CHOICE BASED CREDIT SYSTEM

B.Sc SIXTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023

MICROBIOLOGY

Food, Dairy and Industrial Microbiology

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

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

1. What are perishable foods?

2. Define Ensilage.

3. Define gassy fermentation.

4. Define Yoghurt and organisms involved in its industrial production.

5. Define an Impellor and mention its use.

6. Define Crude media with an example.

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

7. Write a note on blanching.

8. Write a note on Breed's method used for examination of foods.

9. Write a note on Standard Plate Count of milk.

10. Write a note on pathogenic microorganisms in milk.

11. Explain about the air sterilization in fermentor.

12. Explain about the Citric Acid production in industry.

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

13. Describe the factors responsible for the spoilage of food.

14. Explain food poisoning caused by Staphylococcus aureus and Clostridium.

15. Explain the contamination of milk in detail.

16. Explain the methods of Pasteurization of milk.

17. Explain the Beer Production in Industries.

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CHOICE BASED CREDIT SYSTEM
B.Sc SIXTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023
MICROBIOLOGY
Bacterial Genetics

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

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

1. Define a nucleotide.

2. What is a Topoisomerase? Write its function.

3. Define Biochemical Mutants.

4. Define Neutral type of mutation.

5. What is a Bacteriophage?

6. What is the role of DNA polymerase in genetic engineering?

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

7. Write a note on Lac Operon.

8. Write a note on mRNA.

9. Define mutation, mutants and write about spontaneous mutation.

10. Define mutation, and write about transition and transversion type of mutation.

11. Write a brief note on splicing and insertion of DNA by terminal transferase method.

12. Write a note on safeguards of genetic engineering.

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

13. Describe the process of transcription in prokaryotes.

14. Explain the method of specialised transduction as a means of genetic recombination in bacteria.

15. Explain in detail the induced type of mutation.

16. Explain in detail the types of mutation produced using chemical agents.

17. Describe the production of insulin by recombinant DNA technology.

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CHOICE BASED CREDIT SYSTEM

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

MICROBIOLOGY

Paper - VIII: Bacterial Genetics

Duration:3 Hours   Max Marks:80

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

1. What is mRNA? Write its function.

2. What are ligases?

3. Define the term Mutation.

4. Define Replica Plating Tecnhique.

5. List the methods of Splicing and insertion of DNA.

6. Define Plasmid.

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

7. Write a note on genetic code.

8. Write a note on Structure of DNA.

9. Define mutation, mutants and write about mutation rate.

10. Write about the Macrolesions produced in DNA due to mutation.

11. Write briefly on transgenic plants.

12. Write a note on cloning strategy.

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

13. Explain the process of protein synthesis in prokaryotes.

14. Describe the U tube experiment. Add a note on Generalised transduction.

15. Explain in detail the types of mutation produced using chemical agents.

16. Define mutation, mutants and write about DNA repair in organisms by photoreactivation.

17. Describe in detail the types of hosts used for cloning.

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19MAT601   Reg No   :   ....

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

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

a. An approximate value of a number is given by 3.1428571 and it's true value is 3.1415926. Find the absolute, relative and percentage errors.

b. Find an interval of unit length in which the equation $x^3 - x - 4 = 0$ has a real root.

c. Find $\phi(x)$ of iteration method for the equation $\cos x = 3x - 1$ with $x_0 = 0.5$.

d. (i) What is the degree of interpolating polynomial which interpolates n distinct points?
(ii) When is Lagrange's interpolation formula specially used?

e. (i) When is Newton's backward difference formula specially used?
(ii) What is inverse interpolation?

f. Write the formula for $\frac{d^2y}{dx^2}$ at $x = x_0$ when Newton's forward difference formula is used.

g. (i) What is the order of error in Runge-Kutta method of order 2?
(ii) In Runge-Kutta fourth order formula $y_1 = y_0 + \frac{1}{6}[k_1 + 2k_2 + 2k_3 + k_4]$, write the expression for k_2.

h. If $y' = -y, y(0) = 1$, find $y(0.1)$ using Euler's method $h = 0.1$.

i. Find the approximate value of $\int_0^1 \frac{dx}{x+1}$ correct to 3 decimal places, using trapezoidal rule with $h = 0.5$

j. In adam-Moulton formula $y^c = y_0 + \frac{h}{24}[af_1^p + bf_0 - cf_{-1} + df_{-2}]$, write the values of a, b, c, d.

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

a. Solve the following system of the equation by Gauss-Jacobi method, carry out 3 iterations.

$5x - 3y + 7z = 4$

$3x + 26y + 2z = 9$

$7x + 2y + 10z = 5$

b. Find a real root of the equation $x^3 - x - 4 = 0$ using the Regula-Falsi method .

c. Find a real root of the equation $x^3 - x^2 - 1 = 0$ by bisection method, correct to 3 decimal places.

d. Derive Newton's forward difference formula to interpolate the set of points $(x_0, y_0), (x_1, y_1), \ldots \ldots, (x_n, y_n)$.

e. From the following table of values of x and $f(x)$, determine $f(0.29)$:

x	0.20	0.22	0.24	0.26	0.28	0.30
f(x)	1.6596	1.6698	1.6804	1.6912	1.7024	1.7139

f. Using Lagrange's interpolation formula, express the function $\dfrac{3x^2+x+1}{(x-1)(x-2)(x-3)}$ as the sum of partial fractions .

g. From the following table of values of x and y , find $\dfrac{dy}{dx}$ and $\dfrac{d^2y}{dx^2}$ when $x = 3$.

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

h. Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ with $h = 0.125$ using Simpson's $\frac{1}{3}$rd rule.

i. Using modified Euler's formula, find y(0.04) if y ' = x² + y, y(0)=1. Take h=0.02.

j. Given

$y' = 1 + y^2, y(0) = 0, y(0.2) = 0.2027, y(0.4) = 0.4228, y(0.6) = 0.6841.$

Compute $y(0.8)$ by using Adam-Bashforth predictor formula.

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CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION .MAY/JUNE 2023
MATHEMATICS
PAPER VII: Partial Differential Equations, Vector spaces and Series.

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) Eliminate the arbitrary function from $z = e^y f(x + y)$.

  b) Solve $pq = k$.

  c) Find the complete integral of $\frac{z}{pq} = \frac{x}{q} + \frac{y}{p} + \sqrt{pq}$.

  d) If V is a vector space over a field F, then prove that
   i) $(-\alpha)v = -(\alpha v)$ for every $\alpha \epsilon F, v \epsilon V$
   ii) If $v \neq 0$ and $\alpha v = 0$ then prove that $\alpha = 0$

  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 independence 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) Find the matrix which represents the linear transformation described by:
   $(1,1) \rightarrow (0,1), (-1,1) \rightarrow (3,-2)$.

  h) Prove that the null space of a linear transformation $T: V \rightarrow W$ is a subspace of V.

  i) Find the eigen values of matrix $\begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}$

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

  k) Determine if the sequence $\left\{ \frac{n}{2n+1} \right\}$ is increasing or decreasing.

  l) Determine whether the sequence $\left\{ n \sin \frac{\pi}{n} \right\}$ is convergent or divergent.

  m) Use the comparison test to determine if the series $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}}$ is convergent or divergent.

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

  o) Prove that the series $\sum \frac{(-1)^{n+1}}{n}$ is conditionally convergent.

PART - B

UNIT-I

2. a) Assuming the condition of integrability solve
    $(2x + y^2 + 2zx)dx + 2xydy + x^2dz = 0$. **(6)**

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

    c) Solve $p^2 + q^2 = z$. **(6)**

3. a) Assuming the condition of integrability solve

    $(y^2 + yz)dx + (xz + z^2)dy + (y^2 - xy)dz = 0$. **(6)**

    b) Solve $p(1 + q^2) = q(z - 1)$. **(6)**

    c) Solve $p^2 + q^2 = x - y$. **(6)**

UNIT-II

4. a) If $v_1, v_2, \ldots \ldots v_n \in V$ are linearly independent, then prove that every element in their linear span has a unique representation in the form $\lambda_1 v_1 + \lambda_2 v_2 + \cdots + \lambda_n v_n$ with $\lambda_i \in F$. **(6)**

    b) If V is a finite dimensional vector space, then prove that there exists a finite set $v_1, v_2 \ldots \ldots v_n$ of linearly independent elements whose linear span is V. **(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)**

5. a) V is a vector space over F. If $v_1, v_2, \ldots \ldots v_n$ are in V, then prove that either they are linearly independent or some v_k is a linear combination of its preceding vectors. **(6)**

    b) 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 $dimW \leq dimV$. **(6)**

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

UNIT-III

6. a) Prove that an isomorphism T of V onto W carries any set of linearly independent vectors $\alpha_1, \alpha_2, \ldots, \alpha_n$ in V into linearly independent vectors in W and any set $\beta_1, \beta_2, \ldots, \beta_n$ of vectors spanning V into vector spanning W. **(6)**

    b) Find the inverse of the matrix $\begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix}$ using linear transformations. **(6)**

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

7. a) Define linear transformation of a vector spaces V into W. Prove that the product of two linear transformation of V into V is linear. **(6)**

    b) If $\beta_1, \beta_2, \ldots \ldots \beta_m$ is any basis of a vector space V and $\alpha_1, \alpha_2, \ldots, \alpha_m$ are any m vectors in a vector space W, then prove that there is one and only one linear transformation $T: V \to W$ with $\beta_1 T = \alpha_1, \beta_2 T = \alpha_2, \ldots, \beta_m T = \alpha_m$. This linear transformation is defined by $(x_1\beta_1 + x_2\beta_2 + \ldots \ldots x_m\beta_m)T = x_1\alpha_1 + x_2\alpha_2 + \ldots \ldots x_m\alpha_m$. **(6)**

    c) Express $\begin{pmatrix} -1 & 1 \\ 2 & 0 \end{pmatrix}$ as a product of elementary matrices. **(6)**

UNIT-IV

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

   b) Determine if the series $\sum(\frac{1}{4n} + \frac{1}{4^n})$ is convergent or divergent. **(6)**

   c) Prove that the series $\sum\frac{1}{n!}$ is convergent. **(6)**

9. a) Using $\in -\delta$ definition of limits, prove that the sequence $\left\{\frac{2n^2}{5n^2+1}\right\}$ has limit $\frac{2}{5}$. **(6)**

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

   c) Discuss the convergence of $\sum_{n=1}^{\infty}\frac{1}{n(n+1)}$ **(6)**

UNIT – V

10. a) Determine whether the infinite series $\sum_{n=1}^{\infty}\frac{1}{(n^2+1)^{1/3}}$ is convergent or divergent. **(6)**

    b) Determine if the following series is convergent or divergent
       $\sum_{n=1}^{\infty}\frac{1}{3^n+1}$ **(6)**

    c) 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 $\displaystyle\lim_{n \to \infty} a_n = 0$. **(6)**

11. a) Let $\sum_{n=1}^{\infty} u_n$ be a series of positive terms. If $\sum_{n=1}^{\infty} w_n$ is a series of positive terms that is *known to be divergent and*
       $u_n \geq w_n$ *for all positive integers n, then prove that* $\sum_{n=1}^{\infty} u_n$ *is* divergent. **(6)**

    b) Using root test find if the series $\sum_{n=1}^{\infty}\frac{1}{(log(n+1))^n}$ is convergent or divergent. **(6)**

    c) Use ratio test to determine whether the series $\sum_{n=1}^{\infty}(-1)^{n+1}\frac{n}{2^n}$ is convergent or divergent. **(6)**

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CHOICE BASED CREDIT SYSTEM

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

MATHEMATICS

Mathematics VIII: Linear Algibra

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

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

a. Define linear transformation. Prove that $T : F_n[x] \to F$ defined by
$T(a_0 + a_1 x + a_2 x^2 + \ldots + a_n x^n) = a_0$ is a linear transformation.

b. Give one example each for nilpotent matrix, non-singular matrix and diagonal matrix.

c. Let $T : V \to V'$ be a linear transformation, then prove that T is a one one mapping if and only if $kerT = \{0\}$.

d. Prove that a linear transformation $T : V \to V$ is $(1,1)$ if and only if T is onto.

e. Show that the ring $M_n(F)$ has zero divisor.

f. Find the row rank of the matrix $A = \begin{bmatrix} 1 & 0 \\ 2 & 0 \end{bmatrix}$.

g. Let $T \in L(V,V)$ and let $n(T) = dim(kerT)$ (i.e nullity of T). Prove that $n(T) + r(T) = dimV$.

h. Show that the system of 3 non-homogeneous equations
$x_1 - 2x_2 + x_3 = \frac{1}{2}$, has no solution.
$2x_1 - 5x_2 + x_3 = 1$,
$x_1 + x_2 + x_3 = 1$

i. Define the minimum polynomial of a linear transformation.Find the minimum polynomial of $A = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$

j. Let $A \in M_n(F)$ and A^t be the transpose of A. Then show that $P_A(t) = P_{A^t}(t)$.

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

a. State and prove First Isomorphism theorem.

b. Let V be a vectorspace over F and let W be a subspace of V. Let $v_1, v_2, \ldots, v_n$ be a basis of V such that $v_1, v_2, \ldots, v_m (m \leq n)$ is a basis of W. Then prove that $\bar{v}_{m+1}, \bar{v}_{m+2}, \ldots, \bar{v}_n$ is a basis of V/W over F.

c. If the matrix of a linear transformation $T : R^3 \to R^2$ with respect to the basis $\{(1, 0, 1), (1, 1, 0), (0, 1.1)\}$ is $\begin{bmatrix} 2 & 1 \\ 4 & 0 \\ 1 & 1 \end{bmatrix}$. Find the matrix of T with respect to the basis $\{(1, 0, -1), (-1, 1, 0), (0, -1, 1)\}$.

d. Prove that T is an isomorphism if and only if $m(T)$ is non-singular.

e. Let $T, T' \in L(V, V')$. Then prove that
   (i) $r(TT') \leq min\{r(T), r(T')\}$
   (ii) $r(TT') = r(T'T) = r(T)$, if T' is non-singular.

f. If $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$, find A^{-1} by using elementary row operations.

g. Show that two similar matrices have the same minimum polynomial .

h. Let $A \in M_n(F)$ and let $\lambda \in F$. If λ is a characteristic root of A, then for any $f(x) \in F[x]$, show that $f(\lambda)$ is a characteristic root of $f(A)$.

i. (i) Show that zero is a characteristic root of A if and only if A is singular.
   (ii) Show that A is nilpotent if and only if all its characteristic roots are zero.

j. Find the characteristic roots of $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 3 \\ 0 & 0 & 3 \end{bmatrix}$.

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CHOICE BASED CREDIT SYSTEM

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

MATHEMATICS

Paper VIII - Graph Theory
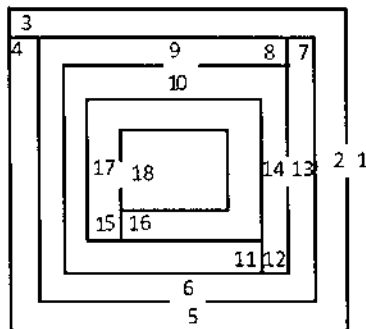
Duration:3 Hours   **Max Marks:80**

I. Answer any EIGHT of the following :   (8×3= 24 Marks)
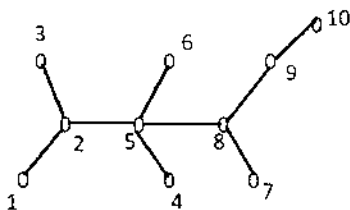
a. Define the following with an example each:

   degree, loop, adjacent edges

b. Define isomorphic graph. Draw 2 non-isomorphic graphs having 4 vertices and 4 edges

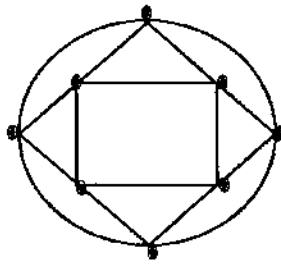c. Represent the following maze by a graph. Write pendant vertices if any.

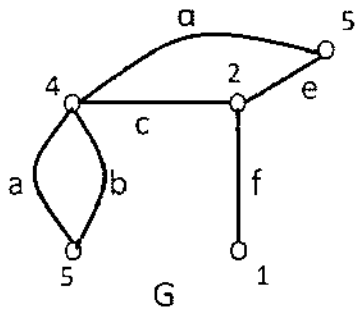d. Define rooted tree. Prove that the number of vertices n in a binary tree is odd.

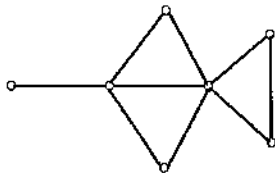e. Find the centre(s) of the tree given below:

f. Define vertex connectivity. Determine the vertex connectivity of the given graph.
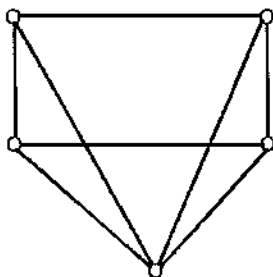
g. Define incidence matrix. Write the incidence matrix of the graph G given below:

h. Define proper colouring. Properly colour the graph given below with minimum number of colours .

i. Find the chromatic polynomial of the following graph.

j. Define adjacency matrix. Write the adjacency matrix of the graph given below:

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

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

a. Prove that a graph G is connected if and only if its vertex set V can be partioned into two nonempty disjoint subsets V_1 and V_2 such that there exists no edge in G whose one end vertex is in subset V_1 and the other in subset V_2.

b. Prove the following:

i) If a graph (connected or disconnected) has exactly two vertices of odd degree, there must be a path joining these two vertices.

ii) A simple graph with n vertices and k components can have at most $\frac{(n-k)(n-k+1)}{2}$ edges.

c. Prove that a given connected graph G is an Euler graph if and only if all vertices of G are of even order.

d. Prove that the complete bipartite graph $K_{3,3}$ is non planar.

e. Prove the following:

i) If in a graph G there is one and only one path between every pair of vertices, then G is a tree.

ii) A graph is a tree if and only if it is minimally connected.

f. i) Prove that every connected graph has atleast one spanning tree.

ii) With respect to the spanning tree $T = \{a, b, c, d\}$ write all the fundamental circuits of G.

G
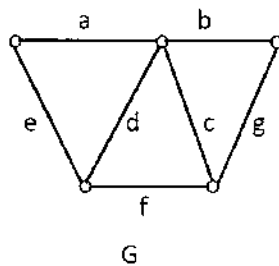
g. Prove that in any simple connected planar graph with f regions, n vertices and e edges $(e > 2)$, $e \leq 3n - 6$ and hence derive that the complete graph K_5 of 5 vertices is non planar.

h. Define union, intersection and ringsum of two graphs and find union, intersection and ringsum of the following graphs.
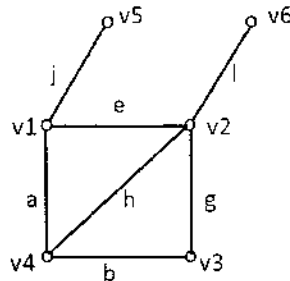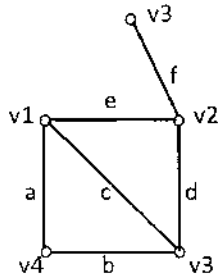
i. Define chomatic polynomial.

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

j. If $A(G)$ is an incidence matrix of a connected graph G with n vertices, then prove that Rank $A(G) = n - 1$.

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CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023
ZOOLOGY
Genetics, Evolution and Palaentology

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

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

1. Give the characteristics of multiple alleles.

2. Give any 4 applications of ABO blood group system in humans.

3. What is lac operon? Name the genes found in the lac operon.

4. What is amniocentesis?

5. What are analogus organs? Give examples.

6. Define gene flow. What are the factors responsible for gene flow?

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

7. Give any 4 practical applications of genetics.

8. Explain the principles of blood transfusion in humans.

9. Give an account of genic balance theory of sex determination.

10. Write short notes on   i) Alkaptonuria   ii) Phenylketotonuria

11. Explain macro evolution with an example.

12. What is Neo-Darwinism? Enumerate the various factors that change the gene frequencies in a given population

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

13. Explain polygenic inheritance with reference to eye colour in humans.

14. Write an essay on nature and nurture with reference to *Potentilla glandulosa* and Human twins.

15. Explain the mutations and genes linked to cancer.

16. Explain DNA repair mechanism

17. Explain the trends in the evolution of man.

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CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023
ZOOLOGY
Ecology, Toxicology and Biostatistics

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

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

1. Name any two mesofauna and macrofauna of soil.

2. Define the term nekton.Give an example.

3. Define habitat degradation with reference to wild life.

4. What is sedimentary Cycle? Give example.

5. Comment on electrostatic precipitation.

6. Define Photochemical Smog.

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

7. Describe food web. Add a note on significance of food web.

8. Write short notes on a) adaptations for temperature b) Thermoregulation in winter

9. Define landscape ecology. Explain the various principles of landscape ecology.

10. With reference to population explain growth curves and age distribution.

11. Discuss the sources and toxicity of Zootoxins.

12. What is a population? Explain its types with suitable examples.

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

13. Differentiate between mutualism and commensalism giving relevant examples.

14. Explain terrestrial habitat with reference to Tundra, forest, grassland and desert biomes.

15. Explain community stratification. Add anote on ecotone and edge effect.

16. With suitable examples and illustrations explain limiting factors.

17. Describe exo and endo toxins. Add a note on thier differences.

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CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023
BOTANY
Plant Biotechnology

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

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

1. What is a Chemostat? Mention its significance.

2. What is hapliod culture?

3. What is shot gun method?

4. What is restriction digestion?

5. Mention the significance of Golden Rice.

6. What is stirred tank fermenter?

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

7. Describe the aseptic techniques involved in preparation of stem cutting as an explant.

8. Explain type II and type III restriction enzymes.

9. What is Biotechnology? Mention its branches and explain its scope.

10. Explain embryogenesis.

11. Briefly explain i) Ageing of wine ii) Ripening of Cheese iii) Hydrometer and Refractometer

12. Differentiate between Chemostat and Turbidostat.

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

13. Briefly explain Anther culture. Mention its significance.

14. Briefly explain the biohazardous events observed in your atmosphere. Add a note on its biosafety measures.

15. What are the tehniques used to screen the transformed cells? Describe them.

16. With neat labelled diagram explain the construction of pBR322 and pUC18.

17. Describe the mechanism of Pest resistance by Genetically engineered Bt toxin and Cowpea trypsin.

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CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023
BOTANY
Paper - VIII: Environmental Biology and Biometrics

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

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

1. What is pH? What are its ranges?

2. List out the ecological group of plants depending upon their water relations.

3. Define primary and secondary succession.

4. Mention the distinct type of vegetation seen in Dakshina Kannada and Udupi districts.

5. What is gully erosion?

6. What are endemic plants? Name any two endemic plants of the Western Ghats.

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

7. Give an account on the effect of light on vegetation.

8. Define food chain. Mention their different types with examples.

9. What is biogas? Add a note on the parts of biogas plants.

10. Write the effects of water pollution.

11. Write the advantages of rain water harvesting.

12. Mention the causes for biodiversity loss.

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

13. Explain in detail the positive interaction of biotic factors.

14. Explain pyramid of number and energy in detail.

15. Explain breifly the process of succession.

16. Write a ote on (i) Protection forestry (ii) Production forestry

17. Compute the arithmetic mean from the following data (both direct and short- cut method).

Plant height	0-10	10-20	20-30	30-40	40-50	50-60
No. of Varieties	5	10	25	30	20	10

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CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023
PHYSICS
Paper - VII: Nuclear Physics

Duration:3 Hrs   Max Marks:80

PART - A

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

1. What are slow neutrons?

2. Give an example for exchange force.

3. What is photo fission?

4. What is the origin of stellar energy?

5. What is meant by chain reaction?

6. What is radioactive decay?

7. What is transient equilibrium?

8. What happens to the mass of an element when it emits 2 beta particles from its nucleus?

9. What is a nuclear reaction?

10. Write the unit of nuclear reaction cross section.

11. Give the necessary condition for the working of a betatron.

12. What is a Cyclotron?

13. What is the significance of a GM characteristic curve?

14. What is East –West effect?

15. What are baryons?

PART - B
UNIT I

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

16. a) Distinguish between isotones and isomers.

    b) Explain in detail nuclear angular momentum and nuclear magnetic moment. Hence arrive at an expression for the ratio of Nuclear magneton to Bohr magneton.

17. a) Give any two merits and demerits of shell model of the nucleus.

    b) Describe the phenomenon of nuclear fission. Explain nuclear fission on the basis of liquid drop model.

18. a) Briefly account for the use of moderators and control rods in a nuclear reactor.

    b) Explain Yukawa's meson field theory and explain how the rest mass of a meson can be estimated using uncertainty principle.

UNIT II

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

19. a) Mention the four radioactive series.

 b) With elements A, B and C forming a radioactive series, derive an expression for the number of atoms of B, if at start B was not present in the sample.

20. a) Obtain an expression for α- particle disintegration energy.

 b) Write in detail about film badges and pocket dosimeter.

21. a) Explain about ionising and non ionising radiations.

 b) Explain Rutherford's experiment on first artificial transmutation of elements.

UNIT III

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

22. a) What are linear and orbital accelerators? Explain.

 b) Describe the construction and working of a betatron and hence arrive at the expression for the energy gained by the electron.

23. a) Write a note on the origin of cosmic rays.

 b) Draw a labeled diagram of a semiconductor detector and explain its working. What are its advantages?

24. a) Distinguish between nucleons and hyperons .

 b) With relevant diagram describe about cosmic ray shower.

PART - C

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

25. On the basis of uncertainty principle estimate mass of pions.

26. It is proposed to produce 100 MW of electrical power on an average in a nuclear reactor having 25 % efficiency, using U-235. Calculate the mass of U-235 required per day for continuous operation. Given energy released per fission of U-235 is 200 MeV.

27. Calculate the time required for 10 % of a sample for Thorium to disintegrate ($T_{1/2}$ of Thorium = 1.4 x 10^{10} years).

28. 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?

29. Deuterons in a cyclotron describe a circle of radius 0.32 m just before emerging from the dees. The frequency of the applied emf is 10 MHz. Find the flux denxity of the magnetic field and the velocity of the deutrons emerging out of the cyclotron.
 Mass of the dueteron = 3.32 x 10^{-27} kg.

30. A betatron working on an operating frequency of 60 Hz has a stable orbit of radius 1.6 m. Find the final energy and energy gained per revolution by the electron, given magnetic flux density at the orbit = 0.5 T. Velocity of electrons is nearly equal to the velocity of light.

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CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION
MAY/JUNE 2023
PHYSICS
Paper - VIII: Electronics

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

PART - A

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

1. What are BJTs?

2. What are the advantages of voltage-divider biasing method?

3. Give the relation between α and β in a transistor.

4. Mention any two drawbacks of a Zener voltage regulator.

5. Which configuration of a transistor amplifier is used to connect a high impedance source to a low impedance load?

6. What is the function of coupling capacitor in an amplifier circuit?

7. What is the output impedance of ideal operational amplifier?

8. What is meant by positive feedback?

9. What is an oscillator?

10. Give the truth table of a two input XOR gate.

11. Write the logic circuit for full adder.

12. How many bits form a byte?

13. What is dc-modulation?

14. What are the major components of a CRT?

15. What is the advantage of interlaced scanning in TV?

PART - B
UNIT I

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

16. a) Define trans-conductance of JFET and write its expression.

    b) What is dc load line of a transistor and how do you obtain it? Explain how Q-point is located.

17. a) Explain in brief CE configuration of a transistor.

    b) With a neat diagram, explain the working of a bridge rectifier.

18. a) Mention any four advantages of JFET over BJT.

    b) Draw and explain the practical circuit of CE amplifier. Discuss the various currents flowing in it.

UNIT II

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

19. a) Describe the action of a π filter.

    b) Draw and explain ac equivalent circuits of CE amplifier using r_e transistor model and derive the operating characteristics.

20. a) Explain the effect of coupling capacitor at low frequency range.

    b) What is an inverting amplifier? How can an OPAMP be used as an inverting amplifier? Derive expression for its voltage gain and mention the values of input & output resistances.

21. a) Explain dc load line analysis.

    b) With a neat circuit diagram, explain the working of a Wein -bridge oscillator.

UNIT III

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

22. a) Define bandwidth, input bias current and give their ideal & practical values.

    b) Explain the working of D flip-flop with diagram. Give the truth table and timing diagram.

23. a) Draw the diagram and write the truth table for a two input OR gate.

    b) What is modulation? Explain briefly the need for modulation.

24. a) Mention any two limitations of AM.

    b) Describe FM radio transmitter with a block diagram.

PART - C

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

25. Find the value of β, if $\alpha = 0.9$ and calculate I_E in a transistor for which $\beta = 50$ and $I_B = 20\mu A$.

26. A bridge rectifier has a transformer secondary voltage $20V_{rms}$. If supplied power to load resistance
    1000Ω and diode forward resistance 10Ω Calculate (i) output voltage (ii) rectifier efficiency.

27. A non- inverting amplifier uses $R_1 = 2.2$ kΩ, $R_2 = 10$ kΩ, calculate the output voltage if the input voltage is 0.1V. Also calculate output voltage when input voltage is halved.

28. In a Wein Bridge oscillator if the resonating frequency is 10 kHz and R =100 kΩ, calculate the value of capacitance of the capacitor used in the network to provide zero phase difference.

29. Prove that the complement of $Y = (A.\overline{AB})(B.\overline{AB} = \bar{A} + \bar{B} + AB$ and draw the logic diagram.

30. A 500 W, 100 KHz carrier is modulated to a depth of 60 % by modulating signal of frequency 1 KHz. Calculate the total power transmitted. What are side band components of the wave?

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CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023
CHEMISTRY
General Chemistry VII

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

PART - A

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

1 What are inert complexes? Give one example.

2 Write two merits of crystal field theory.

3 Write the expression for EMF of the cell.

4 Differentiate between concentration cell with transference and without transference.

5 How is octahydroindole obtained from indole?

6 What is a UV spectrum?

PART - B

II.Answer any seven of the following choosing at least TWO from each Unit.
(10×7= 70 Marks)

UNIT I

7 a. Explain the chemical properties of organolithium compounds
   b. Explain two applications each of complexes by quantitative analysis.
   c. Write short notes on diamagnetic, paramagnetic and ferromagnetic properties of complexes. (4+3+3)

8 a. Explain the classification of organometallic compounds based on nature of bonding.
   b.Give the comparision between Valence Bond Theory and Crystal Field Theory.
   (6+4)

9 a. Discuss the crystal field splitting in case of octahedral complexes.
   b. Explain any two methods of preparation of organomercury compounds. (6+4)

UNIT II

10 a. Represent schematically the cell made up of the following half cell reactions and calculate the EMF of the cell. $Mg \rightarrow Mg^{2+}(0.01M) + 2e^-$, $E^0 = +2.34V$,
            $Sn^{2+}(0.1M) + 2e^- \rightarrow Sn$ $E^0 = -0.136V$
   b. Write a short note on nuclear fission.
   c. Derive Nernst equation for cell EMF. (4+3+3)

11 a. Write any three differences between thermochemical and photochemical reactions.
   b. Calculate the valency of mercury in mercurous nitrate $Hg_2(NO_2)_2$
   c. Write a note on hydrogen overvoltage. (4+3+3)

12 a. Draw and explain Jablonski diagram.
   b. How is EMF of a cell determined by potentiometer?
   c. Write a short note on Quenching. (4+3+3)

UNIT III

13 a. Give the Skraup synthesis for quinoline.
   b. With an example explain Chichibabin reaction.
   c. Explain sulphonation reaction of quinoline. (4+3+3)

14 a. Explain Paal Knorr synthesis of 2, 5 dimethyl thiophene.
   b. Explain hydrogenation reactions of thiophene. (5+5)

15 a. Explain with mechanism why furan undergoes electrophilic substitution at 2 and 5 positions.
   b. How do you convert furan into   i) furfural   ii) thiophene.
   c. Give a reaction to show that furan behaves as a diene. (4+3+3)

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CHOICE BASED CREDIT SYSTEM

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

STATISTICS

Design of Experiments

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

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

1. Define Analysis of Variance.

2. Explain the model for Two way ANOVA?

3. Explain the principle randomization.

4. State expressions for estimating two missing observations in case of RBD.

5. Give any two advantages of Factorial Experiments.

6. What do you mean by Partial confounding in Factorial Experiment?

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

7. Stating the assumptions, derive Expected Sum of Squares of due to factor B under Two way Classified Data.

8. Stating the conditions, Split the total variation under Two way classified data and obtain its components.

9. Under certain conditions, Randomized Block Design is more efficient than Completely Randomize Design. Justify.

10. Briefly explain the layout of Completely Randomized Design.

11. Give the model for 2^2 factorial exeperiment under RBD and explain main efects and interaction effects.

12. Explain confounded factorial designs. What is the need for confounding?

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

13. Briefly Illustrate the technique of ANOVA for one-way classification, stating the breakdown of the total sum of squares, their distributions and the hypothesis that are usually tested. Also write down the ANOVA Table.

14. Stating the assumptions,Derive the expected sum of squares due to factors B and C in Three way ANOVA .

15. Stating the assumptions, deduce the Expected Sum of Squares due to Treatments and Error under RBD .

16. Stating the conditions, derive an expression for estimating one missing observation in case of L.S.D and Illustrate how do you carry out the analysis .

17. Briefly explain the statistical analysis under 2^3 factorial experiment with ANOVA table.

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CHOICE BASED CREDIT SYSTEM

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

STATISTICS

Statistical Quality Control

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

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

1. Define process control.

2. Mention any two objectives of SQC.

3. Name the distribution used in c and u chart.

4. How do you take decision for the choice of p and np chart?

5. The probability of acceptance corresponding to the acceptable quality level is ....

6. Define SSP by attributes.

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

7. What are assignable causes of variation?

8. Explain the concept of rational subgroups.

9. Make a comparative study of R and σ chart.

10. When do you modify the control limits of $\bar{x}$ chart? Obtain the expression for modified limits of $\bar{x}$ chart.

11. Under Single Sampling Plan for variables, determine n and k using the points on the OC curve while σ is known.

12. For a system with 3 components connected in parallel, determine the system reliability for 1000 hours of operation and find MTTF.Assume that all three components have an identical time to failure distribution that is exponential with a constant failure rate of 0.00045/hr.What is the MTTF of each component? If it is desired for the system to have a MTTF of 3500 hours, what should be the MTTF of each component ?

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

13. Give all the possible relations between the process capability and the specification limits.

14. Stating the assumptions, derive the control limits of c chart when the standard value is known and unknown.

15. Find the control limits for p chart given a) n=144 and $\bar{p}$=0.10 and b) n=125 and 0.36 is the target value for p.

16. By explaining the concept of system reliability, derive the expression for reliability of the system when the components are connected in series.

17. Derive the expressions for the OC function for SSP by attributes when (i) Hyper Geometric distribution (ii) Binomial distribution (iii) Poisson distribution are used.

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CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023
CHEMISTRY - PAPER VIII
Industrial Chemistry

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

PART - A

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

1 What is the importance of XRD technique in characterisation of nanomaterials?

2 How is polyacetylene prepared?

3 Name the ore of copper taken for its extraction and write its formula.

4 Explain roasting reaction with an example.

5 How is the adulterant present in black pepper detected?

6 What is BHC ? How is it prepared?

PART - B

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

(10×7= 70 Marks)

UNIT I

7 a. Describe any five applications of nanomaterials.

   b. Explain the disadvantages of nanomaterials. (5+5)

8 a. Give the applications of conducting polymers.

   b. What is a plant nutrient? Give the importance of different plant nutrients. (5+5)

9 a. What is nitinol? Give its applications.

   b. List the characteristics of biomaterials.

   c. What are the differnet types of biomaterials? (4+3+3)

UNIT II

10 a. Write a short note on the important ores of metals.

   b. Draw the Ellingham diagram and explain its significance.

   c. What is the principle involved in the extraction of elements? (3+3+4)

11 a. Explain the concentration of bauxite by Baeyers method.

    b. Explain with a diagram the magnetic separation method of concentration of the ore. (6+4)

12 a. Explain Leaching process of concentration of ore .

    b. Explain hydrometallurgy and pyrometallurgy with an example. (3+7)

UNIT III

13 a. Explain the role of Antioxidants in food storage products.

    b. Write a note on permitted and non-permitted food colours. (6+4)

14 a. Explain the norms set by Bureau of Indian Standards(BIS).

    b. Explain the classification of fertilizers with examples. (5+5)

15 a. Explain preservation by tetrapack and nitrogen preservation.

    b. Write a short note on artificial sweeteners. (5+5)

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CHOICE BASED CREDIT SYSTEM

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

CHEMISTRY

Chemistry Theory VIII

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

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

1. Write two applications of column chromatography.

2. Write the number of significant figures in 0.002340, 7.0298.

3. What is meant by   i) co-precipitation   ii) post precipitation.

4. Write the principle of Parke's process of desilverisation of lead.

5. Mention two sources of soil pollution.

6. What are the common pollutants found in air.

7. What are pesticides? Give examples.

8. How is the adulterant present in black pepper detected?

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

9. a) Explain the theory of titration of strong acid vs strong base. (3)
   b) Explain the theory of titration of weak acid vs weak base.   (3)

10. a) Explain the principle of atomic absorption spectroscopy.   (3)
    b) Write the applications of differential thermal analysis (DTA).   (3)

11. a) Mention different types of ores with an example for each. (3)
    b) Explain froth floatation process. (3)

12. a) Draw the Ellingham's diagram and comment on using carbon as the reducing agent.(3)
    b) Mention the limitations of Ellingham's diagram.(3)

13. a) What are food preservatives? What are Class I and class II preservatives? Give one example for each. (3)
    b) What are sweeteners? Mention different types with examples. (3)

14. a) Explain homogenisation of milk. (3)

b) Explain the proces of preservation of vegetables. (3)

15. a) What are micronutrients? Mention the role of copper in the plants. (3)

b) Explain the production of superphoshate of lime. (3)

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

12. a) In a set of measurements the following concentrations of Mg (ppm) were reported : 17.3, 17.1, 17.7, 17.0, 17.4, 17.8, 17.2, 17.9

Calculate i) Mean deviation ii) standard deviation iii) coefficient of variance (5)

b) Write the rules for identifying the number of significant figures with an example for each. (5)

13. a) Explain purification of copper by electrolytic refining.5)

b) Explain purification of lead by electrolytic method.(5)

14. a) Write a note on Compressed Natural Gas.(5)

b) Explain the method of production and process description of methanol.(5)

15. a) Write a short note on i) Fuel Cell Vehicles ii) fuels used in racing cars (5).

b) Explain the production of butadiene from petrochemicals.(5)

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CHOICE BASED CREDIT SYSTEM

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

COMPUTER SCIENCE

Computer Science Theory VII

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

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

1. How do you use the seed() method in Python? Give an example.

2. Compare Python with other programming languages.

3. What are Tuples in Python?

4. Differentiate between parameter and arguments in Python.

5. How do you create a date object?

6. Write the command to save changes to the database.

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

7. a) Explain the identity operators in Python.
   b) Explain the various membership opeartors in Python.

8. What is garbage collection in Python? Explain.

9. Explain global and local variables in Python.

10. How do you create and use a module in Python? Explain with an example.

11. Explain with example super() function.

12. Explain format() method using different placeholders.

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

13. Explain sets in Python.

14. a) Explain with an example else statement used with while loop.
    b) Explain the continue statement with an example.

15. Explain with an example the use of lambda with filter .

16. a) Mention the basic operations supported by an array in Python.

    b) Explain how to access array elements.

    c) Explain Insert operation in an array.

17. a) Explain how to create a class and objects with an example.

    b) Explain _init_ () function with an example.

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CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY/JUNE 2023
COMPUTER SCIENCE
Computer Science Theory VIII

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

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

1. List any four benefits of ASP.NET.

2. What do you mean by built-in web server? List any two.

3. What are server controls? List the types of server controls.

4. What are the two views for displaying data in a Menu control?

5. Which are the major components of ADO.NET?

6. Write any two advantages of Master page.

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

7. Explain the types of coding model used in web application.

8. Explain any six built-in directories of ASP.NET web application.

9. Explain a) ImageButton server control   b) LinkButton server control

10. Write a note on a) PasswordRecovery   b) ChangePassword controls

11. Write a note on   i) SqlDataSource control ii) ObjectDataSource control

12. Explain i) CatalogZone ii) DeclarativeCatalogPart   iii) PageCatalogPart

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

13. Explain with the help of an example   a) PostBack   b) Cross Page Posting

14. Write a note on   a) Image server control   b) Table server control

15. Write a note on   a) Calendar server control   b) AdRotator server control

16. a) Write the steps involved in using a RequiredFieldValidator control.
    b) Write a note on i) RangeValidator control ii) Compare Validation control

17. Explain any five public properties of i) DataList control ii) DetailsView control

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