \frac{n!}{2^{n+1}}$ is convergent of divergent. (6)

c) Using root test find if the series $\sum_{n=1}^{\infty} \frac{1}{[\log(n+1)]^n}$ is convergent of divergent. (6)

P.T.O.

11. a) Determine whether the following series are convergent or divergent.

i) $\sum_{n=2}^{\infty} \frac{1}{n\sqrt{\ln n}}$ ii) $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}}$ iii) $\sum_{n=1}^{\infty} \frac{1}{(n^2+2)^{1/3}}$ (9)

b) Show that the series $\sum_{n=1}^{\infty} (-1)^{n+1} a_n$ where $a_n > 0$ is convergent if $a_{n+1} < a_n$ and $\lim_{n\to\infty} a_n = 0$ (9)

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PHY 602.3 Reg No.................................

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

PHYSICS

PAPER VII: NUCLEAR PHYSICS

Duration: 3 Hours **Max Marks: 80**

PART –A

1. (A) Answer any TEN of the following. **10 X 1 = 10**

i) Who discovered Neutron?
ii) How many kgms makes one a.m.u?
iii) Which nuclei are highly unstable and radioactive?
iv) What are magic numbers?
v) State radioactive decay law.
vi) What is range of α-particle?
vii) How does the radioactivity of a given sample vary with temperature?
viii) What are trans-uranic elements?
ix) Why the length of drift tube in LINAC gradually increased?
x) Discuss the limitations of a cyclotron.
xi) What is annihilation of matter?
xii) Distinguish between Leptons and Hadrons.

(B) Answer any FIVE of the following. **5 X 2 = 10**

i) Show that nuclear density is a constant.
ii) What is a magnetic bottle? Where is it used?
iii) Why Neptunium series is not found in nature?
iv) Give one example each for (d, α) and (d, p) reactions.
v) What are the differences between Cyclotron and Betatron?
vi) Name the three original quarks proposed in quark model.

PART-B

UNIT-I

Answer any TWO of the following: **2 X 10 = 20**

2. (a) Explain the terms mass defect, binding energy and binding energy per nucleon. Also discuss graphically the variation of average binding energy per nucleon with mass number.

(b) For a nuclear fusion reaction, ${}_1H^2 + {}_1H^2 \rightarrow {}_2He^4$ in a nuclear reactor of 2000MW rating, there is no loss of energy. How many gms of deuterium will be needed per day? Given : Mass of ${}_1H^2$ = 2.0141a.m.u.

Mass of ${}_2He^4$ = 4.0026 a.m.u. **(6+4)**

3. (a) With a neat diagram explain the working of a nuclear reactor.

(b) A city requires 100MW of electrical power per day which is supplied by a reactor of efficiency 40%. Calculate the amount of ${}_{92}U^{235}$ fuel required per day. Given: Energy released per fission of ${}_{92}U^{235}$ is 200 MeV. **(6+4)**

4. (a) Obtain the expression for nuclear mass of a nucleus based on liquid drop model.

(b) The atomic mass of ${}_{10}Ne^{20}$ isotope is 19.992 a.m.u. Calculate its binding energy with the prediction of liquid drop model. Given the set of coefficients: a_v=14.1 MeV, a_s= 13.0 MeV, a_c= 0.595 MeV, a_a=19.0MeV, a_p=33.5 MeV. **(6+4)**

UNIT-II

Answer any <u>TWO</u> of the following. **10 X 2=20**

5. (a) What is radio-active equilibrium ? Deduce the condition for secular equilibrium and transient equilibrium.

   (b) What is the velocity and range of $\alpha -$ particles of 5MeV in $_{13}Al^{27}$

   Given: b = 9.416 X 10^{-28} **(6+4)**

6. (a) Derive an expression for the number of daughter atoms present in a radioactive substance at any instance during successive disintegration.

   (b) A carbon specimen found in a cave contained $\frac{1}{8}$ as much C^{14} as an equal amount of carbon in living matter. Calculate the approximate age of the specimen. Given: Half life of C^{14} is 5568 years. **(6+4)**

7. (a) Explain Rutherford's experiment on first artificial transmutation of elements.

   (b. To produce the reaction N^{14} (α, p) O^{17}, α -particle of energy 1.043 MeV are used. Will the reaction occur? If not, what should be the minimum energy of the incident α -particle for the reaction to occur?

   Given: the atomic mass of Nitrogen =14.00324 a.m.u, Oxygen = 16.9913 a.m.u $_2He^4$ = 4.00260 a.m.u and proton = 1.00783 a.m.u. **(6+4)**

UNIT-III

Answer any <u>TWO</u> of the following. **10 X 2 = 20**

8. (a) Describe with diagram the working of a GM counter and explain its characteristics. Comment on the quenching action of a GM tube.

   (b) A linear accelerator for the accelerating of protons to 45.3 MeV is designed so that between any pair of accelerating gaps, the protons spend one complete radio-frequency cycle inside a drift tube. The radio frequency used is 200 MHz i) what is the length of the final drift tube? ii) If the first drift tube is 5.35 cm long, at what K.E are the protons injected into the linac? Iii) If the peak accelerating potential is 1.49x10^6 volts, calculate the total length of the accelerator. **(6+4)**

9. (a) Deduce the expression for the energy of the particle and length of cylinder in terms of the constants of linear accelerator.

   (b) In a certain Betatron, the maximum Magnetic field at orbit was 0.4T, operating at 50Hz with a stable orbit diameter of 1.524 m. Calculate the average energy gained per revolution and the final energy of the electrons.

   (6+4)

10. (a) What are fundamental particles? Explain the classification of fundamental particles with respect to mass, spin and interaction.

    (b) Deuterons in a cyclotron describe a circle of radius 0.32m just before emerging from the dees. The frequency of the applied e.m-f is 10MHz. Find the flux density of the magnetic field and the velocity of deuterons emerging out the cyclotron. Given: Mass of deuterium =3.32 X 10^{-27} kg, e = 1.6 X 10^{-19} C.

    (6+4)

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STA 602.2 Reg. No. ....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

STATISTICS – VIII

STATISTICAL QUALITY CONTROL

Time: 3 Hrs **Max. Marks: 80**

PART - A

Answer any TEN of the following: **2X10=20**

1. a) What is Statistical Quality Control?
   b) With an example, explain quality taken as a variable in SQC.
   c) What are the assignable causes of variation in quantity?
   d) What are 3σ limits?
   e) Derive the control limits for *np* chart when standards known.
   f) What is product control?
   g) What is AQL?
   h) Define producer's risk.
   i) Define AOQL.
   j) Mention a use of acceptance sampling plan.
   k) Define a defective.
   l) Define reliability.

PART – B

Answer any TWO of the following: **10x2=20**

2. a) What are the advantages of SQC?
   b) What are control charts with and without standards? (5+5)

3. a) Explain the need for rational subgroups. What are the criteria behind the selection of rational subgroups?
   b) What action do you suggest when the specification limits lie outside the control limits. (5+5)

4. a) What are the criteria of lack of control with respect to control chart for variables?
   b) Derive the control limits of $\overline{x}-\sigma$ charts. (5+5)

Answer any TWO of the following: **10x2=20**

5. a) Make a comparative study of charts for variables and charts for attributes.
   b) Derive the control limits of $\overline{x}-R$ charts. (5+5)

6. a) Stating the assumptions, derive the control limits for C-chart.

   b) Outline the steps in the construction and the analysis of a p-chart. **(5+5)**

7. a) Derive the control limits for U-chart stating the assumptions.

   b) Compare the chart for fraction defectives and chart for number of defectives. When do you prefer *np*-chart? **(5+5)**

Answer any TWO of the following: **10x2=20**

8. a) Derive the expression for OC function of SSP by attributes.

   b) Describe double sampling plan for attributes. **(5+5)**

9. a) State the advantages of SSP over DSP.

   b) Construct a SSP for variables with a simple specification U, given AQL, PR, LTPD and CR (σ unknown). **(5+5)**

10. a) Explain minimal path and hazard function.

   b) Derive an expression for the reliability of the system when the components are connected in series and in parallel. **(5+5)**

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ZOO 601.1 Reg. No. ....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

ZOOLOGY

GENETICS, EVOLUTION AND PALAENTOLOGY

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 <u>TEN</u> of the following: 10x2=20

1. What is homozygous condition? Give one example.
2. Define incomplete domaince.
3. What is Erythroblastosis foetalis?
4. Mention any two significant features of crossing over.
5. What is an intersex? Give an example.
6. What is colorblindness? How is it caused?
7. Define Eugenics. Name its two types.
8. What are phenocopies? Give an example.
9. Explain the term homology.
10. Define genetic drift.
11. Explain use and disuse theory.
12. Name the two orders of Dinosaurs with an example for each.

PART-B

UNIT-I

II. a) What is dominant epistasis? Explain the phenomenon with reference to plumage color in fowls.. 07

b) Write a short note on heredity and variation. 03

III. a) What is Linkage? Explain incomplete linkage in Drosophila. 07

b) Explain the genetics of ABO blood groups. 03

IV. a) What is polygenic inheritance? Explain with reference to skin color in man. 05

b) Explain the law of segregation with a suitable example 05

UNIT-II

V. a) Write an essay on Lac-Operon concept. 07

b) Write a note on chorionic villus sampling. 03

VI.	a)	Write an essay on common human syndromes.	07
	b)	Write a note on Holandric genes.	03
VII.	a)	Write short note on the effect of environment on sex determination with an example.	05
	b)	Explain Sex linkage in Poultry.	05

UNIT-III

VIII.	a)	What is Darwinism? Explain the postulates with suitable examples.	07
	b)	Explain sympatric speciation with examples.	03
IX.	a)	Give an account of evidences of organic evolution from comparative physiology and biochemistry.	07
	b)	Write explanatory notes on Hyracotherium.	03
X.	a)	Explain Hardy-Weinberg Law.	05
	b)	Give a brief account of Archaeopteryx.	05

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MIC 601.1 Reg. No. ....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

MICROBIOLOGY

FOOD, DAIRY AND INDUSTRIAL MICROBIOLOGY

Duration: 3 Hours **Max Marks: 80**

Note: Draw diagrams wherever necessary.

PART A

I. Answer any TEN of the following: **2x10=20**

a) Acidophilus Milk
b) Vibrio cholerae
c) MBRT
d) Viable count
e) Baffles
f) DMC
g) Turbidity Test
h) CSL
i) Osmotic Pressure
j) Bioreactor
k) Strain Development.
l) Synthetic Media.

PART-B

UNIT-I

Answer any TWO complete questions of the following: **2x10=20**

II.	a)	Discuss food poisoning by Staphylococcus aureus.	06
	b)	Write a note on Idli and Pickles.	04
III.	a)	Discuss preservation of food by using chemicals.	06
	b)	Write a note on Shigellosis.	04
IV.	a)	Explain in detail Botulism.	06
	b)	Discuss the standards and criteria for food quality control.	04

UNIT-II

Answer any TWO complete questions of the following: **2x10=20**

V.	a)	Discuss the Microflora of Milk.	06
	b)	Write a note on souring and gassy fermentation.	04
VI.	a)	Discuss Pasteurization of Milk.	06
	b)	Write a note on Cheese and Butter Milk.	04
VII.	a)	Discuss Resazurin test and Phosphatase test for Milk	06
	b)	Write a note on stormy fermentation and pigment production in milk.	04

UNIT-III

Answer any TWO complete questions of the following: **2x10=20**

VIII.	a)	Discuss the industrial production of Vinegar.	06
	b)	Write a note on Molasses and Sulphite Waste Liquor.	04
IX.	a)	Discuss the industrial production of Ethanol.	06
	b)	Write briefly on the component parts of an ideal fermenter.	04
X.	a)	Discuss the industrial production of Penicillin.	06
	b)	Write a note on Media sterilization in industry.	04

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MIC 602.5 Reg. No. ....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

MICROBIOLOGY

Bacterial Genetics

Duration: 3 Hours **Max Marks: 80**

Note: Draw diagrams wherever necessary.

PART A

I. Answer any TEN of the following: **2x10=20**

a) Mutants
b) Complementary base pairing
c) Super Bug
d) Genotype
e) Cloning
f) Codon
g) Recombinant DNA
h) Translation
i) Cosmids
j) Spontaneous Mutation
k) mRNA
l) Inversion

PART-B

UNIT-I

Answer any TWO complete questions of the following: **2x10=20**

II. a) Explain the process of Transformation in Prokaryotes. 06
b) Write a note on t RNA. 04

III. a) Explain the Lac Operon concept. 06
b) Write a note on Genetic code. 04

IV. a) Explain the process of DNA replication. 06
b) Write a note on Watson and crick model of DNA. 04

UNIT-II

Answer any TWO complete questions of the following: **2x10=20**

V. a) Explain the Isolation of Biochemical mutants by replica plating technique. 06
b) Write a note on Mutations caused by physical agents. 04

VI. a) Explain the types of Mutation based on genotypic changes causing macrolesions. 06
b) Write a note on DNA repair. 04

VII. a) Explain the types of mutation based on chemical agents. 06
b) Write a note on microlesions due to base pair substitution. 04

UNIT-III

Answer any TWO complete questions of the following: **2x10=20**

VIII. a) Explain the potential hazards and safeguards of genetic engineering. 06
b) Write a note on hosts used for cloning. 04

IX. a) Explain the Shot-Gun method for DNA isolation. 06
b) Write a note on transgenic plants. 04

X. a) Explain the cloning vectors. 06
b) Explain the types and uses of restriction enzymes. 04

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PHY 601.1 Reg. No. ....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION . APRIL 2017
PHYSICS
PAPER – VII: ELECTRONICS

Time: 3 Hrs. **Max. Marks: 80**

PART – A

I. A. Answer any TEN of the following: **10×1=10**

i. What is meant by ripple factor?
ii. In which region the transistor is operated, when it acts as an amplifier?
iii. Expand MOSFET.
iv. Why a transistor is current controlled device?
v. What is a ac load line?
vi. What is an oscillator?
vii. Define input offset voltage.
viii. On what factors does the voltage gain of an amplifier depend?
ix. What is a logic gate?
x. What is the need for modulation?
xi. What is a shift register?
xii. Write any two applications of CRO.

B. Answer any FIVE of the following: **5×2=10**

i) Write any two differences between JEET and MOSFET.
ii) Describe the action of a π filter.
iii) Write any four ideal characteristic of OP-AMP.
iv) Distinguish between positive and negative feedback.
v) Construct a AND gate using NAND gate.
vi) What is progressive scanning and interlaced scanning?

PART – B

UNIT - I

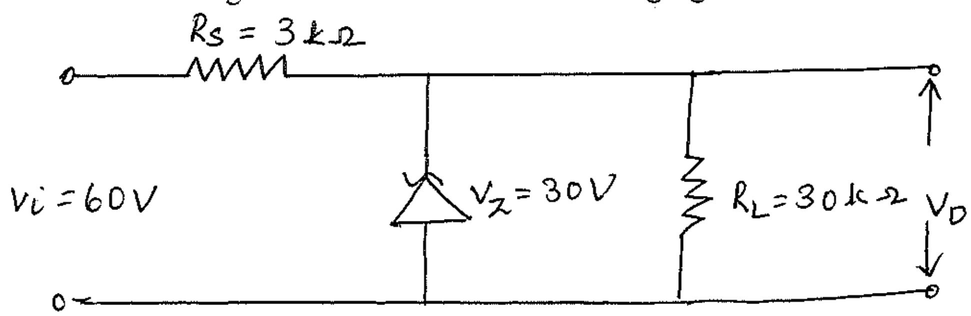
Answer any TWO of the following: **2×10=20**

2. a) Describe voltage divider biasing method for a transistor with suitable diagram and explain how stabilization of operating point is achieved.
   b) A bridge rectifier has transformer secondary voltage of $V_s = 100 \sin \omega t$ volt. It supplies power to a load of resistance 500Ω. $r_f = 20\Omega$

   Calculate:- i) dc output voltage ii) percentage efficiency **(6+4)**

3. a) With a neat diagram, explain the working of a bridge rectifier.
   b) Determine the value of collector current and collector to emitter voltage for the voltage divider bias circuit.
   Given:- $V_{BE} = 0.7V$, $\beta = 100$, $V_{CC} = 10V$, $R_1 = 10k\Omega$, $R_2 = 5k\Omega$,
   $R_C = 1\Omega$, $R_E = 500\Omega$, **(6+4)**

4. a) Explain the working of n-channel JFET. Draw the necessary structural diagram.
   b) Find the current through a zener diode for the following figure.



(6+4)

UNIT – II

Answer any TWO of the following: **2×10=20**

5. a) What is meant by feedback in amplifiers? Why is it needed? Derive an expression for the gain in a feedback amplifier in terms of feedback fraction.
   b) For a transistor amplifier $R_1 = 10k\Omega$, $R_2 = 5k\Omega$, $R_C = 1k\Omega$, $R_E = 2k\Omega$, $R_L = 1k\Omega$, $V_{CC} = 15V$, $V_{BE} = 0.7V$
      i) Draw dc load line ii) determine the operating point
      ii) Draw ac load line **(6+4)**

6. a) Explain the frequency response of an amplifier in CE mode. Explain briefly the effect of various capacitors at low frequency range.
   b) For a non-inverting amplifier with $R_1 = 1k\Omega$ and $R_f = 7k\Omega$. Calculate output voltage if input is 0.25 volt. What will be the output voltage if input is doubled. **(6+4)**

7. a) What is meant by inverting amplifier? How OP-AMP can be used as inverting amplifier. Derive expression for its voltage gain and mention the values of input and output resistances.
   b) In a Wien's bridge oscillator with resistance of 5kΩ and capacitance of 0.02μF, calculate the frequency of oscillation. What will be the value of frequency if both R and C values doubled. **(6+4)**

UNIT – III

Answer any TWO of the following: **2×10=20**

8. a) What is sum of products? Explain how is it used to solve a Boolean expression.
   b) An AM wave is represented by the $V = 5(1 + 0.6\cos 6280t)\sin 211 \times 10^4 t$.
      i) What are the maximum and minimum amplitudes of the AM wave?
      ii) Calculate the frequency component and amplitude component in the AM wave. **(6+4)**

9. a) Explain the working of Binary Counter using JK Flip Flop and draw the timing diagram.
   b) An AM broadcast radio transmitter radiates radio waves at 20kW at modulation index of 75%. Calculate the power of the carrier wave? **(6+4)**

10. a) Explain the working of a colour TV transmitter with a block diagram.
    b) Simplify the following Boolean equation $\overline{AC} + B\overline{C} + \overline{A}BC + ABC$. Realize using basic gates. **(6+4)**

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ZOO 601.2 Reg. No. ....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

ZOOLOGY

GENETICS, EVOLUTION AND PALAENTOLOGY

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 the scientists who have discovered Mendel's research work.
2. Define pseudo alleles with an example.
3. Mention the different types of comb pattern in fowls with their respective genotypes.
4. What is phenocopy?
5. What are gynandromorph? Give two examples?
6. Define split genes.
7. What is haemophilia?
8. Write a short note on albinism.
9. What is micro-evolution?
10. Write any two reptilian characters of Archaeopteryx.
11. What are homologous organs?
12. What is genetic drift?

PART-B

UNIT-I

II.	a)	Explain complementary factor with an example.	07
	b)	Write short note on nature and nurture.	03
III.	a)	Explain the law of Independent Assortment with an example of Drosophila.	07
	b)	What is incomplete dominance? Give an example.	03
IV.	a)	Explain polygenic inheritance with reference to skin colour in humans.	05
	b)	Explain incomplete linkage with an example.	05

UNIT-II

V.	a)	Give an account of genic balance theory of sex determination.	07
	b)	Write a note on sex-limited genes.	03

VI. a) Explain sex-linked inheritance with reference to eye colour in Drosophila. 07

b) Write a note on sex determination in Bonellia. 03

VII. a) Write short notes on Klinefelter's syndrome. 05

b) Write a short note on chemical mutagenic agents. 05

UNIT-III

VIII. a) Give an account on evidences of organic evolution from comparative embryology.07

b) Write short notes on Brontosaurus. 03

IX. a) Explain the postulates of Darwinism with a suitable example. 07

b) Write explanatory note on Cromagnon man. 03

X. a) Write a note on vestigial organs. 05

b) Explain the trends in the evolution of horse. 05

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ZOO 602.4 Reg. No. ....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2017

ZOOLOGY

ENVIRONMENT BIOLOGY, BIOSTATISICS AND TOXICOLOGY

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. Define phototaxis with an example.
2. Name the biotic relationship seen in i) shark and suckerfish ii) ants and aphids.
3. Pyramids of energy is always upright. Why?
4. Enumerate the types of natural ecosystems with examples.
5. Define population. Name any two methods to measure the population density.
6. Write a short note on ecotone and edge effect.
7. What is denitrification? Name any two denitrifying bacteria.
8. With reference to landscape ecology, explain corridors.
9. Find the mode of 3,5,9,6,9,7,8,6,1,4,6 and 5.
10. Expand CITES and BNHS.
11. What are Zootoxins? Give two examples.
12. Define acid rain.

PART-B

UNIT-I

II. a) Explain freshwater adaptations found in the lentic and lotic fauna. 07

b) Enumerate any 3 branches of ecology with definition. 03

III. a) Define soil profile. Explain the soil profile with a neat labelled diagram. 07

b) What is food web? Explain food web with a schematic illustration. 03

IV. a) Comment upon the interaction between the different components of pond ecosystem 05

b) Write short notes on i) Predation ii) Competition. 05

UNIT-II

V. a) Define biogeochemical cycle. Explain carbon cycle with illustration. 07

b) Explain briefly In-Situ methods of wildlife conservation. 03

VI. a) What are limiting factors? Explain Liebig's Law of Minimum and Shelford's Law of Tolerance. 07

b) Write a short note on landscape matrix. 03

VII. a) Explain the process of ecological succession. 05

b) Write notes on Gause's principle. 05

UNIT-III

VIII. a) What are the various methods of measuring air quality? Explain two methods of control of emission of air pollution. 07

b) Explain briefly genetic effects of radioactive compounds. 03

IX. a) Discuss the biological effects of mercury, DDT and fluorine. 07

b) Define discrete variable and continuous variables giving examples. 03

X. a) What is biomedical waste? Discuss methods of management. 05

b) The frequency distribution according to age group of persons are as follows. 05

Groups:	5-15	15-25	25-35	35-45	45-55	55-65
No of persons:	4	7	12	9	5	3

Calculate the arithmetic means of their age

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