21PHYC501 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025

PHYSICS

Classical Mechanics and Quantum Mechanics

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

PART - A

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

UNIT I

1 a) State the principle of virtual work.

b) Derive equation of motion for a simple pendulum using Lagrangian equation of motion. (2+7)

2 a) Define Newton's second law of motion.

b) What is a constraint? Explain the type of constraints in detail. (2+7)

UNIT II

3 a) Define variational principle.

b) Derive Lagrangian equation from Hamilton's principle. (2+7)

4 a) Write the mathematical form of Hamilton's principle.

b) Prove that Poisson's bracket obyes commutative and distributive law. (2+7)

UNIT III

5 a) Derive the relation between uncertainties in angular displacement and angular momentum.

b) State Heisenberg's uncertainty principle and explain in detail about Gamma ray microscope. (2+7)

6 a) Distinguish between matter waves and electromagnetic waves.

b) Describe with necessary theory Davisson and Germer experiment for establishing wave nature of the electron. (2+7)

UNIT IV

7 a) Show that the de Broglie wavelength of a particle in a one-dimensional box in the first excited state is equal to the length of the box.

b) What is a wave function? Why should it be in complex form? **(2+7)**

8 a) Show that the probability curves for linear harmonic oscillator for higher quantum numbers approximate the classical values.

b) What are Expectation value, Eigen value and Eigen function? Explain their significance. **(2+7)**

PART - B

Answer any three questions: **3×5= 15**

9 A block is pulled 5 m along a horizontal surface by a 10 N force acting at 30° to the horizontal. Calculate the work done by the force.

10 $F=x^2p$, $G=x$ where x and p are canonical coordinates and momenta. Find the Poisson bracket [F,G].

11 A marble of mass 1×10^{-3}kg is constrained to roll inside a tube of length $L = 10^{-2}$m. The tube is capped at both ends. Modelling this as a one-dimensional infinite square well, determine the value of the quantum number n if the marble is initially given an energy of 1×10^{-3} J. Calculate the excitation energy required to promote the marble to the next available energy state.

12 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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21PHYC502 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025

PHYSICS

Elements of Atomic, Molecular & Laser Physics

Duration:2 Hours Max Marks:60

PART - A

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

UNIT I

1 a) State and explain the postulates of Bohr's atom model.

b) Explain Franck and Hertz experiment with the help of diagram. (2+7)

2 a) Name the spectral series of hydrogen atom and write the expression of the wave number for Balmer series.

b) Derive an expression for the fraction of α particles experiencing scattering angles greater than θ. (2+7)

UNIT II

3 a) What are the two important concepts of vector atom model?

b) Derive an expression for magnetic dipole moment of electron due to orbital motion. Hence deduce the expression for gyromagnetic ratio. (2+7)

4 a) Find the expression for the total number of electrons in a subshell?

b) Explain the theory of Stern Gerlach experiment and discuss the results. (2+7)

UNIT III

5 a) Write a note on intensity of Raman lines.

b)Write about vibration spectra of a diatomic molecule and draw the relevant diagram for the rotation-vibration band. (2+7)

6 a) Explain why molecules like H_2, N_2 do not produce rotational spectra?

b) What is coherent scattering? Explain the phenomena of scattering of light and hence explain the reason for the blue colour of the sky. (2+7)

UNIT IV

7 a) Draw the energy level diagrams for stimulated emission and spontaneous emission.

b) With a neat diagram explain the working of a Semiconductor Laser. **(2+7)**

8 a) Mention the applications of Laser.

b) With a neat diagram explain the working of a Helium Neon Laser. **(2+7)**

PART - B

Answer any three questions: **3×5= 15**

9 Calculate the radius and energy of the electron in the n^{th} orbit from the following data. $\epsilon_0 = 8.85 \times 10^{-12}$ F/m.

10 The value of Bohr Magneton is 9.2×10^{-24} J/T and Planck's constant is 6.625×10^{-34} Js. Calculate the ratio of e/m of an electron.

11 Calculate the frequency of oscillation of Hydrogen molecule if its force constant is 4800 N/m and mass of Hydrogen atom is 1.67×10^{-17} Kg.

12 A beam of Silver atoms in a Stern Gerlach experiment obtained from an oven heated to a temperature of 1000 K passes through a heterogeneous magnetic field having field gradient 200 T/m covers a distance 0.12m in the magnetic field. Calculate the seperation between the traces. Mass of Silver atom = 1.79×10^{-25} kg,
Bohr magneton = 9.2×10^{-24} J/T, K = 1.38×10^{-23} J/K.

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21MICC501 Reg. No.....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025
MICROBIOLOGY
Molecular Biology

Duration: 2 hours **Max Marks: 60**

SECTION -A

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

UNIT - I

1. Write short notes on enzymes involved in DNA Replication.

OR

2. Write a short note on Nitrogen bases.

UNIT - II

3. Write short notes on tRNA.

OR

4. Write a short note on mRNA.

UNIT - III

5. Write a short note on isolation of DNA by shot gun method.

OR

6. List the potential hazards and safeguards of genetic engineering.

UNIT - IV

7. Discuss x-rays and gamma rays as mutagens.

OR

8. Write short note on base analogues as mutagens.

SECTION - B

Answer the following strictly observing the internal choice provided: **4X10=40**

UNIT - I

9. Write a detailed mechanism of DNA replication in prokaryotes.

OR

10. Discuss the various types of DNA replication.

UNIT - II

11. Describe Zinder and Lederberg's experiment of transduction.

OR

12. Explain the mechanism of transformation in bacteria.

UNIT - III

13. Explain the steps of translation in prokaryotes.

OR

14. Explain the properties of plasmids and cosmids.

UNIT - IV

15. Explain in detail the chemical agents of mutation with suitable examples.

OR

16. Write detailed notes on biochemical mutation.

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21MICC502 Reg. No.....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025
MICROBIOLOGY
Food Microbiology

Duration: 2 hours **Max Marks: 60**

SECTION -A

Answer the following strictly observing the internal choice provided: **4 X5= 20**

UNIT - I

1. Write a note on contamination of fruits and vegetables.

OR

2. Mention the significance of SCP in human diet.

UNIT - II

3. Write short notes on spoilage of meat and poultry

OR

4. Write a note on types of food packaging materials.

UNIT - III

5. Write a note on sources of microbial contamination of milk.

OR

6. Write short notes on probiotics.

UNIT - IV

7. Write a short note on bacterial indicator organisms.

OR

8. Explain the importance of GLP in food industry.

SECTION - B

Answer the following strictly observing the internal choice provided: **4X10=40**

UNIT - I

9. Explain in detail bacterial food poisoning.

OR

10. Explain in detail the production process of sauerkraut and kombucha.

UNIT - II

11. Explain the principles of food spoilage.

OR

12. Explain the methods of preservation of food by low temperature.

UNIT - III

13. Explain in detail the preservation of milk by pasteurization.

OR

14. Explain in detail the dye reduction tests.

UNIT - IV

15. Explain the quality testing of food by rapid microbiological methods.

OR

16. List the various food safety laws and regulations.

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21MATC501 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025

MATHEMATICS

Real Analysis - II and Complex Analysis

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

PART - A

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

a. Define upper integral and lower integral for f over $[a, b]$.

b. A function f is defined on $[-1, 1]$ as follows,
$f(x) = \begin{cases} k, \text{a positive constant when } x \neq 0, \\ 0 \text{ when } x = 0. \end{cases}$. Check if the function is Riemann integrable.

c. State the comparison test for integrals.

d. Evaluate $\int_0^\infty x^6 e^{-2x}\, dx$.

e. Simplify: $\frac{1+2i}{3-4i} + \frac{2-i}{5i}$.

f. Find the polar and exponential form of $z = -1 - \sqrt{3}i$.

g. Verify that the function $f(z) = coshxcosy + isinhxsiny$ is entire.

h. If $z = -1$ then find $log\, z$ and $Log\, z$.

PART - B

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

a. If f_1 and f_2 are 2 bounded and integrable functions on $[a, b]$ then show that $f = \frac{f_1}{f_2}$ is also integrable on $[a, b]$.

b. State and prove the second form of condition of integrability.

c. Show that every continuous function is integrable.

d. Compute the upper and lower sums for the function $f(x) = x^2$ on $[0, 10]$, where $P = \{0, 2, 5, 6, 9, 10\}$.

PART - C

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

a. Determine if the following integral converges or diverges and if it converges find its value: $\int_0^2 \frac{1}{x-2}\,dx$.

b. Show that $\beta(m,n) \times \beta(m+\frac{1}{2}, m+\frac{1}{2}) = \frac{\pi}{m} 2^{1-4m}$.

c. Show that $\beta(m,n) = \int_0^\infty \frac{x^{n-1}}{(1+x)^{m+n}}\,dx = \int_0^\infty \frac{x^{m-1}}{(1+x)^{m+n}}\,dx$.

d. Prove that $\frac{\beta(m+1,n)}{m} = \frac{\beta(m,n+1)}{n} = \frac{\beta(m,n)}{m+n}$.

PART - D

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

a. Prove that existence of the derivative of a function at a point implies the continuity of the function at that point. Is the converse true? Justify your answer.

b. Find all the values of $(-8-8\sqrt{3}i)^{\frac{1}{4}}$.

c. Prove that $f'(z)$ and $f''(z)$ exists everywhere and find $f''(z)$ for $f(z) = iz + 2$.

d. Prove that $f'(z)$ exist everywhere and find $f'(z)$ for $f(z) = \frac{1}{z}$, by using C-R equations in polar form.

PART - E

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

a. Find the harmonic conjugate of $u(x,y) = 2x - x^3 + 3xy^2$.

b. Find all the values of z such that (i) $e^z = -1$ (ii) $e^{2z-1} = 1$.

c. Prove that $sin(z_1+z_2) = sinz_1 cosz_2 + cosz_1 sinz_2$ and $cos(z_1+z_2) = cosz_1 cosz_2 - sinz_1 sinz_2$.

d. If m and n are integers, then find $\int_0^{2\pi} e^{im\theta} e^{-in\theta}\,d\theta$.

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21MATC502 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025

MATHEMATICS

Advanced Algebra and Discrete Mathematics

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

PART - A

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

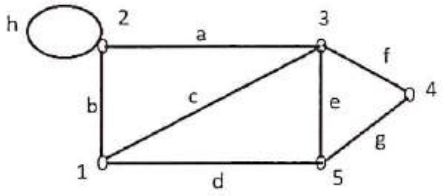
a. Define isomorphism and automorphism in groups.

b. Check whether $\phi(x) = e, \forall\ x \in G, \phi : G \longrightarrow G$ is a homomorphism.

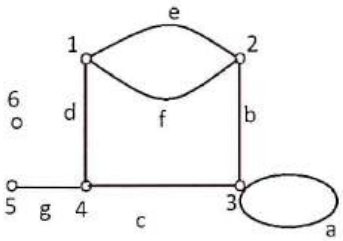
c. Define Rings. Give an example of a Ring.

d. Define regular element. Mention the regular elements of $(Z, +, \times)$.

e. Define walk, path, circuit and length of a path. Give an example for each of them from the graph given below:

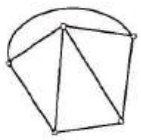


f. Find the isolated vertex, parallel edges, sum total of the degrees in the graph given below:



g. Define vertex connectivity . Determine vertex connectivity of a circuit.

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



PART - B

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

a. Prove that any 2 left cosets of H in G have the same number of elements.

b. Prove that every group of prime order is cyclic.

c. Prove that a subgroup H is normal in G iff every left coset of H in G is a right coset of H in G.

d. If ϕ is an homomorphism of $G \times \bar{G}$ then show that
a) $\phi(e) = \bar{e}, \bar{e}$ is an identity element of $\bar{G}$.
b) $\phi(x^{-1}) = (\phi(x))^{-1}, \forall x \in G$

PART - C

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

a. If $a^2 = a$ in a ring R, then show that $ax + xa$ commutes with $a \in R$.

b. Prove that every field is an integral domain.

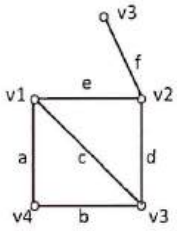
c. If ϕ is a homomorphism of $\mathcal{R}$ into $\mathcal{R}'$ then prove that
a) $\phi(0) = 0$
b) $\phi(-x) = -x, \forall\, x \in \mathcal{R}$.

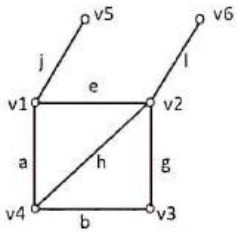
d. If F is a field, prove that its only ideals are 0 and F itself.

PART - D

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

a. Define union, intersection and ringsum of two graphs and find union, intersection and ringsum of the following graphs:





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) The vertex connectivity of any graph G can never exceed the edge connectivity of G.

c. Prove that the necessary and sufficient condition for connected graph to be an Euler graph is that all its vertices are of even order.

d. Prove the following:

i) There is one and only one path between every pair of vertices in a tree.

ii) Any connected graph with n vertices and n-1 edges is a tree.

PART - E

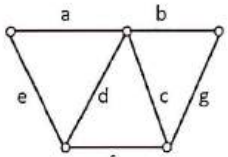
5. Answer any 2 questions. Each question carries 6 marks: (6×2= 12 Marks)

a. Define chromatic number. Prove that every tree with two or more vertices is 2 chromatic.

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

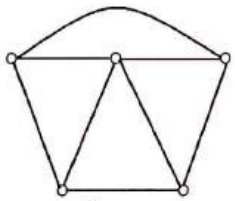
c. i) Prove that every connected graph has atleast one spanning tree.

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



G

d. Find the chromatic polynomial of the following graph.



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21MATC502 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025

MATHEMATICS

Advanced Algebra and Discrete Mathematics

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

PART - A

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

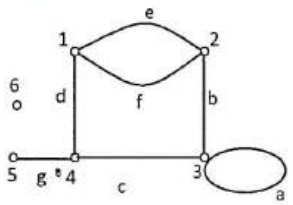
a. Define even permutations and odd permutations.

b. If G is a group of positive real numbers under addition and $\bar{G}$ is the group of all real numbers under addition, then check whether ϕ which is defined as $\phi : G \longrightarrow \bar{G}$ by $\phi(x) = log_{10}(x), \forall\, x \in G$ is a homomorphism.

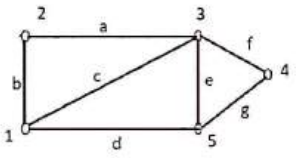
c. Define field. Give an example for a field.

d. Define isomorphism in Rings.

e. Find the isolated vertex, parallel edges, sum total of the degrees in the graph given below



f. Define walk, path, circuit,and length of a path. Give example for each of them from the graph given below



g. Define cut vertex. Draw a graph of 6 vertices with no cut vertex.

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

PART - B

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

a. Let G be a group and H be a subgroup of G, then show that G is the union of all left cosets of H in G and any 2 distinct left cosets of H in G are disjoint.

b. Let G be a group. Let H and K be finite subgroups of G such that $O(H)$ and $O(K)$ are relatively prime, then show that $H \cap K = \{e\}$.

c. Prove that N is a normal subgroup of G if and only if $gNg^{-1} = N$ for every $g \in G$.

d. Let ϕ be a homomorphism of G onto $\bar{G}$ with kernel K then show that $G/K \cong \bar{G}$.

PART - C

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

a. Show that every boolean ring is commutative.

b. Let $\mathcal{R}$ be a finite integral domain then show that $\mathcal{R}$ is a field.

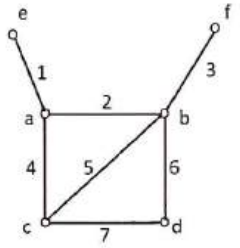
c. If ϕ is a homomorphism of $\mathcal{R} \times \mathcal{R}'$ with $Kernel(I(\phi))$ then prove that
a) $I(\phi)$ is a subgroup of $\mathcal{R}$ under addition.
b) If $a \in I(\phi)$and $r \in \mathcal{R}$ then both ar and ra are in $I(\phi)$.

d. If U is an ideal of $\mathcal{R}$ and $I \in U$ then prove that $U = \mathcal{R}$.

PART - D

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

a. Define edge deletion, vertex deletion and fusion. Draw the graph obtained by
i) deleting edge 5
ii) deleting the vertex b
iii) fusing vertices a and b in the following graph



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 has an Euler line if and only if all its vertices are of even order.

d. 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) Any connected graph with n vertices and n-1 edges is a tree.

PART - E

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

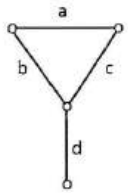
a. Define chromatic polynomial.

Prove that a graph with atleast one edge is 2-chromatic if and only if it had no circuits of odd length.

b. Prove that Kuratowski`s second graph is non planar.

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

ii) Draw all the spanning trees of the following graph



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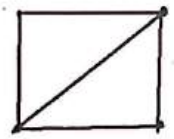
iii) Write the rank and nullity of G

d. Find the chromatic polynomial of the following graph :



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21CSCC501 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025

COMPUTER SCIENCE

Programming in Python

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

PART A

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

1) Write any four features of Python.
2) How do you represent string datatype in Python? Give an example.
3) What do you mean by arbitrary arguments? Give an example.
4) How do you check if a specified item exists in a tuple? Give an example.
5) What is IndexError exception? Give an example.
6) How do you read data from a file? Give an example.

PART B

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

7) Explain if-elif-else statement in Python with syntax and example.
8) Explain a) insert() b) remove() c) reverse() methods of an array with an example.
9) Explain a) swapcase() b) endswith() c) split() methods in strings with an example.
10) Explain with syntax and example a) items() b) update() c) clear() methods of a dictionary.
11) Explain multilevel inheritance with an example.
12) Explain any six NumPy array creation with initial placeholder content with examples.

PART C

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

13) Explain Relational and Logical operators in Python with an example.
14) Explain a) len() b) copy() c) reverse() d) del() e) count() methods of lists with syntax and example.
15) How do you delete a row from a table in Python? Explain with a help of an example.

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21CSCC502 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025

COMPUTER SCIENCE

Computer Networks

Duration:2 Hours Max Marks:60

PART A

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

1) What do you mean by error correction?
2) Define flow control.
3) What is Admission control?
4) What is Multicast routing?
5) What is SMTP?
6) What do you mean by resource sharing in computer networks?

PART B

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

7) Explain a) DNS b) DNS Namespace
8) Explain the problem of Bellman Ford algorithm in best and worst case.
9) Explain light transmission with a neat diagram.
10) Explain fiber optics with a neat diagram.
11) Write a real-world example for a star topology application.
12) Write any six differences between LAN and WAN.

PART C

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

13) Explain OSPF with a neat diagram.
14) a) Write the functions of the Network Layer in the OSI model .
    b) What is the role of the Transport Layer in ensuring reliable communication in a network?
15) Briefly explain addressing, connection establishment and connection release in transport layer.

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21CHEC501 Reg. No.....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025
CHEMISTRY
Inorganic and Physical Chemistry – III

Duration: 2 hours **Max Marks: 60**

PART – A

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

1. Differentiate between isotopes and isobars.
2. Define the terms rad and roentgen.
3. Write the structure of cyclic trimer and tetramer phosphazines.
4. What are pyroxenes?
5. Write significance of wave-function.
6. Write Arrhenius equation and explain the terms.
7. Define cell constant.
8. State Kohlrausch's law.

PART – B

Answer any SIX of the following:

9. a) Explain the different types of quarks.
   b) What is a dosimeter? Describe the principle of Fricke's dosimetry. **(4+4)**

10. a) Describe the liquid drop model of nucleus.
    b) Describe the application of radioisotopes in the study of organic reaction mechanism with a suitable example. **(4+4)**

11. a) State Wade's rules for boranes. Discuss the structure of closo boranes.
    b) Why are zeolites used in water-softening operations. **(4+4)**

12. a) Explain the structure of S_4N_4.
    b) Discuss the characteristics of hard and soft acids and bases. **(4+4)**

13. a) Give Schrodinger wave equation for particle in three dimensional box and explain its significance for H-atom.
    b) Compare collision theory with transition state theory. **(4+4)**

14. a) Write a note on the significance of quantum numbers.
    b) Describe continuous flow method for studying kinetics of fast reactions. **(5+3)**

15. a) Explain the variation of specific and equivalent conductance with dilution.
    b) Outline the principle of conductometric titration of Na_2SO_4 against $Bacl_2$. **(5+3)**

16. a) How is transport number of silver ion determined by Hittorf's method using platinum electrodes?
    b) At 25°C, the specific conductance of distilled water is 58.0×10^{-7} Sm^{-1} and that of saturated solution of AgCl is 2.338×10^{-4} Sm^{-1}. Calculate the solubility of AgCl at this temperature if equivalent conductance of AgCl solution at infinite dilution is 138.26×10^{-4} $Sm^2\,eq^{-1}$. **(5+3)**

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21CHEC502 Reg. No.....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025

CHEMISTRY

Organic Chemistry and Spectroscopy – I

Duration: 2 hours **Max Marks: 60**

PART – A

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

1. Write the Haworth pyranose structure of α and βD(+) glucose.
2. What happens when fructose react with i) HCN and ii) Hydroxylamine.
3. How do you convert furan into pyrrole?
4. How is neoprene prepared?
5. Write the selection rule for rotational spectroscopy.
6. What is finger print region in Vibrational spectroscopy?
7. N_2 is IR inactive, but Raman active. Give reason.
8. What is auxochrome? Give one example.

PART – B

Answer any SIX of the following: **6×8=48**

9. a) What is Amadori rearrangement? Give the mechanism.
   b) Describe the classification of dyes based on their structure. **(4+4)**

10. a) What is Kiliani – Fischer synthesis? Explain with an example.
    b) Write the synthesis of (i) Congo Red (ii) Alizarin **(4+4)**

11. a) Explain the aromatic character of pyridine with the help of molecular orbital picture.
    b) What are epoxy resins? Write their preparation. **(4+4)**

12. a) Explain the Bischler – Napieralski synthesis for the preparation of isoquinoline.
    b) What happens when (i) quinoline is subjected to reduction
    (ii) thiophene undergo hydrogenation **(4+4)**

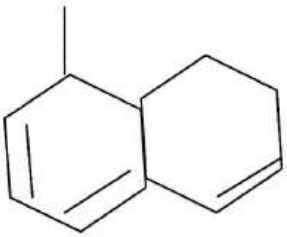
13. a) Derive an expression for the moment of inertia of a diatomic molecule as a rigid rotor.
    b) Force constant of HI bond is $283 Nm^{-1}$. The bond length and moment of inertia of HI are 1.3×10^{-10} m and 2.95×10^{-47} kgm^2 respectively. Calculate the frequency of vibration of the molecule? [Given $c=3\times10^8$ ms^{-1}]. **(4+4)**

14. a) Show that the successive lines are separated by 2B in pure rotational spectra.
    b) What is meant by finger print and functional group region in IR spectroscopy? How is identification of an organic compound done by finger printing? **(3+5)**

15. a) Explain the applications of Raman Spectroscopy.
    b) Describe the different electronic transitions that take place when a molecule absorbs UV or visible radiation. **(4+4)**

16. a) Describe the theory of Raman spectroscopy.
    b) Calculate λ max for the following:

(4+4)

i) 

ii) $CH_3 - \underset{\displaystyle CH_3}{\underset{|}{CH}} = CH - CH = CH_2$

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21BOTC501 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025

BOTANY

Plant Morphology and Taxonomy

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

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

1. How did Theophrastus classify plants?
2. What is an accrescent calyx? Give an example.
3. Write the systematic position (classification) of the family Myrtaceae.
4. Write any important feature of perianth of Orchid flowers.
5. What is a dendrogram? What is the relevance of it in taxonomy?
6. Write any two features of author citation.
7. Differentiate a phenogram and a cladogram.
8. Mention the type and features of leaf modification seen in Cactus.

II. Answer any FOUR of the following : **(4×5= 20 Marks)**

9. What are the different types of subaerial stem modifications? Explain with an example each.
10. Explain the features of the Subfamily Caesalpiniaceae.
11. Define Botanical Nomenclature. Expand ICN. Rewrite the following scientific names following the rules of binomial nomenclature:
    (i) mangifera Indica (ii) Cocosnucifera (iii) SativaOryza.
12. What are: (i) OTU (ii) Cluster analysis (iii) Taxonomic characters (iv) Phenogram (v) Cladogram?
13. Write a note on any two types of simple dry dehiscent fruits.
14. What are: (i) Glume (ii) Palea (iii) Lemma (iv) Tiller and (v) Caryopsis?
15. What is flora? How is it different from monograph and manual? Mention any two flora examples.

16. Write a short note on *atp*B, *rbc*L, ITS, *trn*L, and nuclear ribosomal 18S DNA. What are their significance?

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

17. Give an account of the types of root modifications for storage with examples.

18. Write the distinguishing characteristics of the family Acanthaceae. Mention two plants of economic importance.

19. What is a Herbarium? Explain the technique. Name any two National Herbaria.

20. Describe: (i) the co-evolution of angiosperms and animals and
(ii) the method of construction of a phylogenetic tree.

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21BOTC502 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025

BOTANY

Genetics and Plant breeding

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

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

1. What is pleiotropism? Give an example.
2. State law of segregation.
3. What are base analogues? Give two examples.
4. What is CIB Method?
5. What is Hybridization? Where is it used?
6. What is bulbil? Give an example.
7. Mention any two disadvantages of mutation breeding.
8. What is heterosis? How does hybrid vigour arises.

II. Answer any FOUR of the following : **(4×5= 20 Marks)**

9. Explain codominance with example.
10. Explain point mutation with respect to base pair substitutions.
11. Mention the wide range of materials used as PGRs.
12. Explain how kernel color inheritance works in wheat.
13. Explain mitochondrial mutation in yeast.
14. Explain the mechanism of crossing over.
15. State Hardy- Weinberg law. Name the factors effecting Hardy-Weinberg equilibrium.
16. Write a note on pure line selection.

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

17. Explain supplimentary gene epistasis with suitable plant example.
18. Explain gene mutation and induced mutation.
19. Explain plant acclimatization and plant genetic resources in detail.
20. Explain applications and limitations of mutation breeding.

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21ZOOC501 Reg. No.....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025
ZOOLOGY
Non chordates and Economic Zoology

Duration: 2 hours **Max Marks: 60**

SECTION - A

I. Answer the following strictly observing the internal choice provided: **4 X5= 20**

UNIT - 1

1. Write the salient feature of Phylum Ctenophora. Give an example.

OR

2. Explain briefly the sexual dimorphism in *Ascaris lumbricoides* with neat labeled diagrams.

UNIT - 2

3. Write a short note on a) mandible of *Palaemon* b) Chelate leg of *Palaemon.*

OR

4. Give the outline classification of Phylum Annelida with an example for each.

UNIT - 3

5. Write the general characteristics of Phylum Echinodermata.

OR

6. Write a short note on respiration in *Pila.*

UNIT - 4

7. Write the uses of lac.

OR

8. Give the nutritive value of egg.

SECTION – B

II. Answer the following strictly observing the internal choice provided: **4X10=40**

UNIT - 1

9. Explain the morphology of *Paramecium* with a neat labelled diagram.

OR

10. With the aid of neat labelled diagrams, explain the life cycle of *Taenia solium.*

UNIT - 2

11. Explain the morphology of *Hirudinaria* with suitable illustrations.

OR

12. Give the general characteristics of Phylum Arthropoda.

UNIT - 3

13. Describe the water vascular system in *Asterias* with neat labelled diagram.

OR

14. Write an explanatory note on a) nervous system of *Pila* b) *Pila* shell.

UNIT - 4

15. Give a detailed account on methodology of vermicomposting.

OR

16. Explain the life cycle of Sugarcane leaf hopper and Gundhi Bug.

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21ZOOC502 Reg. No.....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025

ZOOLOGY

Chordates and Comparative Anatomy

Duration: 2 hours **Max Marks: 60**

SECTION -A

I. Answer the following strictly observing the internal choice provided: **4 X5= 20**

UNIT- 1

1. What are the affinities of Hemichordates with non-chordates?

OR

2. With a neat labelled diagram, explain the structure of *Tornaria* larva.

UNIT- 2

3. Differentiate between the class Osteichthyes and Chondrichthyes.

OR

4. Mention five adaptations in birds for migration.

UNIT- 3

5. Write the differences between axial and appendicular skeleton.

OR

6. Mention the types of dentitions in vertebrates with examples.

UNIT- 4

7. Classify receptors in vertebrates with suitable examples.

OR

8. Write a short note on the cranial nerves in mammals.

SECTION -B

II. Answer the following strictly observing the internal choice provided: **4X10=40**

UNIT- 1

9. With the healp of neat labelled diagram, explain the morphology of *Branchiostoma.*

OR

10. Describe in detail the habit, habitat, and morphology of *Balanoglossus*.

UNIT- 2

11. Write an explanatory note on neoteny and paedogenesis in Amphibians with examples.

OR

12. Discuss the living orders of Class Reptilia with suitable examples.

UNIT- 3

13. Describe the structure, functions, and derivatives of integument in Pisces and Reptiles.

OR

14. Give a comparative account of respiratory organs in vertebrates.

UNIT- 4

15. Explain the succession of kidneys in vertebrates.

OR

16. Discuss the evolution of aortic arches in vertebrates with neat diagrams.

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21STAC501 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025

STATISTICS

Matrix Algebra and Regression Analysis

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

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

1. Define an involutary matrix and a unitary matrix.
2. How do you obtain a basis for the row space of a matrix?
3. Define an orthogonal vector.
4. Define a surplus variable with an example.
5. Give the test statistic for testing the significance of regression and how do you draw inference.

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

6. (a) If A is a non-singular matrix, then $(A')^{-1} = (A^{-1})'$
   (b) If A and B are non singular matrices of the same order then $(AB)^{-1} = B^{-1}A^{-1}$
7. Prove that $\begin{vmatrix} 3 & a+b+c & a^2+b^2+c^2 \\ a+b+c & a^2+b^2+c^2 & a^3+b^3+c^3 \\ a^2+b^2+c^2 & a^3+b^3+c^3 & a^4+b^4+c^4 \end{vmatrix} = \begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}^2$
8. Find the eigen values and eigen vectors of the following matrix $A = \begin{bmatrix} -1 & 2 \\ 2 & 4 \end{bmatrix}$
9. Find the quadratic form corresponding to the given matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 0 & 3 \\ 3 & 3 & 1 \end{bmatrix}$
10. State and prove the theorem for existence of feasible solution of TP.
11. Derive an unbiased estimator of the variance from the residual sum of squares in the multiple regression model..

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

12. Using RREF,Check whether the following system of equations is consistent and find the solution, if it exists.

$$x_1 - x_2 + x_3 = 2$$
$$3x_1 - x_2 + 2x_3 = -6$$
$$3x_1 + x_2 + x_3 = -18$$

13. Using Cayley-Hamilton Theorem, find the inverse of the following non-singular matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$

14. a) Prove that if the kth constraint of the primal is an equality, then the kth dual variable is unrestricted in sign.(5)

    b) What are the characteristics of duality.(5)

15. a) Explain any five models of OR with examples. (5)

    b) Explain the main phases of OR.(5)

16. a) Explain AP and write its mathematical formulation.(5)

    b) Explain the concept of travelling salesman problem.(5)

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21STAC501 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025

STATISTICS

Matrix Algebra and Regression Analysis

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

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

1. Define an orthogonal matrix.
2. What is an Elementary Matrix?
3. Define row space and column space of a matrix.
4. State the test procedure for the significance of regression.
5. Define Operations Research.

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

6. State and prove Jacobi's Theorem.
7. Convert the following matrix to the row echelon form.

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 5 \\ 1 & 3 & 3 \end{bmatrix}$$

8. Find the matrix of the following quadratic form and verify whether the matrix is positive definite ?

$$q = x^2 + 2y^2 + 3z^2 + 4xy + 5yz - 6zx$$

9. Explain the graphical method of solving an LPP.
10. What is AP? How do you convert a maximization Assignment Problem into minimization?
11. List the properties of Least-Squares Estimators.

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

12. Find the inverse of $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 3 & 5 \\ 1 & 4 & 12 \end{bmatrix}$ by partitioning method

13. Find the eigen values of A, B, AB and BA. Check whether Eigen values of AB = Eigen values of BA.

$A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$

14. Diagonalise the following matrix using orthogonal transformation.

$A = \begin{bmatrix} 2 & 1 & -1 \\ 1 & 1 & -2 \\ -1 & -2 & 1 \end{bmatrix}$

15. a) Make a comparative study between Primal and Dual Simplex method. (5)

b) What are the characteristics of duality. (5)

16. Mention the steps involved in MODI method.

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21STAC502 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025

STATISTICS

Analysis of variance and Design of Experiments

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

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

1. "ANOVA is a very powerful tool in Statistical Analysis". Justify.
2. Give a t- statistic for pairwise testing of treatments in Three-way ANOVA.
3. What is randomization?
4. State an expression for estimating one missing observation in RBD.
5. State an expression for Interaction effect of A and B under 2^2 factorial experiment.

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

6. Obtain least square estimates of the parameters of Two Way Classified Data model.
7. Briefly explain Tuckeys Method of pairwise testing in ANOVA.
8. What do you mean by RBD? Give the model of the design and explain the components.
9. Briefly explain the layout of the Completely Randomized Design.
10. Describe Yate's method of computing factorial effects totals in a 2^3 factorial experiment.
11. How do you identify Partial and complete confounding in an factorial experiment?

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

12. Explain Three-way classified data with an example. Give the model for three way classified data and explain the components.
13. Describe the model, layout, hypothesis to be tested and analysis with ANOVA table in case of Completely Randomized Design.
14. "Latin Square Design is more efficient than Randomized Block Design by taking Columns as blocks". Justify.
15. Briefly explain how the statistical analysis can be carried on under Two square factorial experiment. .
16. What is complete Confounding? Explain how the statistical Analysis can be carried out in case of Complete confounding.

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22NHEC501 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc/B.A FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025

NUTRITION AND HEALTH EDUCATION

Therapeutic Nutrition

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

SECTION - A

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

UNIT 1

1) Write a note on HIV.

OR

2) Write a short note on nutrition assessment under NCP.

UNIT 2

3) Write a note on different types of NALD along with their causes.

OR

4) Write a note on dietary considerations for diarrhea.

UNIT 3

5) Write a note on dietary considerations for kidney stone.

OR

6) Write a note on nutritional management of Dyslipidemia.

UNIT 4

7) Write a note on PKU.

OR

8) Write a note on dietary considerations for cancer.

SECTION - B

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

UNIT 1

9) a) What is need for modification of a diet? (5)
   b) Explain the modifications of diet commonly used in clinical setups. (5)

OR

10) Explain in detail the progression of a diet.

UNIT 2

11) Discuss the etiology and clinical features of constipation.

OR

12) Evaluate the nutritional management and dietary considerations for patients with infective hepatitis.

UNIT 3

13) Discuss the etiology and clinical features of nephritis.

OR

14) Evaluate the nutritional management and dietary considerations for patients with hypertension.

UNIT 4

15) Discuss the etiology and clinical features of diabetes.

OR

16) Evaluate the nutritional management and dietary considerations for patients with underweight.

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22ANMC501 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc and B.A FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025

COMPUTER ANIMATION

2D Animation

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

PART A

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

1) Define animation.
2) Mention two advantages of digital 2D animation.
3) What is compositing?
4) What is the full form of SFX?
5) Mention any two traditional animation devices used before film.
6) Define vector-based animation.

PART B

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

7) Explain "layers" in animation software.
8) Explain the difference between 2D and 3D animation with examples.
9) Mention the steps to animate run cycle.
10) Describe the role of the sound designer in animation production.
11. Explain the techniques to create effective storyboard.
12. Differentiate between traditional, stop-motion, and digital 2D animation.

PART C

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

13. Breifly explain the usage of 2D animation in different fields.
14. Briefly explain the techniques of traditional animation.
15. Explain step by step process to create car moving animation with suitable drawing.

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22NHEC502 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.A and B.Sc FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025

NUTRITION AND HEALTH EDUCATION

Entrepreneurship For Small Catering Units

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

SECTION - A

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

UNIT 1

1) In medival times, how did the origin of food service units take place.

OR

2) How does industrial development impact the development of food service units.

UNIT 2

3) Explain the methods of cost control in food service units.

OR

4) Explain the importance of financial management in the food service units.

UNIT 3

5) If a customer has a food allergy, what steps should a food service staff member take to ensure their safety?

OR

6) If you receive a shipment of perishable goods, what steps should you take to ensure they are stored correctly?

UNIT 4

7) Differentiate between survey of food service units and menu planning in an food service sector.

OR

8) Write in detail in about the different equipment needs for different situations.

SECTION - B

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

UNIT 1

9) How does the Customer factor play a role in affecting the menu planning.

OR

10) Explain in detail about the types of menus.

UNIT 2

11) Explain the factors to be considered in the organization and management of a food service unit.

OR

12) Differentiate between controlling and coordinating in food service units. Explain with examples how both are interdependent.

UNIT 3

13) What is portion control, and why is it important in food production? List three methods to ensure proper portion control in a kitchen.

OR

14) Explain the role of personal hygiene in food safety. Discuss at least three specific practices that food handlers should follow to minimize the risk of foodborne illnesses.

UNIT 4

15) Explain in detail the work area relationship involved in the planning of food service units.

OR

16) Discuss in detail the process of planning and setting up a food service unit, including key factors to be considered.

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22ANMC502 Reg. No.....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.A./B.Sc. FIFTH SEMESTER DEGREE EXAMINATION OCTOBER 2025
3D MODELLING & TEXTURING

Duration: 2 hours **Max Marks: 60**

PART - A

Answer any **FIVE** of the following: **(2 x 5 = 10)**

1. Write a short note on Polygon modeling.
2. Mention the uses of Booleans?
3. What do you mean by Extrude?
4. What is an Attribute Editor?
5. What is Normal mapping?
6. What do you mean by Texturing?

PART - B

Answer any **FIVE** of the following: **(6 x 5 = 30)**

7. Mention the advantages of 3D modeling.
8. Mention the step by step process to add texture to a 3d mesh.
9. Explain: a) Organic Modeling b) Hard Surface Modeling.
10. Explain the uses of 3D modeling in:
    a) Cultural Heritage Preservation b) Education & Training.
11. Explain the uses of UV Mapping.
12. Explain how 3d modeling enhances animation.

PART - C

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

13. Explain with step by step process of UV mapping a cereal box.
14. Briefly explain key elements of 3D modeling.
15. Explain in brief about the challenges of 3D Modeling.

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24ZOOC101 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. FIRST SEMESTER DEGREE EXAMINATION OCTOBER 2025

ZOOLOGY

Zoomorphology I

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

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

1. What is metagenesis? Give an example.
2. Write the scientific names of following 2 animals: -1) liver fluke 2) Marine prawn
3. Name the regions in the body of earthworm.
4. Give the scientific name of hookworm and human pin worm.
5. State the function Malpighian tubules.
6. Write any two distinguishing features of Class Echinoidea.

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

7. Write explanatory notes on the following: a) exflagellation b) ookinete.
8. Write the distinctive characters of Class Demospongia with any two examples.
9. Give an account of pathogenecity of round worm and filarial worm.
10. Describe the life cycle of *Taenia solium* in pig.
11. Explain the water vascular mechanism in sea star.
12. Write the distinguishing feature of Class Pelecypoda with example.

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

13. Classify Phylum protozoa upto classes; write the distinctive characters and suitable examples.
14. Give an account of water canal systems in sponges.
15. Enumerate the characters of Phylum Annelida mentioning any two classes with suitable examples for each.
16. Explain the external features of Leech, with a neat labeled diagram.
17. Comment on the Annelidan and Arthropodan characteristics of Peripatus.

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24STAC101 Reg. No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. FIRST SEMESTER DEGREE EXAMINATION OCTOBER 2025

STATISTICS

Descriptive Statistics

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

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

1. Distinguish between discrete and continuous variables.
2. Define population with an example.
3. Prove that mutually exclusive non zero events need not be independent.
4. Show that E(aX+b)=aE(X)+b.
5. Define supply.
6. Mention any two properties of regression coefficients.

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

7. Write a short note on Primary data and Secondary data.
8. Prove that Karl Pearson's coefficient of correlation lies between -1 and 1.
9. If $f(x,y)=8xy$, $0< x \leq y<1$.Find the marginal densities of X and Y.
10. In a Call Center there are three call receivers X, Y and Z. They do respectively 25%,35%and 40%of the total call receiving duty. The probabilities of each of these making errors while recording information are 0.1,0.15 and 0.25. If the recorded information had error, find the probability that it has been recorded by the Receiver Y.
11. Obtain the expression for residual variance.
12. Explain the concept of Engel Curves.

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

13. 1) Prove that correlation coefficient is independent of change of origin and scale. **(5)**

    2) Derive an expression for Spearman's Rank Correlation Coefficient without ties for the ranks. **(5)**

14. Derive the regression equation of X on Y.

15. a) With usual notations prove that
$0 \leq P(A \cap B) \leq P(A) \leq P(AUB) \leq P(A) + P(B)$. **(5)**

b) Given P(A)=a, P(B)=b, P(A∩B)=C, find the probability that
(i) A alone occurs (ii) A alone occurs or B alone occurs. **(5)**

16. State and prove the Addition theorem of probability for any two events. What happens if the events are mutually exclusive?

17. Discuss Cross Elasticity of demand and its importance in economic analysis with examples.

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