19ZOO501 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

ZOOLOGY

Zoology Theory V

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

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

1. List any two features of Cri Du Chat syndrome.
2. Name any four cell organelles.
3. List any two features of Telophase II.
4. Write any two features of Vitamin C as antioxidant.
5. Define homocatalytic function.
6. Write any two principles of DNA finger printing.

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

7. Draw a labeled diagram of polytene chromosomes of *Drosophila*.
8. Classify chromosomes based on the number of centromeres.
9. Mention the important events that take place during mitotic Prophase and Metaphase.
10. Write short notes on nucleocytoplasmic interactions in Protozoa.
11. Wrie a note on the degeneracy of Triplet Code.
12. List the steps involved in gene cloning.

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

13. Give a brief account of Cytoskeleton.
14. Explain the structure and functions of mitochondria and ribosomes.
15. Define cancer. How do you distinguish benign tumours from malignant tumours? Explain the main types of cancer.
16. With the aid of labeled diagrams, compare the prophase of mitosis with the prophase-I of meiosis.
17. Give a brief account of enzymes of DNA replication.

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19STA501 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

STATISTICS

Statistics Theory V

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

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

1. Define a Pilot Survey.
2. State any two objectives of NSSO.
3. What is a Standard Error?
4. Give any two examples for the application of Stratified Random Sampling.
5. Explain the principle of Systematic Sampling.
6. Under what conditions Systematic Sampling can be viewed as an Stratified Random Sampling?

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

7. Explain Sampling Errors with an Example.
8. Explain the role of the measurements validity and reliability in testing a questionnaire.
9. Under SRSWOR for attributes obtain an expression for the standard Error of the estimated population proportion.
10. Under certain assumptions show that $V(\bar{y_{ST}})_{PROP} \geq V(\bar{y_{ST}})_{NEYMAN}$.
11. Distinguish between Linear and Circular Systematic Sampling with an example.
12. Briefly discuss about the importance of mulitistage sampling with an example.

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

13. Briefly explain various types of questions that can be incorporated in designing a questionnaire with examples.
14. Obtain an estimate of Standard Error for the estimation of population total under SRSWOR.
15. What is Neymans Allocation? Under Neymans allocation show that sample variance is minimum for a fixed sample size if $n_h \propto N_h S_h$.
16. Under Systematic Sampling prove that $V(\bar{y_r}) = \frac{\sigma^2}{n}(1 + (n-1)\rho)$.
17. a) Distinguish between Stratified sampling and Cluster Sampling with an example. What are their merits and demerits? (5)
    b) Obtain an unbiased estimator of population total under Cluster Sampling. (5)

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19STA512 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

STATISTICS

Statistics Theory VI

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

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

1. Define post optimal analysis. What is its objective?
2. How do we select the entering variable in Dual Simplex method?
3. What is Travelling Salesman Problem?
4. Why AP is called a special case of TP?
5. What is VED analysis?
6. Discuss the problems associated with inventory.

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

7. Write a short note on Big M method.
8. Explain the graphical method of solving an LPP.
9. What is replacement problem? Explain the concept of individual replacement.
10. Define TP. How do you resolve degeneracy in TP?
11. Explain newspaper boy problem.
12. Explain the concept of Simplex method.

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

13. Briefly explain purchase inventory models with prize breaks. Discuss the situation when there are two prize breaks.
14. Explain Two phase method and make a comparative study of it with Big M method.
15. Define TP. Explain the general formulation of TP by justifying why is it called the special case of LPP.
16. a) Explain AP and write its mathematical formulation. (5)
    b) Explain the concept of travelling salesman problem. (5)
17. Obtain the EOQ model with constant rate of demand and scheduling time variable.

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18MAT501 Reg. No. .....

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION JANUARY 2023

MATHEMATICS

PAPER V: Differential Equations and Ring Theory

Duration: 3 hours **Max Marks: 120**

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

PART A **10×3=30**

1. a) Solve $(D^3 - 3D^2 + 9D + 13)y = 0$.

b) Find the complimentary function of $(D^2 - 6D + 13)y = 5e^{2x}$.

c) Find the particular integral of $(D^2 - 4)y = \cos 2x$.

d) Transform $x^3 \frac{d^3y}{dx^3} + 2x^2 \frac{d^2y}{dx^2} + 2y = 10x$ into a differential equation with constant coefficients.

e) Express $\frac{d^2y}{dx^2}$ in terms of independent variable z.

f) Reduce $y_2 - 2xy_1 + x^2y = 0$ to normal form.

g) Find $L\{H(t)\}$ where $H(t) = \begin{cases} 1, & 0 < t < 2 \\ t, & t > 2 \end{cases}$

h) Show that $L\left\{t^{5/2}\right\} = \frac{15}{8s^3}\left(\frac{\pi}{s}\right)^{\frac{1}{2}}, s > 0$.

i) Find $L^{-1}\{\frac{3s+1}{(s+1)^4}\}$

j) Define ring .

k) If U is an ideal of a ring R and $1 \in U$ then prove that U=R .

l) If $\phi: R \to R'$ is a homomorphism of rings, then prove that $(i)\phi(0) = 0$
$(ii)\phi(-a) = -\phi(a), \forall a \in R$

m) In a Euclidean ring, prove that any two greatest common divisors of a and b are associates.

n) Prove that $x^2 + 1$ is irreducible over the field of integers modulo 3.

o) If R is a Euclidean ring, for all $a, b, c \in R$, $a|bc$ and $\gcd(a, b) = 1$, prove that $a|c$.

PART - B

UNIT-I

2. a) Solve $(3D^2 + D - 14)y = e^{-3x} + 13e^{2x}$ **(6)**

b) Solve $(D^2 + 4)y = \sin 3x + \cos 2x$ **(6)**

c) Solve $(D^2 + 3D + 2)y = x^2 + 3x$. **(6)**

3. a) Solve $(D^3 - 12D + 16)y = (e^x + e^{-2x})^2$. (6)

b) Solve $(D^3 - D^2 - D + 1)y = 1 + x^2$. (6)

c) Solve $(D^2 - 4)y = \sin^3 x$ (6)

UNIT-II

4. a) Solve $(D^2 + 2D + 5)y = xe^x$. (6)

b) Solve $\frac{d^2y}{dx^2} + \tan x \frac{dy}{dx} + y\cos^2 x = 0$ by the method of changing independent variable. (6)

c) Solve $(D^2 + 1)y = \sec^2 x$ by the variation of parameters method. (6)

5. a) Solve $(D^2 - 7D - 6)y = e^{2x}(1 + x)$. (6)

b) Solve $x^3 \frac{d^3y}{dx^3} - 3x\frac{dy}{dx} + 3y = 4x$. (6)

c) Solve $xy_2 + 2y_1 + xy = 0$ by reducing to normal form. (6)

UNIT-III

6. a) Derive $L\{\cos kt\}$ (6)

b) Find $L^{-1}\left\{\frac{s+1}{s^2+6s+25}\right\}$. (6)

c) Derive the formula $L\{F(t)\} = \frac{1}{1-e^{-sw}}\int_0^w e^{-s\beta}F(\beta)d\beta$ for the Laplace transform of a periodic function with period w. (6)

7. a) Express in terms of α −function and find $L\{F(t)\}$ where $F(t) = \begin{cases} t^2, & 0 < t < 1 \\ 2, & t > 1 \end{cases}$ (6)

b) Find $F(t) = L^{-1}\left\{\frac{e^{-3s}}{(s+1)^3}\right\}$ and hence find $F(2), F(5)$ (6)

c) Solve $y''(t) - y(t) = 5\sin 2t, y(0) = 0, y'(0) = 1$ (6)

UNIT – IV

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

b) If $\emptyset$ is a homomorphism of a ring R into a ring R', then prove that kernel of $\emptyset$ is an ideal of R.

c) If U and V are ideals of a ring R then prove that U+V={u+v| u∈ $U, v \in V$} is an ideal of R. (6)

9. a) If R is a commutative ring with unit element whose only ideals are (0) and R itself, the prove that R is a field (6)

b) Define homomorphism of rings. Prove that $f(x) = x^2$ is a homomorphism in the ring of integers . (6)

c) If U is an ideal of a ring R, prove that r(U)={x∈ R| xu=0, ∀ u∈U} is also an ideal of R. (6)

UNIT – V

10 a) Let R be a Euclidean ring and A be an ideal of R. Prove that there exists an element $a_0 \in A$ such that $A = \{a_0 x / x \in R\}$. (6)

b) Prove that every element in a Euclidean ring R is either a unit in R or can be written as the product of a finite number of prime elements of R. (6)

c) In a commutative ring R with unit element, define the relation 'is an associate of' and show that it is an equivalence relation. (6)

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

b) If p is a prime number of the form $4n + 1$, then prove that the congruence relation $x^2 \equiv -1 \, mod \, p$ has a solution for x **(6)**

c) If $f(x), g(x)$ are two non-zero elements of $F[x]$ then prove that $\deg(f(x)g(x)) = \deg f(x) + \deg g(x)$ **(6)**

19MAT501 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

MATHEMATICS

Mathematics Theory V

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

I. Answer any EIGHT of the following : **(8×3= 24 Marks)**

a. Define commutative ring with an example .

b. Prove that $(Z_6, \oplus_6, \otimes_6)$is a ring with zero divisor .

c. Show that for any prime number p , Z_p is a field .

d. Define Vectorspace and give an example .

e. Verify whether $W = \{x = (x_1, x_2, \ldots, x_n)/x_1 + x_2 + x_3 + \ldots + x_n = 3\}$ is a subspace of R^n .

f. Let $V = F_n[x]$ be the space of all polynomials of degree $\leq n$. Then show that $v_0 = 1, v_1 = x, v_2 = x^2, \ldots, v_n = x^n$ form a basis of V.

g. Find $L\{e^{-4t} + 3e^{-2t}\}$.

h. Find $L\{\cos^2 kt\}$.

i. Find $L\{t \cos t\}$.

j. Find $L^{-1}\{\frac{s}{s^2+2s+5}\}$.

II. Answer any EIGHT of the following : **(8×7= 56 Marks)**

a. Prove that the set of all 2×2 matrices forms a ring with unity and not commutative .

b. Let R be a finite integral domain, then prove that R is a field .

c. (i) Define subspace of a vectorspace V and give an example .
(ii) Let V be a vectorspace over F and $\{W_\alpha\}_{\alpha \in I}$ be a collection of subspaces of V. Then prove that $W = \bigcap_{\alpha \in I} W_\alpha$ is also a subspace of V.

d. Let V be a vectorspace of dimension n. Then prove that any set of m linearly independent elements $(m \leq n)$ can be completed .

e. Define a maximal linearly independent set .Let $\{v_1, v_2, \ldots\ldots, v_n\}$ be a maximal linearly independent set in V ,then show that it forms a basis of V .

f. Let V be an inner product space . Prove that $|(v, v')| \leq \|v\|\|v'\| \, \forall \, v, v' \in V$.

g. Define Laplace transform of a function $F(t)$. Find$L\{\psi(t)\}$ where

$$\psi(t) = \begin{cases} 4, & 0 < t < 1, \\ 3, & t > 1 \end{cases}$$

h. Find the Laplace Transform of the function

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

i. Find $L\{F(t)\}$ where $F(t) = \begin{cases} 6 & 0 < t < 4 \\ 2t + 1 & t > 4 \end{cases}$ using α-function.

j. Solve: $x''(t) + 4x(t) = 15e^t$ with $x(0) = 1 , x'(0) = 3$ using Laplace transforms.

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18MAT512 Reg. No. .....

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION JANUARY 2023
MATHEMATICS
PAPER VI - DISCRETE MATHEMATICS

Time: 3 Hrs. **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 **3×10=30**

1. a. Symbolize the statement, "given any positive integer, there is a greater positive integer".

   b. Show that, $\neg(P \wedge Q)$ follows from $\neg P \wedge \neg Q$

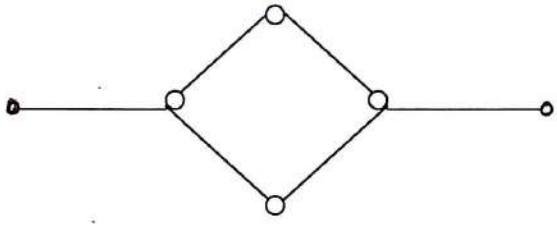
   c. Show that conclusion C follows from the premises H_1, H_2, $H_1 : R, H_2 : P \vee \neg P$, $C : R$.

   d. Prove that the number of odd degree vertices in a graph is always even.

   e. Draw complete graphs K_n for $n \leq 5$.

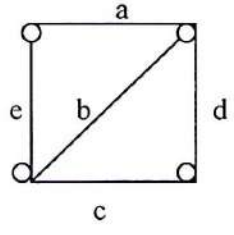
   f. Define the terms a) Hamiltonian path b) Eulerian path.

   g. Find the number of different spanning trees in the following graph.



   h. Obtain a binary tree for the prefix code $\{00, 011, 10, 111\}$.

   i. List all the fundamental cutsets with respect to the spanning tree $\{a, b, c\}$ for the following graph.



   j. Construct a grammar for the language $L = \{a^i b^{2i} : i \geq 1\}$.

   k. Prove that two states are in the same block in π_k if and only if they are in the same block in π_{k-1}.

l. Write the output sequence produced by the finite state machine given below for the input sequence 1011101.

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

m. If $A(z)=\frac{2}{1-2z}$ find a_r.

n. Obtain the characteristic roots of the equation $4a_r-20a_{r-1}+17a_{r-2}-4a_{r-3}=0$.

o. Prove that the numeric function $\alpha=\alpha_0+\alpha_1 r+\alpha_1 r^2+\ldots+\alpha_n r^n$ *is* $O(r^n)$.

PART – B

UNIT – 1

2. a. Show that $(\exists x)M(x)$ follows logically from the premises $(x)(H(x)\rightarrow M(x))$ and $(\exists x)H(x)$ (6)

b. Without constructing the truth table show that the statements $R\vee M,\ \neg R\vee S,\ \neg M$ *and* $\neg S$ cannot be true simultaneously. (6)

c. Show that $R\wedge(P\vee Q)$ is valid conclusion from the premises $P\vee Q, Q\rightarrow R, P\rightarrow M$ *and* $\neg M$ (6)

3. a. Show that from

i). $(\exists x)\big(F(x)\wedge S(x)\big)\rightarrow(y)\big(M(y)\rightarrow W(y)\big)$ and

ii). $(\exists y)\big(M(y)\wedge\neg W(y)\big)$, *the conclusion* $(x)\big(F(x)\rightarrow\neg S(x)\big)$ follows. (9)

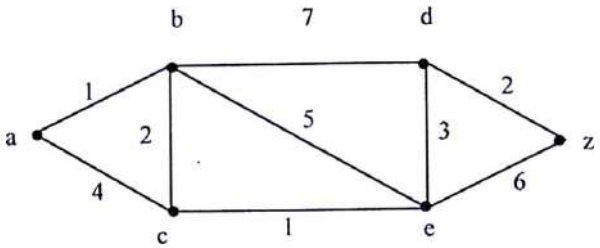
b. Prove that $(\exists x)\big(P(x)\wedge Q(x)\big)=(\exists x)P(x)\wedge(\exists X)Q(x)$. Also prove that the converse does not hold. (9)

UNIT –II

4. a. For any connected planar graph, prove with usual notations that $v-e+r=2$. (9)

b. Prove that an undirected graph possesses an Eulerian path if and only if it is connected and has either zero or two vertices of odd degree. (9)

5. a. Find the shortest distance from a to z in the graph. (9)

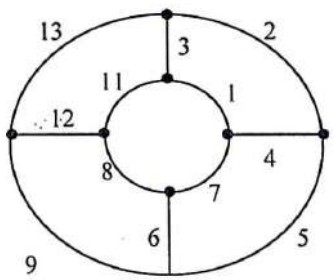


b. Prove that there is always a Hamiltonian path in a directed complete graph. (9)

UNIT –III

6. a. Show that a circuitless graph with 'v' vertices and 'v-1' edges is a tree. (6)

b. Describe a procedure to determine minimum spanning tree of a connected weighted graph. Use it to obtain a minimum tree for the following graph. (6)



c. Prove that a graph with $e = v - 1$ edges that has no circuits is a tree. (6)

7. a. Show that in a connected graph every circuit has even number of edges in common with every cutset. (6)

b. Draw a binary tree for the prefix code {1,01,000,001}. (6)

c. In a graph G, with respect to a given spanning tree *Let* $D = \{e_1, e_2, \ldots, e_k\}$ be a fundamental cutset in which e_1 is a branch and $e_2, e_3, \ldots, e_k$ are chords. Show that
i) e_1 is contained in the fundamental circuits corresponding to the chords $e_i, 2 \leq i \leq k$.
ii) e_1 is not contained in any other fundamental circuits. (6)

P.T.O.

UNIT – IV

8. a. Provide a step by step derivation of the sentence C=A+D*(D+B) using the set of productions:

Asgn-stat → *id*=exp
exp → exp+term
exp → *term*
term → term*factor
term → *factor*
factor → (exp)
factor → id
id → *A*
id → *B*
id → *C*
id → *D* (9)

b. Show that the language L=$\{a^k | k = i^2, i \geq 1\}$ is not a finite state language (9)

9. a. Define phrase structure grammar. Construct a grammar for $L = \{aaaa, aabb, bbaa, bbbb\}$. (9)

b. Let *L* be a finite state language accepted by a finite state machine with N states. For any sequence ∝ whose length is N or larger in the language, ∝ can be written as uvw such that v is nonempty and $uv^i w$ is also in the language for i≥ 0, *where* v^i denotes the concatenation of i copies of the sequence v. (9)

UNIT – V

10. a. Find the homogeneous solution of the difference equation, $4a_r - 20a_{r-1} + 17a_{r-2} - 4a_{r-3} = 0$. (6)

b. Obtain the numeric function a_r corresponding to the generating function. $A(Z) = \frac{2+3Z-6Z^2}{1-2Z}$ (6)

c. Find the particular solution of $a_r + 5a_{r-1} + 6a_{r-2} = 3r^2 - 2r + 1$. (6)

11. a. If $3a_r - 5a_{r-1} + 2a_{r-2} = r^2 + 5$, $a_3 = 3$, $a_4 = 6$, find a_2 *and* a_5. (6)

b. Find the homogeneous solution of the difference equation $a_r + 6a_{r-1} + 12a_{r-2} + 8a_{r-3} = 0$. (6)

c. If $a_r = 2^r, r \geq 0$ and $b_r = 3^r, r \geq 0$ and $c = a * b$ determine the generating function of c. Also find the numeric function c_r for $c = a * b$. (6)

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19MAT512 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

MATHEMATICS

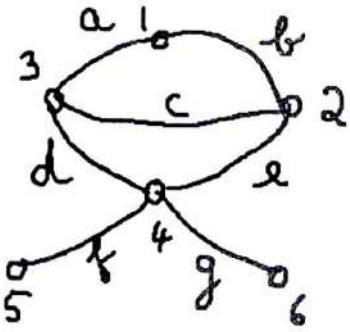
Mathematics Theory VI

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

I. Answer any EIGHT of the following : **(8×3= 24 Marks)**

a. Find the chromatic number of the cycle graph C_5

b. Define deletion of a vertex and deletion of an edge in a graph. Find the graph obtained by (i) deleting deleting vertex 3 and (ii) deleting the edge e in G given below.

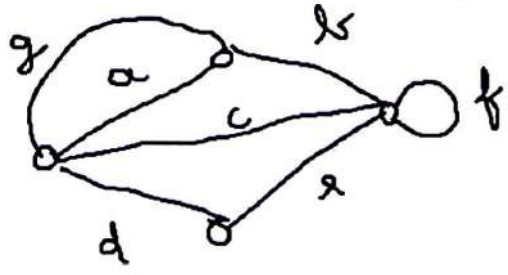


c. Show that for a planar graph $e \leq 3v - 6$

d. State Kruskal's algorithm

e. Draw a binary tree for the prefix code {1,01,0010,000}.

f. Draw three spanning trees of the rgaph given below.



g. Find the particular solution of the difference equation, $a_r = a_{r-1} + 7$

h. Find the particular solution of the recurrence relation

$a_r + 6a_{r-1} + 12a_{r-2} + 8a_{r-3} = 2.3^r$

i. Find the particular solution of the recurrence relation $a_r - 2a_{r-1} = 3.2^r$

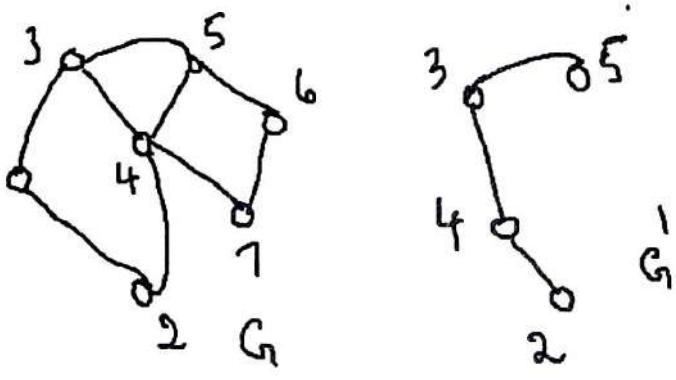
j. Obtain the characteristic roots of the difference equation

$a_r - a_{r-1} - 2a_{r-2} + 2a_{r-3} = 0$ and write its homogenous solution

II. Answer any EIGHT of the following : **(8×7= 56 Marks)**

a. Define complement of a subgraph. in the graph G given below find the complement of the subgraph G'.

Also draw the complement of G' with respect to the complete graph of 4 vertices.



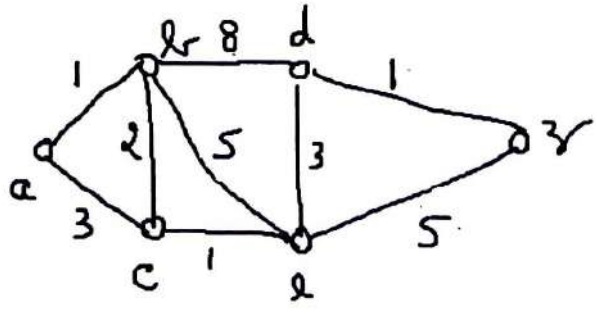
b. Define incidence matrix and adjacency matrix of undirected graph.

Write an incidence matrix containing the matrix given below and draw the undirected graph G represented by it. Also write the adjacency matrix of G.

$$\begin{pmatrix} 1 & 1 & 1 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$$

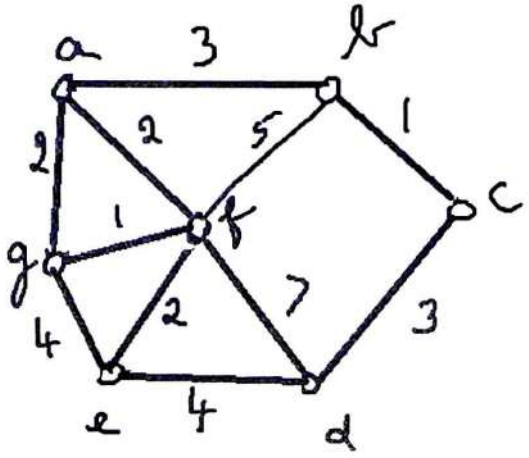
c. Prove that in a linear graph G of n vertices if the number of degrees for each pair of vertices in G is $n-1$ or larger, than there exists a hamiltonian path in G.

d. Find the shortest distance from the vertex a to the vertex z in the graph given below.



e. Define tree, forest with an example each. Prove that a graph G is a tree if and only if there is a unique path between every pair of vertices in G.

f. State Prim's algorithm. Use this algorithm to find minimal spanning tree of the graph given below.



g. Define the following.

spanning tree, cutset.

Prove the following.

(i) A circuit and the complement of any spanning tree must have at least one edge in common.

(ii) A cutset and any spanning tree must have at least one edge in common.

h. Let a be the numeric function defined by

$$a_r = \begin{cases} 2 & 0 \le r \le 3 \\ 2^{-r} + 5 & r \ge 4 \end{cases}$$

Find the forward difference $\triangle a$, the backward difference ∇a, and $s^2 a$

i. Find the particular solution of the recurrence relation

$a_r + 5a_{r-1} + 6a_{r-2} = 3r^2 - 2r + 1$

j. Find the solution of the recurrence relation $a_r = a_{r-1} + a_{r-2}$ determined from the boundary conditions $a_0 = 3, a_1 = 1$

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19MAT542 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

MATHEMATICS

Mathematics Theory VI - Linear Programming

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

I. Answer any EIGHT of the following : **(8×3= 24 Marks)**

a. Write the canonical form of maximization LPP .

b. Pivot on $a_{22} = 3$ in the following canonical maximization table :

x_1	x_2	-1	
2	3	6	$=-t_1$
1	3	2	$=-t_2$
0	2	1	$=f$

c. State the canonical minimization LPP represented by

x	20	25	300
y	40	20	500
-1	1000	800	0
	$=t_1$	$=t_2$	$=g$

d. Write the table of the noncanonical LPP: Maximize
$f(x, y, z) = x + 2y + z$, subject to $x + y \leq 1$, $x + y + z = 6$, $x, z \geq 0$.

e. Given the LPP : Maximize $f(x_1, x_2) = -2x_1 + x_2$, subject to
$x_1 + x_2 \leq 2,\ 2x_1 + x_2 \leq 6,\ x_1, x_2 \geq 0$ .State the dual canonical minimization LPP .

f. Reduce the following table of the matrix game using domination:

$$\begin{bmatrix} -1 & 1 & -1 & 2 \\ -1 & -1 & 1 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}$$

g. Define mixed strategy and pure strategy for the column player in the matrix game.

h. Convert the following unbalanced transportation problem into a balanced transportation problem .

3	2	1	30
2	5	9	75
40	30	50	

i. Find all permutation set of zeros in the following table of balanced assignment problem .

0	0	1
0	0	0
1	0	0

j. Prove that any flow in a capacited directed network satisfies $\sum_j \phi(v_j) = 0$.

II. Answer any EIGHT of the following : **(8×7= 56 Marks)**

a. An appliance company manufactures heaters and airconditioners. The production of one heater requires 2 hours in the parts division of the company and 1 hour in the assembly division of the company. The production of one airconditioner requires 1 hour in the parts division of the company and 2 hours in the assembly division of the company. The parts division is operated for atmost 8 hours per day and the assembly division is operated for atmost 10 hours per day. If the profit realised upon sales is 30 dollars per heater and 50 dollars per airconditioner. How many heaters and airconditioners should the company manufacture per day so as to maximise profits ? Solve graphically .

b. Solve using simplex algorithm:

x_1	x_2	-1	
-1	1	1	$=-t_1$
1	-1	3	$=-t_2$
1	2	0	$=f$

c. State the complete simplex algorithm for maximum table .

d. Solve the noncanonical LPP : Maximize $f(x, y) = x + 3y$, subject to $x + 2y \leq 10\,, 3x + y \leq 15, x \geq 0\,.$

e. Solve the dual canonical LPP :

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

f. Solve the dual noncanonical LPP :

	x_1	x_2	-1	
y_1	2	-1	-1	$=0$
y_2	-1	1	-1	$=-t_1$
-1	2	1	0	$=f$
	$=0$	$=s_2$	$=g$	

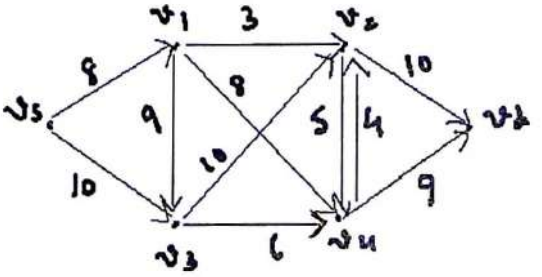
g. State VAM to find the initial basic feasible solution of a balanced transportation problem .

P. T. O.

h. Solve the unbalanced transportation problem :

2	1	2	40
9	4	7	60
1	2	9	10
50	60	30	

i. Solve the maximal flow network problem given below :



j. Solve the assignment problem below :

38	21	34
41	14	36
28	20	25

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PHY501.1 Reg No : .....

CREDIT BASED SEMESTER SYSTEM

B.Sc FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

PHYSICS

Physics Theory V

Duration:3 Hrs **Max Marks:80**

PART - A

I. a. Answer any TEN from the following: **(10×1= 10 Marks)**

i. In an atom if l = 3, what is the value of j?

ii. What is Eigen value?

iii. Mention the order of wavelength of various regions of molecular spectra.

iv. What is magnetic resonance?

v. Give the expression for rotation- vibration energy of the molecule. Mention the terms used.

vi. Draw the graph showing the distribution of energy in the spectrum of black body.

vii. What is Wein's distribution law of blackbody radiation?

viii. Give the relation between maximum velocity of a photoelectron and the stopping potential.

ix. Why uncertainty principle is not significant at macroscopic level?

x. What is a magnetic lens?

xi. What is a free particle?

xii What is meant by stationary state?

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

i. State and explain Pauli's exclusion principle.

ii. How do you explain blue of the sky from Rayleigh scattering?

iii. Show that Planck's constant has the dimension of angular momentum.

iv. Calculate the phase velocity when the particle is said to be non-relativistic.

v. What is the physical significance of Schrodinger wave function?

vi. Why states with same quantum numbers do not degenerate? Explain.

PART - B

UNIT I

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

2. a) What is meant by fine structures of spectral lines? Explain the fine structure of sodium D line.

   b) A beam of Silver atoms in Stern Gerlach experiment obtained from an oven heated at 1000 K passes through a heterogeneous magnetic field having a field gradient 200 T m^{-1} covers a distance 0.12 m in the magnetic field. Calculate the separation between the traces. **(6+4)**

3. a) What is a diatomic molecule? Give brief account of electronic spectra of diatomic molecules by drawing energy level diagram.

   b) The J = 0 to J = 1 absorption lines occur at a frequency 1.153 X 10^{11} Hz in $^{12}C^{16}O$ and at 1.102 X 10^{11} Hz in $^{x}C^{16}O$. Find the mass number of the unknown isotope of Carbon. Mass of C atom = 12 amu, mass of O atom = 16 amu. **(6+4)**

4. a) Explain Raman effect on the basis of quantum theory. What are the applications of Raman effect?

   b) A substance shows Raman line at 554.3 nm when excited with a radiation of wavelength 546.1nm. Calculate a) The Raman frequency b) The wavelength of the corresponding anti-stokes line. (Given: h=6.625x10^{-34} Js). **(6+4)**

UNIT II

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

5. a) Write down Planck's distribution law for black body radiation in terms of wavelength and frequency. Mention the terms used and obtain the Stefan's law from Planck's law of blackbody radiation.

   b) In an experiment, the work function of potassium surface is found to be 2.1 eV. Calculate the threshold wavelength. What should be the wavelength of incident radiation if the stopping potential for electrons is 0.43 eV. **(6+4)**

6. a) Explain the experiment of photoelectric effect with a neat labelled diagram and discuss the results.

   b) Determine the kinetic energy (in electron volts) required for electrons to resolve (i). a large organic molecule of size 10 nm, (ii). an atomic features of size 100 pm and (iii). a nucleus of size 10 fm. **(6+4)**

7. a) Describe with necessary theory Davison and Germer experiment for establishing wave nature of the electron and discuss it.

b) Calculate the De-broglie wavelength associated with proton moving with a velocity equal to one twentieth of the velocity of light.
(Given: m_p=1.67x10^{-27}kg h=6.625x10^{-34} Js). **(6+4)**

UNIT III

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

8. a) Derive the Schrödinger wave equation for a free particle in a linear potential box and obtain eigen functions and eigen values.

b) The wave function inside a long barrier of height V is $\psi(x) = N e^{-kx}$. Calculate (a) the probability that the particle is inside the barrier and (b) The average penetration depth of the particle into the barrier. **(6+4)**

9. a) Write down the Schrödinger wave equation and obtain expression for energy of a linear harmonic oscillator and discuss the energy level and probability curves.

b) Calculate the expectation value of the position < x >and expectation value of the momentum < p > of a particle trapped in a one-dimensional box of width L.
(6+4)

10. a) Starting from the wave equation, derive an expression for one dimensional Schrödinger wave equation in time-dependent form.

b) Calculate the energy difference between the ground state and the first excited state of an electron in a one dimensional potential box of width 1 A^0 . **(6+4)**

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19PHY501 Reg No : .....

CHOICE BASED CREDIT SYSTEM
B.Sc FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023
PHYSICS - V

Duration:3 Hrs **Max Marks:80**

PART - A

Answer any TWELVE from the following: **(12×1= 12 Marks)**

1. Give the value of magnetic moment.
2. Give the selection rule for L.
3. What is coherent scattering?
4. What is Nuclear Magnetic Resonance?
5. What is the order of rotational energy of molecules?
6. Define energy density of radiation.
7. Write a difference between photoelectric effect and compton effect.
8. What is photo-electric effect?
9. Which phenomenon was observed in Davisson-Germer experiment using an electron beam?
10. Give any two applications of Heisenberg's uncertainty principle.
11. Write the expression for three dimensional time independent Schrödinger wave equation and mention the terms used.
12. What is a free particle?
13. What is Eigen value?
14. What is the expression for zero point energy of a particle in a one dimensional box?
15. What do you understand by the wave function of a moving particle?

PART - B

UNIT I

Answer any TWO from the following: **(2×8= 16 Marks)**

16. a) What are longitudinal and transverse normal Zeeman effects?

    b) What is spin-orbit coupling? Explain the splitting of spectral lines due to spin orbit coupling. **(2+6)**

17. a) Find the wave number for a spectral line of wavelength 500 nm.

    b) Give brief account of vibrational spectra and explain vibrational-rotational spectra of a diatomic molecule by drawing energy level diagrams. **(2+6)**

18. a) State and explain Franck-Condon principle.

    b) Draw the energy level diagram for diatomic molecule. Show that in rotational spectra the energy levels are not equally spaced whereas the frequencies are equally spaced. **(2+6)**

UNIT II

Answer any TWO from the following: **(2×8= 16 Marks)**

19. a) Show that Planck's constant has the dimension of angular momentum.

    b) Write down Planck's distribution law for black body radiation in terms of wavelength and frequency. Mention the terms used and obtain the Stefan's law from Planck's law of black body radiation. **(2+6)**

20. a) State the laws of photoelectric effect.

b) Derive an expression for Compton shift and wavelength of scattered photon. **(2+6)**

21. a) Give a labelled diagram of an Electron microscope.

b) State Heisenberg's uncertainty principle. Apply it to explain the minimum energy of harmonic oscillator. **(2+6)**

UNIT III

Answer any TWO from the following: **(2×8= 16 Marks)**

22. a) Write the conditions for a particle of rest mass m to be confined to move in a rectangular box of length L.

b) Explain in detail degeneracy for a three dimensional system. **(2+6)**

23. a) Why the Schrödinger wave equation is not valid for relativistic particles?

b) Show that for a single value of energy or momentum, different quantum states are possible. Explain the term degeneracy. **(2+6)**

24. a) Sketch $\chi(x)$ for the three quantum states n=2, n=3, and n=5. What is the wavelength of each?

b) What is a square wave function? Explain its limitations. **(2+6)**

PART - C

Answer any FOUR from the following: **(4×5= 20 Marks)**

25. The spacing between vibrational levels of Carbon Mono-oxide molecule is 0.8 eV. Calculate the value of force constant. Mass of Carbon atom = 12 amu and that of Oxygen atom = 16 amu, 1 amu = 1.67×10^{-27} kg.

26. With an exciting radiation of wavelength 589.3 nm a substance showed Raman line at a wavelength 578.7 nm. Find the wavelength, frequency of Stoke's and anti Stoke's line.

27. The wavelength of maximum solar emission is observed to be approximately 0.475 μm. What is the surface temperature of the sun (assumed as blackbody)? Also calculate the rate at which energy is radiated from its surface assuming it to be a perfectly black body.

28. Light of wavelength 2000 falls on a photo-sensitive material having work function 4.2 eV. What is the kinetic energy of the fastest and slowest photo-electron? Also calculate the stopping potential.

29. (i). If the uncertainty in position of an electron is 4×10^{-10} m, calculate the uncertainty in its momentum. (ii). Determine the minimum uncertainties in the positions of the electron if their speeds are known with a precision of 3×10^{-3} m s^{-1}?

30. Think of the nucleus as a box with a size of 10^{-14} m across. Compute the energy of a neutron confined to the nucleus for the ground state, first, second and third excited states. Comments on the results. Mass of the neutron is 1.67×10^{-27} kg.

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18PHY502 Reg No : .....

CREDIT BASED SEMESTER SYSTEM
B.Sc. FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023
PHYSICS - VI

Duration:3 Hrs **Max Marks:80**

PART - A

I. Answer any TWELVE from the following: **(12×1= 12 Marks)**

1. What is the main drawback of Einstein's theory?
2. Write Planck's formula for the energy of an atomic oscillator.
3. What is the probability of occupation of Fermi level at any temperature greater than 0 K?
4. Define mobility of electrons.
5. Define Hall coefficient.
6. What is doping?
7. Give the symbol for junction diode .
8. Give the symbol for Solar cell.
9. Give the symbol for Photo diode.
10. Define nano meter.
11. State Moseley's law.
12. Give an example for body centered cubic stuctured crystal.
13. What is volume defect?
14. Give example for ferrimagnetic materials.
15. Give an example for diamagnetic material.

PART - B
UNIT I

Answer any TWO from the following: **(2×8= 16 Marks)**

16. a) If there are two substances with Debye temperature 500 K and 1000 K, at low temperature which one of them will have a higher specific heat? Why?

    b) Show that both FD and BE statistics reduce to MB statistics at low densities and high temperatures. **(2+6)**

17. a) What is the limitation of Dulong and Petit's law? Expalin in detail.

    b) Derive expression for specific heat of solids using Debye's theory, assuming the expression for the number of possible modes of vibrations. **(2+6)**

18. a) Prove that Fermi energy level is the highest energy level occupied by electrons at absolute zero temperature.

    b) Describe how Hall coefficient can be determined experimentally. **(2+6)**

UNIT II

Answer any TWO from the following: **(2×8= 16 Marks)**

19. a) Draw energy band diagrams of conductors and semiconductors.

b) Based on the energy gap distinguish between a semiconductor, insulator and conductor. **(2+6)**

20. a) Give any two applications of LED.

    b) Explain with diagram the working of a p-n junction diode and draw the necessary graph for the same. **(2+6)**

21. a) Write a note on carbon nano tubes.

    b) Show that the Fermi level lies mid way between the valence band and conductin band in an intrinsic semiconductor **(2+6)**

UNIT III

Answer any TWO from the following: **(2×8= 16 Marks)**

22. a) Why transparent gratings cannot be used to study the diffraction of X-rays?

    b) Assuming the experimental observations, how the crystal structures of NaCl and KCl can be established? **(2+6)**

23. a) Give the classification of volume defects.

    b) With a suitable diagram explain about Edge dislocation . **(2+6)**

24. a) Explain antiferromagnetism.

    b) Give an account for the quantum theory of paramagnetism and obtain an expression for the paramagnetic susceptibility. **(2+6)**

PART - C

Answer any FOUR from the following: **(4×5= 20 Marks)**

25. The Debye temperature of Carbon is 1850 K. Calculate its specific heat per K mole for diamond at 20 K. Also compute the highest lattice vibration frequency ($R = 8.31 \times 10^3$ J/kmole/K)

26. The resistivity of aluminium having three conduction electrons/atom is 2.62×10^{-8} Ωm. Calculate a) the drift velocity in a field of 50 V/m b) the mobility of electrons in the given field c) the relaxation time of conduction electrons on the basis of classical free electron theory. Density of Aluminium = 2700, atomic mass = 27 and $N = 6.02 \times 10^{26}$ / k mole.

27. The resistivity of intrinsic Germanium at 27°C is equal to 0.47 Ωm. Assuming electron and hole mobilities as 0.38 $m^2V^{-1}s^{-1}$ and 0.18 $m^2V^{-1}s^{-1}$ respectively, calculate the intrinsic carrier density.

28. The resistance of an intrinsic semiconductor is 150 Ω at 60 °C and 50 Ω at 80 °C. Calculate the width of the energy gap in eV, $K = 1.38 \times 10^{-23}$ J/K

29. X rays incident on a crystal with inter planar spacing of 0.265 nm produces the first three orders of reflection at glancing angles of 8.6°, 17.5° and 26.7° respectively. Show that these observations are in conformity with Bragg's law. Calculate the wavelength of X- rays and the highest order of reflection possible.

30. An X-ray tube operates at the voltages (i). 40 kV (ii). 100 kV. Find the speed of the electrons striking the anode and shortest wavelength of the X-rays produced in each case.

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19PHY502 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

PHYSICS - VI

Duration:3 Hrs **Max Marks:80**

PART - A

I. Answer any TWELVE from the following: **(12×1= 12 Marks)**

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2. Write Planck's formula for the energy of an atomic oscillator.
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9. Give the symbol for Photo diode.
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12. Give an example for body centered cubic stuctured crystal.
13. What is volume defect?
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PART - B

UNIT I

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    b) Derive expression for specific heat of solids using Debye's theory, assuming the expression for the number of possible modes of vibrations. **(2+6)**

18. a) Prove that Fermi energy level is the highest energy level occupied by electrons at absolute zero temperature.

    b) Describe how Hall coefficient can be determined experimentally. **(2+6)**

UNIT II

Answer any TWO from the following: **(2×8= 16 Marks)**

19. a) Draw energy band diagrams of conductors and semiconductors.

b) Based on the energy gap distinguish between a semiconductor, insulator and conductor. **(2+6)**

20. a) Give any two applications of LED.

    b) Explain with diagram the working of a p-n junction diode and draw the necessary graph for the same. **(2+6)**

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    b) Show that the Fermi level lies mid way between the valence band and conductin band in an intrinsic semiconductor **(2+6)**

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    b) With a suitable diagram explain about Edge dislocation . **(2+6)**

24. a) Explain antiferromagnetism.

    b) Give an account for the quantum theory of paramagnetism and obtain an expression for the paramagnetic susceptibility. **(2+6)**

PART - C

Answer any FOUR from the following: **(4×5= 20 Marks)**

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28. The resistance of an intrinsic semiconductor is 150 Ω at 60 °C and 50 Ω at 80 °C. Calculate the width of the energy gap in eV, $K = 1.38 \times 10^{-23}$ J/K

29. X rays incident on a crystal with inter planar spacing of 0.265 nm produces the first three orders of reflection at glancing angles of 8.6°, 17.5° and 26.7° respectively. Show that these observations are in conformity with Bragg's law. Calculate the wavelength of X- rays and the highest order of reflection possible.

30. An X-ray tube operates at the voltages (i). 40 kV (ii). 100 kV. Find the speed of the electrons striking the anode and shortest wavelength of the X-rays produced in each case.

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19BOT501 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

BOTANY

Botany Theory V

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

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

1. Define turgour pressure and wall pressure.
2. Define Water Potential.
3. What is absorption spectrum?
4. Write any two properties of water.
5. Define Photolysis. Represent it with an equation.
6. Write a note on catabolism of sucrose.

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

7. Define Hydrolases. Explain its sub-classes.
8. Write a note on anatomical adaptations found in xerophytes to check excessive transpiration.
9. Give the schematic representation of Kreb's cycle.
10. Write a note on i) Anerobic respiration and its mechanism ii) RQ value of Malic acid, Tartaric acid and Oxalic acid.
11. Write a note on i) Photoinductive cycle and flowering ii) Vernalization
12. Describe the physiological effects of Ethylene.

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

13. List the advantages and disadvantages of Hydroponics. Add a note on Carbonic acid exchange theory and Cation exchange theory.
14. Explain the theories of enzyme action.
15. Explain the role of Macro and Micro elements in plant growth.
16. Explain ß oxidation with a schematic representation.
17. Define i) Hypotonic solution ii) Cavitation iii) Hydrolases iv) Holoenzyme v) Allosteric inhibition

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19BOT502 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

BOTANY

Botany Theory VI

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

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

1. Mention any two function of mRNA.
2. What is the central dogma of molecular biology?
3. What are regulatory genes? Name the two processes of gene regulation?
4. What is the function of RNA polymerase III?
5. Differentiate transition and transversion.
6. What is PCR? Mention the steps involved in PCR.

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

7. Explain Semi-conservative replication of DNA.
8. Write the difference in Prokaryotic and Eukaryotic transcription.
9. Mention the uses of aneuploidy.
10. What is deletion? Write the cytological properties of deficiency.
11. Explain chemical mutagens.
12. Write a note on (i) Nucleotide Sequence Databases (ii) Protein databases

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

13. Define Translation. Explain the process of translation in Prokaryotes with a neat labeled diagrams.
14. (i) Explain the experimental proof of transformation principle.
    (ii) Explain the experiment conducted by Avery, Macleod and Mc Carty.
15. Write in detail about autoploidy.
16. Explain pericentric inversion and its cytology.
17. What is Southern blotting? Explain the detailed procedure involved.

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19COS501 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

COMPUTER SCIENCE

Computer Science Theory V

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

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

1. Enterprise applications are reusable. Justify.
2. What is a client-server architecture?
3. What is the use of executeUpdate() method?
4. List any four methods of ResultSetMetaData interface.
5. What is a Java Servlet? Write any one benefit of using servlet over CGI.
6. Write the usage of declaration tag in JSP.

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

7. Explain J2EE architecture with a neat diagram.
8. Write a note on a) Java Servlet b) Java Server Pages c) JavaMail
9. Explain the components of JDBC.
10. Differentiate JDBC Type-1 and Type-3 Driver.
11. How does a servlet program send HTTP response headers? Explain with a help of an example.
12. Explain method overloading in JSP with an example.

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

13. Explain any three J2EE service technologies and any two component technologies.
14. Explain any five methods of a) JDBC core API b) DriverManager class
15. Write a servlet program to insert employeeid, name and basicpay of an employee into the database using PreparedStatement interface. Use HTML form to take user input.
16. How do you read the data from a client? Explain with the help of an example, how do you accept three user inputs from client.
17. Write a servlet program to add and retrieve session variable from HTML form. Input CollegeName and Class using HTML form.

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19COS512 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

COMPUTER SCIENCE

Computer Science Theory VI

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

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

1. What is the function of a data bus?
2. What is the function of an AX register?
3. Write the general form of the directive INCLUDE. Give one example.
4. Write the general format of an Assembly Language instruction.Give an example.
5. Write the syntax of Shift Logical Right instruction with an example.
6. What is the function of STOS instruction?

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

7. Write a note on memory mapped I/O and I/O mapped I/O.
8. With a neat diagram, explain any 5 flags of the flag register.
9. Explain the following directives: (i) SEGMENT (ii) SIZE
10. Explain the concept of procedures with its advantages.
11. With the function and an example explain ASCII adjust for Division.
12. Explain the various interrupt instructions used in the processor.

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

13. (a) Differentiate Direct Addressing mode and Indirect Addressing mode.
    (b) Write a note on Stack addressing Modes.
14. Write a note on: (i) Source Index Registers (ii) Pointer Registers (iii) Stack Segment Register
15. (a) Differentiate between the instructions SUB and CMP.
    (b) Explain the instructions i) DIV ii) MUL
16. (a) Write an Assembly Language Program to generate 8 fibonacci numbers.
    (b) Write an Assembly Language Program to check if the two strings are equal.
17. (a) What is the significance of the Processor Control instructions?
    (b) Explain the following processor control instructions:i)CLC ii)CMC (iii)CLD

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19MIC501 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

MICROBIOLOGY

Microbiology Theory V

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

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

1. Define Hypersensitivity.
2. Define innate immunity.
3. Write the properties of Dane particle.
4. Mention the culture media used to isolate Vibrio cholerae.
5. Name the organisms used to produce Streptomycin and Bacitracin antibiotics.
6. Mention the use of paper disc plate method.

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

7. Write a brief note on vaccines.
8. Write a short note on Immunoglobulin D.
9. Write a note on Diarrhoeagenic E.coli.
10. Write a note on pathogenesis and laboratory diagnosis of Neisseria gonorrhoeae.
11. Write a note on Griseofulvin and Zidovudine.
12. List the factors affecting antimicrobial control.

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

13. Explain in detail on Cell mediated Immune response.
14. What are Serological reactions? Add a note on the general features and measurement of Antigen Antibody reactions.
15. Explain in detail on Penicillosis and Aspergillosis.
16. Describe the morphology, pathogenesis and laboratory diagnosis of Trichomonas vaginalis.
17. Describe in detail on the development of drug resistance in microbes.

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19MIC501 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

MICROBIOLOGY

Microbiology Theory V

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

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

1. Define Hypersensitivity.
2. Define innate immunity.
3. Write the properties of Dane particle.
4. Mention the culture media used to isolate Vibrio cholerae.
5. Name the organisms used to produce Streptomycin and Bacitracin antibiotics.
6. Mention the use of paper disc plate method.

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

7. Write a brief note on vaccines.
8. Write a short note on Immunoglobulin D.
9. Write a note on Diarrhoeagenic E.coli.
10. Write a note on pathogenesis and laboratory diagnosis of Neisseria gonorrhoeae.
11. Write a note on Griseofulvin and Zidovudine.
12. List the factors affecting antimicrobial control.

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

13. Explain in detail on Cell mediated Immune response.
14. What are Serological reactions? Add a note on the general features and measurement of Antigen Antibody reactions.
15. Explain in detail on Penicillosis and Aspergillosis.
16. Describe the morphology, pathogenesis and laboratory diagnosis of Trichomonas vaginalis.
17. Describe in detail on the development of drug resistance in microbes.

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19MIC502 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

MICROBIOLOGY

Microbiology Theory VI

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

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

1. What is Oxidation pond?
2. What is ground water and atmospheric water?
3. Write the causative agent of measles.
4. Write any two symptoms of Blastomycosis.
5. What are autochthonous bacteria?
6. Which organisms cause Coffee rust and Blister Blight of tea?

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

7. Discuss the different types of microorganisms present in water.
8. Write a note on membrane filtration technique.
9. Write a note on gravity slide method and Burkard spore trap.
10. Write a short note on factors affecting microflora of air.
11. Define microbial insecticide. Explain the use of one microbial insecticide in controlling the pests.
12. Explain the degradation of cellulose and pectin.

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

13. Explain sedimentation and filtration as methods involved in purification of drinking water.
14. Write about the different types of water and effect of sedimentation and food supply on microbes in stored water.
15. Describe the Kluyver and Visser sampler with a diagram.
16. Describe in detail bacterial pneumonia and bacterial meningitis.
17. Define microbial leaching. Explain any two methods of microbial leaching.

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18CHE501 Reg No : .....

CREDIT BASED SEMESTER SCHEME

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

CHEMISTRY

Chemistry Theory V

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

I. Answer any SEVEN of the following : **(7×2= 14 Marks)**

1. What is hydrate isomerism? Give an example.
2. Draw radial distribution curve for 2s and 3p orbitals.
3. Write the IUPAC name of i) $[Co(en)_3]SO_4$ ii) $Na_2[SiF_6]$.
4. Write Debye Huckel onsager equation and explain the terms.
5. Calculate the cell constant of a conductivity cell which shows a conductance of 10 mS when dipped in 0.1N KCl solution at 298K. Given specific conductance of 0.1N KCl solution at 298K is 1.29 Sm^{-1}
6. What is a stereogenic centre? Give an example.
7. What are the conditions for a compound to exhibit geometrical isomerism?
8. What is Walden inversion? Give an example.

II. Answer any SIX of the following : **(6×6= 36 Marks)**

9. a) Briefly explain Planck's quantum theory. (3)
   b) Mention any three postulates of valence bond theory. (3)
10. a) Calculate the wavelength of a particle of mass $4x10^{-13}$kg, moving with a velocity of $3x10^{7}ms^{-1}$ ($h = 6.626 \times 10^{-34}$ Js).(3)
    b) Explain ionisation isomerism with an example. (3)
11. a) Explain phase diagram of water system. (3)
    b) State and explain Kohlrausch's law. (3)
12. a) What are the points to be remembered while selecting a freezing mixture. (3)
    b) Explain the advantages of conductometric titrations vs usual titrations using indicators. (3)

13. a) What is dissociation constant of a weak electrolyte? How is it determined experimentally. (3)

b) A potential of 11 volts were applied between two electrodes placed 16 cm apart. A dilute solution of potassium chloride was placed between the electrodes when potassium ions found to cover a distance of 2 cm in one hour.. What is the mobility of potassium ions? (3)

14. a) What are racemic mixtures? Explain with an example. (3)

b) Explain the method of resolution of racemic mixtures by chemical method. (3)

15. a) Draw the Newmann projection formula for the conformers of ethane.(3)

b) Explain the mechanism of mutarotation.(3)

III. Answer any THREE of the following : (3×10= 30 Marks)

12. a) Write any five postulates of quantum mechanics. (5)

b) Explain geometrical isomerism in square planar complexes with two examples.(5)

13. a) Explain the application of Schrodinger's wave equation for a) particle in one dimensional box ii) hydrogen atom. (5)

b) Explain the hybridisation and geometry in $[Co(CN)_6]^{3-}$ using VBT theory. (5)

14. a)Explain the terms, phase, components, degrees of freedom with an example for each. (6)

b) Define the terms, specific conductance and equivalent conductance. Derive the relationship between specific conductance and equivalent conductance of an electrolytic solution. (4)

15. a) Write short note on diastereomers. (4)

b) Explain optical isomerism in tartaric acid (6)

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19CHE501 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

CHEMISTRY

Chemistry Theory V

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

PART - A

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

1 What is photoelectric effect?

2 Write all the four quantum numbers of $4f^1$ electron.

3 Define the term specific conductance of an electrolytic solution. Give the SI unit.

4 The fusion curve of water system is slopping towards the pressure axis. Why?

5 Write the structure of (i) deoxyribose and (ii) sucrose

6 What are glycosides? Give an example.

PART - B

II.Answer any <u>seven</u> of the following choosing at least TWO from each Unit.

(10×7= 70 Marks)

UNIT I

7 a) Explain the formation of complex $[Ni(CN)_4]^{2-}$ based on VBT and account for its magnetic property.

b) Write a note on Hamiltonian operator.

c) Derive de Broglie equation. (4+3+3)

8 a) Write any four postulates of quantum mechanics.

b) Write the IUPAC names of the following compounds. i) $Cr(PPh_3)(CO)]$

ii) $[Fe(C_2O_4)_3]^{3-}$ iii) $Co(NH_3)_5(ONO)]SO_4$

c) Write a note on radial distribution curves. (4+3+3)

9 a) Write the possible geometrical and optical isomers of $[Co(Cl_2)(en)_2]^+$

b) Write Schrodinger's wave equation for a particle in one dimensional box and hydrogen atom.

c) Explain the physical significance of wave function. (4+3+3)

UNIT II

10 a) Explain the phase diagram of water system.

b) Explain the experimental determination of dissociation constant of a weak electrolyte?

c) The specific conductance of saturated solution of silver chloride at 25°C after subtracting the specific conductance of water is 2.25×10^{-4} Sm^{-1}. Calculate the solubility of AgCl in g/ dm^3 if $\lambda_{AgCl} = 138.3 \times 10^{-4}$ Sm^2. Molecular mass of AgCl is 143.5. (4+3+3)

11 a) With the help of a diagram discuss the phase diagram of lead-silver system.

b) State Kohlrausch's law and explain any one of its applications.

c) Explain the conductometric titration between weak acid and strong base. (4+3+3)

12 a) Explain the Hittorf's method of determining the transport number of an ion using non attackable electrodes.

b) Explain reduced phase rule equation with an example.

c) A decinormal solution of silver nitrate was electrolysed between platinum electrodes. After passing a small current for 2 hours a fall in concentration of 0.0805125 g.eq occurred in the anodic solution. The weight of copper deposited in the copper coulometer placed in series was found to be 0.03879g. Calculate the transport number of silver and nitrate ions. (Eq wt of Copper is 31.8). (4+3+3)

UNIT III

13 a) Explain the method of resolution of racemic mixtures by chemical method and biochemical method.

b) Discuss the mechanism of mutarotation.

c) How is the ring size of glucose determined by periodic acid method. (4+3+3)

14 a) Explain with example Kiliani synthesis.

b) Discuss optical isomerism in threose and erythrose.

c) Explain Ruff degradation with an example. (4+3+3)

15 a) How is the configuration of glucose determined?

b) With the help of Newmann projection formulae explain conformational isomerism in 1,2-dichloroethane.

c) Write short note on geometrical isomerism in oximes. (4+3+3)

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18CHE502 Reg No : .....

CREDIT BASED SEMESTER SCHEME

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

CHEMISTRY

Chemistry Theory VI

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

I. Answer any SEVEN of the following : **(7×2= 14 Marks)**

1. Among NaCl, $BaCl_2$ and $AlCl_3$, the melting point decreases in the order NaCl > $BaCl_2$ > $AlCl_3$. Give reason.
2. How does HSAB principle govern the occurrence of minerals?
3. What is molecular spectroscopy?
4. Define chemical shift.
5. Explain Meervein Pondorf Verley reduction with an example.
6. Write the keto and enol forms of acetoacetic ester.
7. How is acetic acid obtained from Grignard reagent?
8. What are the characteristics of a dye?

II. Answer any SIX of the following : **(6×6= 36 Marks)**

9. With suitable examples explain the characteristics of (i) hard/soft acids (ii) hard/soft bases.
10. Explain the conducting properties of materials using band theory.
11. a) Explain anharmonic behaviour of diatomic molecules. Draw the energy level diagram of a molecule for vibrational transition with anharmonic oscillator. (3)
    b) Derive an expression for rotational energy and rotational constant of a rigid rotor. (3)
12. a) Explain the NMR spectrum of toluene. (3)
    b) How does PMR spectrum of a compound helps us to elucidate the structure of a compound. (3)

13. a) The bond length of ^{12}C ^{14}N is 0.129nm. Predict the position of first three lines of microwave spectrum. (3)

    b) What is selection rule. Write and explain the selection rule for Infra red transition (vibrational transition). (3)

14. Give the synthesis of a) acetone from AAE b) cinnamic acid from DEM

15. Give the synthesis of a) barbituric acid from DEM b) propanoic acid from AAE

III. Answer any THREE of the following : (3×10= 30 Marks)

12. a) Explain how lattice energy of sodium chloride crystal is calculated using Born Haber cycle.(6)

    b) Explain the solubility of ionic solids on the basis of lattice energy and solvation energy.(4)

13. a) With the help of a neat diagram explain the separation of lanthanides by ion echange method. (6)

    b) What are the consequences of lanthanide contraction? (4)

14. a) Show that the frequency separation of successive lines in pure rotational spectra of rigid diatomic molecule is 2B (3)

    b) The pure rotational spectrum of gaseous HCl consists of a series of equally spaced lines separated by 20.8 cm^{-1} . Calculate the internuclear distance of the molecule if the atomic masses are ^{1}H = 1.008gmol^{-1} and ^{35}Cl = 35.453 gmol^{-1}.(4)

    c) What is a selection rule? Write and explain the selection rule for a Microwave (rotational) transition (4)

15. a) Give the salient features of the molecular orbital theory of colour. (3)

    b) With suitable examples explain the classification of dyes based on methods of application. (7)

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19CHE502 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

CHEMISTRY

Chemistry Theory VI

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

PART - A

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

1 What is the principle used in the separation of lanthanides?

2 Explain how electronegativity can be used to explain hardness and softness of acids and bases.

3 Define shielding of protons.

4 Give the expression for the force constant and explain the terms.

5 Explain Gatterman-Koch aldehyde synthesis.

6 Give one method of preparation of Aluminium isopropoxide.

PART - B

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

(10×7= 70 Marks)

UNIT I

7 a) What is lanthanide contraction? Explain its cause.
b) Explain the complexation tendencies of f-block elements.
c) State the limitations of HSAB theory. (4+3+3)

8 a) Differentiate between conductors, semiconductors and insulators on basis of band theory of metallic bond.
b) Give any three differences between actinides and lanthanides.
c) With suitable examples explain the characteristics of hard and soft bases. (4+3+3)

9 a) Explain how lattice energy of sodium chloride crystal is calculated using Born Haber cycle.
b) Explain the general trends in electronic configuration of lanthanides.
c) Use the following information to calculate the heat of sublimation for potassium: Heat of formation for KCl (s) = -437 kJ/mol, Electron affinity for Cl = -349 kJ/mol, Ionization energy for K = 418 kJ/mol, Lattice energy for KCl = 717 kJ/mol, Heat of

formation for Cl(g) = 122 kJ/mol, Bond dissociation energy for Cl2(g) = 243 kJ/mol. (4+3+3)

UNIT II

10 a) Derive an expression for moment of inertia of a rigid diatomic rotor.

b) What are the various molecular vibrations for a molecule of AB_2 type with A in the centre?

c) The bond length of $^{12}C^{14}N$ is 0.129nm. Predict the position of first three lines of microwave spectrum. (4+3+3)

11 a) The pure rotational spectrum of gaseous CN molecule consists of a series of equally spaced lines separated by 3.7879 cm^{-1}.Calculate the internuclear distance of the molecule.The molar masses are ^{12}C = 12.01$gmol^{-1}$ and ^{14}N = 14.007$gmol^{-1}$.

b) Explain the quantum theory of Raman effect?

c) Give three advantages of Raman effect? (4+3+3)

12 a) Explain the following in NMR spectroscopy of ethyl bromide (i) Number of signals (ii) spin-spin splitting (iii) peak area

b) Draw and explain the NMR spectrum of toluene.

c) Explain the principle of Raman spectroscopy.(4+3+3)

UNIT III

13 a) Give the synthesis of 4-methyl uracil from AAE and barbituric acid from DEM.

b) Write a note on bathochromic and hypsochromic shift.

c) How is anhydrous aluminium chloride prepared? (4+3+3)

14 a) Give the salient features of the molecular orbital theory of colour.

b) Explain the formation of t-Butyl alcohol from Grignard reagent.

c) How is cinnamic acid prepared from DEM. (4+3+3)

15 a) Give the synthesis of methyl orange and congo red.

b) Explain the mechanism of Claisen condensation.

c) How is butanoic acid prepared from DEM. (4+3+3)

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19ZOO502 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION JANUARY 2023

ZOOLOGY

Zoology Theory VI

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

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

1. Define parthenogenesis. Explain complete parthenogenesis with an example.
2. Define gametogenesis? Name the germinal cells of the testis.
3. Explain any two morphogenetic movements occurring during the development of frog.
4. Classify frog egg based on amount and distribution of yolk.
5. What is the type of cleavage in chick?
6. Explain the structure of human blastocyst.

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

7. What is a gene bank? List the advantages.
8. Explain pre-vitellogenesis and vitellogenesis.
9. Explain the theory of Epigenesis, give the experimental evidence.
10. Describe different types of cleavage with suitable examples.
11. Give an account of gastrulation in chick. Illustrate your answer with suitable diagram.
12. Draw a labeled diagram and explain Epitheliochorial placenta and Endotheliochorial placenta.

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

13. With reference to recent trends in human reproduction explain in detail IVF, ET and surrogate mother .
14. Explain the male and female reproductive system in human. Add a note on secondary sexual characters.

15. Define organizer phenomenon. Explain the transplantation experiment of Spemann and Mangold on amphibian gastrula to show the dorsal lip of the blastopore as the organizing centre.

16. With labelled diagram, explain acrosomal reaction, sperm penetration and cortical changes during fertilization.

17. Explain the origin, structure and function of Yolk sac & Allantois. Illustrate with diagram.

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