22NHEC601 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.A./B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

NUTRITION AND HEALTH EDUCATION

Functional Foods and Nutraceuticals

Duration:2 Hours Max Marks:60

SECTION - A

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

UNIT 1

1) Classify functional foods with examples.

OR

2) Explain dietary supplements and fortified foods with examples.

UNIT 2

3) Describe the health benefits of spices.

OR

4) How do eggs act as a functional food, and what health benefits do they offer?

UNIT 3

5) How do fortified foods help in reducing micronutrient deficiencies?

OR

6) How does product availability and convenience shape consumer interest in functional foods?

UNIT 4

7) Describe the process of biofortification and explain how it enhances the nutritional value of staple crops.

OR

8) How do misleading health claims affect consumer trust in functional foods?

SECTION - B

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

UNIT 1

9) (a) Differentiate between proteins and peptides along with their examples. (5)
(b) List the sources of proteins and mention its health benefits. (5)

OR

10) (a) Differentiate between vitamins and minerals (5)
(b) Mention the role of vitamins promoting human health. (5)

UNIT 2

11) (a) Discuss the effects of probiotics on human health. (5)
(b) Provide examples of probiotic-rich foods. (5)

OR

12) Explain the benefits of probiotics and prebiotics in human health.

UNIT 3

13) Analyze the challenges in the functional food supply chain and suggest possible solutions.

OR

14) Explain how the functional food industry uses enrichment and enhancement techniques to meet consumer health demands.

UNIT 4

15) Discuss in detail the labelling considerations for functional ingredients.

OR

16) How do functional foods help in reducing cholesterol and improving heart health in CVD patients? Provide examples and mechanisms of action.

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22NHEC602 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.A./B.Sc. SIXTH SEMEST ER DEGREE EXAMINATION MAY 2025

NUTRITION AND HEALTH EDUCATION

Food Preservation

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

SECTION - A

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

UNIT 1

1) Explain the significance of classifying foods based on their ease of spoilage.

OR

2) Explain how microorganisms cause food spoilage.

UNIT 2

3) Describe the general characteristics of chemical preservatives.

OR

4) Define food concentration. How does it differ from dehydration?

UNIT 3

5) Differentiate between freezing and refrigeration.

OR

6) Differentiate between IMF and semi moist foods with examples.

UNIT 4

7) Differentiate between vacuum drier and vacuum belt driers with examples.

OR

8) Explain the advantages and disadvantages of different types of drying.

SECTION - B

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

UNIT 1

9) Explain in detail the general principles of food preservation with suitable examples.

OR

10) Discuss different methods used for maintaining aseptic conditions in food processing and packaging.

UNIT 2

11) a) What are the health risks of excessive use of chemical preservatives in food? (5)

b) Explain the impact of antibiotics in food on antimicrobial resistance.(5)

OR

12) Describe the step-by-step method of preparing fermented pickles.

UNIT 3

13) Explain the merits and demerits of Ohmic heating.

OR

14) Explain sterilisation.

UNIT 4

15) Explain the different applications of irradiations in food industry.

OR

16) Explain dehydration and pre treatment methods of drying.

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16PHY601/19PHY601 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

PHYSICS

Nuclear Physics

Duration:3 Hrs Max Marks:80

PART - A

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

1. Give examples for isomers.
2. Why are nuclear forces called exchange forces?
3. What is plasma?
4. What is spontaneous fission?
5. Mention the types of nuclear reactors depending on their utility.
6. What is secular equilibrium?
7. What is the difference between natural and artificial radioactive series?
8. How does the mass number vary when an alpha particle is emitted from its nucleus?
9. What is threshold energy?
10. What are transuranic elements?
11. How are accelerators classified?
12. Why the length of drift tubes in LINAC gradually increases?
13. Which compounds are used as quenching agents in a GM counter?
14. What is annihilation of matter?
15. What are Quarks?

PART - B

UNIT I

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

16. a) Write a note on charge and mass of neutron.

b) Explain in detail nuclear size, nuclear charge, nuclear mass and nuclear density.

17. a) Write the basic features of liquid drop model.

b) Stating the main assumptions explain the shell model of the nucleus. Mention its achievements and failures.

18. a) Determine the energy released during a fission for 1kg of $_{92}U^{235}$.

b) Deduce the four factor formula for a nuclear reactor.

UNIT II

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

19. a) State decay law and draw the decay curve.

b) What is gamma ray emission? Write a note on the interaction of gamma rays with matter.

20. a) State and explain Geiger Nuttal law.

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

21. a) Explain about Somatic and Genetic effect of radiation.

b) Derive an expression for threshold energy of a nuclear reaction.

UNIT III

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

22. a) What is the principle of working of cyclotron?

b) Describe the principle of betatron and hence arrive at the average magnetic field intensity over the area of orbit.

23. a) Explain the variation of cosmic ray intensity with altitude giving possible reasons.

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) Explain in detail the variation of cosmic ray intensity with latitude and altitude.

PART - C

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

25. Estimate the rest mass of a meson using uncertainty principle assuming the range of nuclear force as 1.5 fm.

26. A reactor develops energy at the rate of 32×10^6 W. How many atoms of U-235 undergo fission / second. Assume that on an average 200 MeV of energy is released per fission?

27. A carbon specimen found in a cave contained 1/8 as much C^{14} as an equal amount of Carbon in living matter. Calculate the approximate age of the specimen. Half life of C^{14} is 5568 years.

28. The Q value of the $Na^{23}(p, \alpha) F^{20}$ reaction is -5.4 MeV. Determine the threshold energy of the neutrons for this reaction. Mass of proton is 1.008665 amu and mass of Sodium is 22.9898 amu.

29. The radius of cyclotron dee is 0.4 m and the applied magnetic field is 1.5 Wb/m^2. What is the maximum energy of a beam of protons?
Mass of a proton $=1.67 \times 10^{-27}$ 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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21PHYC601 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

PHYSICS

Elements of condensed matter and nuclear 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) Deduce an expression between electron mobility and Hall coefficient.

   b) Give the applications of Nano materials. Explain any two in detail. (2+7)

2. a) Explain anti-ferromagnetism.

   b) Assuming Debye's expression for energy, discuss the results for specific heat at high and low temperatures. (2+7)

UNIT II

3. a) Draw a labeled diagram of a Coolidge tube

   b) Explain with neat diagrams Meissner effect and critical current. (2+7)

4. a) Mention three types of cubic crystal structures, along with their cell diagram.

   b) Draw the diagram of Bragg's spectrometer and explain how it is used to determine the wavelength of X-rays. (2+7)

UNIT III

5. a) Show that nuclear density is a constant.

   b) Write a note on properties and classification of neutrons. (2+7)

6. a) Distinguish between nuclear fusion and nuclear fission.

   b) With a neat diagram explain the working of a nuclear reactor. (2+7)

UNIT IV

7. a) State and explain Geiger Nuttal law.

   b) Write a note on radioactive series. (2+7)

8. a) Why the energy of the ions produced by the cyclotron is limited?

   b) Describe the principle of betatron and hence arrive at the average magnetic field intensity over the area of orbit. **(2+7)**

PART - B

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

9. The resistivity of aluminium having three conduction electrons/atom is 2.78×10^{-8} Ωm. Calculate a) the drift velocity in a field of 50 V/m b) the mobility of electrons in the given field c) the relaxation time of conduction electrons on the basis of classical free electron theory. Density of Aluminium = 2700, atomic mass = 27 and $N = 6.02 \times 10^{26}$.

10. An X-ray tube operates at 40 kV. Find maximum speed of electrons striking the anticathode and shortest wavelength of X-rays produced.

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

12. In a linear accelerator protons are accelerated thrice by a potential of 40 KeV. After leaving the third tube they enter the accelerating gap of length 0.3 m before entering the next tube. Find the frequency of oscillations applied and the length of the fourth tube. Mass of the proton = 1.67×10^{-27} kg.

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21PHYC602 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

PHYSICS

Electronic instrumentation and sensors

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) Draw a neat diagram of CRT and lable the parts of CRT.

   b) Draw the block diagram of a CRO. Briefly explain its various parts. (2+7)

2. a) Why a transistor cannot be used as a rectifier?

   b) What are filters? Explain the working of π filter in detail. (2+7)

UNIT II

3. a) Draw the diagram for star configuration and give the expression for line current.

   b) Define line current and phase current. Show that line current is $\sqrt{3}$ times the phase current in delta configuration. (2+7)

4. a) What are the disadvantages of high load current at low power factor?

   b) Define power transmission in three phase system and find the relationship between line voltage and phase voltage in star connection. (2+7)

UNIT III

5. a) How Diode detector is used in communication?

   b) What is Amplitude Modulation? Show that the amplitude of an AM wave is the sum of the three components. (2+7)

6. a) Explain Audio frequency (AF) section in AM transmitter.

   b) Describe FM radio transmitter with a block diagram. (2+7)

UNIT IV

7. a) What is the difference between Piezo electric transducers and photoelectic transducers?

   b) Explain the construction and working of LVDT. (2+7)

8. a) What is strain gage? How it is used as transducer?

   b) Define resistive thermometer with a neat diagram. (2+7)

PART - B

Answer any three questions: 3×5= 15

9. Input voltage of a bridge rectifier is 10 Vrms, with frequency 50 Hz. Calculate (i) output voltage, (ii) rectification efficiency (iii) peak inverse voltage and (iv) output frequency, assume $r_f = 20\Omega$, $R_L = 200\Omega$.

10. 3 identical impedances are connected in delta to a three phase supply of 200 V. The line current is 25 A and the total power taken from the supply is 10 kW. Calculate the resistance and the reactance value of each impedance.

11. 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?

12. A 20 V, 500 mW zener diode is used for providing a 20 V suitable supply to a variable load. If the input voltage is 32 V calculate the following (i) value of series resistance required (ii) the diode current when R_L is 2.4kΩ. (iii) the minimum value of R_L that can be connected across the regulator.

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18PHY612 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

PHYSICS

Electronics

Duration:3 Hrs Max Marks:80

PART - A

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

1. What is MOSFET?
2. What is meant by biasing of a transistor?
3. What is leakage current in a transistor?
4. What is meant by ripple factor?
5. What is the function of input capacitor in an amplifier circuit?
6. What is an ac load line?
7. Define the differential gain of an OPAMP.
8. What is the input impedance of ideal operational amplifier?
9. What type of feedback is required in an oscillator?
10. Name the commonly used logic gates.
11. What is sum of products?
12. How NOT gate is obtained using NAND gates?
13. Give any two applications of CRO.
14. What type of modulation is adopted for video signals in TV transmission?
15. What is de-modulation?

PART - B

UNIT I

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

16. a) What is dc load line of a transistor and how does one obtain it?

    b) Explain the model of r_e transistor.

17. a) In a transistor the emitter and collector are of the same type of semi conducting material, yet they cannot be interchanged in a circuit connection. Explain

    b) With a neat diagram, explain the working of a transistor series voltage regulator.

18. a) Define α_{dc} , β_{dc} of a transistor and obtain the relation between α and β.

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) What is a rectifier? Why junction diode is used as a rectifier?

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

20. a) Explain why the voltage gain of an amplifier falls at very low frequencies.

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) Obtain the expressions for current gain and power gain of a CE amplifier using r_e transistor model.

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) What are the characteristics of practical OPAMP- IC741?

b) With diagram explain the working of an AND gate. Give its truth table, logic expression and logic symbol.

23. a) Draw the circuit diagram and truth table for half adder.

b) Describe FM radio receiver with a block diagram.

24. a) Draw the block diagram of FM transmitters.

b) Describe AM radio transmitter with a block diagram.

PART - C

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

25. Transistor with voltage divider bias uses the following components R_1 = 23kΩ, R_2 = 6kΩ, R_E = 250Ω, R_C = 2kΩ, V_{BE} = 0.8V, V_{CC}= 14V. Determine the operating point.

26. Input voltage of a bridge rectifier is 20 V_{rms}, with frequency 50Hz. Calculate dc output voltage, rectification efficiency peak inverse voltage, output frequency, assume r_f = 10Ω, R_L = 100Ω.

27. In an OP- AMP, R_1 = 50 kΩ and feedback resistance r_f = 100 kΩ. Find voltage gain, output voltage by considering a non- inverting amplifier with V_{in} = 100 mV.

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 (A + B + C)(A + B) = A + B

30. An AM wave is represented by the expression V = 5 (1+0.6 cos 6280t) sin 211x10^4t
a) What are the minimum and maximum amplitudes of the AM wave?
b) What frequency components are contained in the modulated wave and what is the amplitude of each component?

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21BOTC601 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

BOTANY

Plant physiology and plant biochemistry

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

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

1. Write any two important roles of Nitrogen in plants
2. Give any two merits of Munch Hypothesis.
3. What is absorption spectrum?
4. Write a note on red drop effect and Emerson effect.
5. What are the two components of a starch molecule?
6. What are transferases? Give an example.
7. What are Parthenocarpic fruits? How are they obtained?
8. List any two roles played by Cytokinins in plants.

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

9. Write a note on scenescence
10. Explain Cohesion-Tension theory of Ascent of Sap
11. Explain i) Phototropism ii)PCD
12. Explain Origin of i)Auxin ii)Gibberellins
13. Write a note on Photoinductive cycle and flowering.
14. Decribe the method of Nitrogen fixation in plants.
15. Give an account of Enzyme inhibitors.
16. What are Proteins? Mention its functions.

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

17. Describe the mechanism of water absorption.
18. Define i) Hypotonic solution ii) Cavitation iii) Hydrolases iv) Holoenzyme v)Allosteric inhibition
19. Describe the biosynthesis of Lipids.
20. Give the schematic representaion of Glycolysis and Krebs cycle.

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21BOTC602 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

BOTANY

Cell biology

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

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

1. What are Intrinsic and Extrinsic proteins?
2. List the different types of plastids.
3. What are carrier proteins? Mention their significance
4. Differentiate between Raphides and Cystoliths.
5. Define allosomes and autosomes
6. Define euchromatin and its significance
7. Mention any two function of tRNA.
8. Define (i) RNA primer (ii) ORI site

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

9. Describe the structure and function of cell.
10. Write a note on i) Rackers particles ii) Starch grains
11. Write a note on active and passive transport.
12. Write brief note on endoplasmic reticulum.
13. Write a note on cytokinesis in plants with help of a neat labelled diagram.
14. Write a note on i)Equatorial plate ii)Centromere
15. Explain Griffith's experiment .
16. Draw a neat labeled diagram of Watson and Crick model of DNA.

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

17. Explain lipid synthesis and transport in the SER.
18. Write a note on Meiosis and mention its significance.
19. Explain the process of transcription in Prokaryotes.
20. Explain post transcriptional gene modifications in Eukaryotes.

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21MICC601 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

MICROBIOLOGY

IMMUNOLOGY AND MEDICAL MICROBIOLOGY

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 Diarrhoegenic *E.coli*.

OR

2) Write a short note on morphology and cultural characters of *Vibrio cholerae*.

UNIT 2

3) Write a note on Tetracycline

OR

4) Write a short note on origin of drug resistance.

UNIT 3

5) Write a note on Thymus.

OR

6) Write a short note on Lymphokines.

UNIT 4

7) Write a note on mechanism of precipitation.

OR

8) Write a brief note on classification of Hypersensitivity.

SECTION - B

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

UNIT 1

9) Outline the importance of normal microflora.

OR

10) Describe the pathogenesis of Salmonella

UNIT 2

11) Explain the factors affecting antimicrobial control.

OR

12) Give a general account of Hepatitis A and Hepatitis B viruses.

UNIT 3

13) Describe the immune mechanism of innate immunity.

OR

14) Give a general account of antigens.

UNIT 4

15) Describe the production of monoclonal antibodies by hybridoma technique.

OR

16) Define and classify Immunoglobulins.Write a note on the properties of Immunoglobulin that participates in Hypersensitivity.

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21MICC602 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

MICROBIOLOGY

INDUSTRIAL MICROBIOLOGY

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

SECTION - A

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

UNIT 1

1) Define stock culture. Write briefly on dried cultures and lyophilization.

OR

2) Define fermentation. Write a short note on Fed batch fermentation process.

UNIT 2

3) Write briefly on the precautions to be taken during sterilization of media and air.

OR

4) Define a bioreactor. Draw a neat labelled diagram of a bioreactor.

UNIT 3

5) List the chemical methods used for Cell disruption and write on the use of organic solvents and osmotic pressure for cell disruption.

OR

6) Define formulation. Write briefly on freeze drying method.

UNIT 4

7) Define alcohol fermentation. Write briefly on different types of wines.

OR

8) Define biogas. List the advantages and disadvantages of biogas production.

SECTION - B

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

UNIT 1

9) Write in detail about GRAS.

OR

10) Define Scale up of fermentation Process. Explain in detail about the scale up of industrial processes.

UNIT 2

11) With a neat labelled diagram explain a Fluidized bed fermentor.

OR

12) List the characteristics of an ideal raw media used in industries.

UNIT 3

13) Write in detail about the Culture collection centres.

OR

14) List the chromatographic techniques for separation of proteins and explain in detail the ion exchange chromatography and MIC.

UNIT 4

15) Explain in detail the process of patenting.

OR

16) Write in detail about Vitamin B2 production in industries.

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18MAT601 Reg. No. .....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION MAY 2025

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) Solve the differential equation. $(yz + xyz)\,dx + (zx + xyz)dy + (xy + xyz)dz = 0$ by rearranging the terms.

b) Obtain the partial differential equation of all planes having equal x and y intercepts.

c) Solve : $\frac{z}{pq} = \frac{x}{p} + \frac{y}{q} + \sqrt{pq}$

d) Prove that the vectors (1, 1, 0, 0) (0, 1, -1 0) and (0, 0, 0, 3) in R^4 are linearly independent over R

e) If V is finite dimensional then prove that any two bases of V have same number of elements.

f) V is a vector space over F and W is a subspace of V. Define orthogonal complement W of W and prove that it is a subspace of V.

g) Find the matrix which represents the linear transformation T with T(1, 0) = (0, 1),

T(0, 1) = (3, 2). Also find T(x, y).

h) Prove that the sum of two linear transformations is linear.

i) Prove that the range of a linear transformation T: V→W is a subspace of W.

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

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

l) Use integral test to determine if the series $\sum_{n=2}^{\infty} \frac{1}{n\sqrt{\ln n}}$ is convergent or divergent.

m) Determine whether the series $\sum_{n=1}^{\infty} \frac{\cos^2 n}{3^n}$ is convergent or divergent.

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

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

PART - B

UNIT-I

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

   b) Solve $p(1 + q) = qz$ (6)

   c) Solve $p^2 - y^3q = x^2 - y^2$ (6)

3. a) Solve $(3z - 4y)p + (4x - 2z)q = 2y - 3x$ (6)

   b) Solve $p^2 + q^2 = npq$ (6)

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

UNIT-II

4. a) If $\{v_1, v_2, \ldots v_n\}$ is a basis of V and $\{w_1, w_2, \ldots w_m\}$ are linearly independent in V then prove that $m \leq n$. (6)

   b) If V is a vector space over F and W is a subspace of V then prove that

   $$dim\, V/_W = dim V - dim W.$$ (6)

   c) If V is finite dimensional inner product space and W is a subspace of V when prove that V is the direct sum of W and W. (6)

5. a) V is a vector space over F. For any nonempty subset S of V define L(S), the linear span of S. Prove that L(S) is a subspace of V. (6)

   b) V is a vector space over F. Prove that the vectors $\{v_1\, v_2 \ldots\ldots v_n\}$ in V are linearly independent or some v_k is a linear combination of its proceeding ones. (6)

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

UNIT-III

6. a) Define the linear transformation of a vector space V into W. Prove that the product of two linear transformations of V into V is linear. (6)

   b) Prove that a linear transformation T of a vector space V with basis $\alpha_1, \alpha_2, \ldots \alpha_n$, is nonsingular if and only if the vectors $\alpha_1T, \alpha_2T, \ldots \alpha_nT$, are linearly independent in V. When this is the case, prove that T has a two sided inverse T^{-1} such that $TT^{-1} = T^{-1}T = I$. (6)

   c) Find the inverse of the matrix $\begin{pmatrix} 1 & 0 & 3 \\ 2 & 4 & 1 \\ 1 & 3 & 0 \end{pmatrix}$ using linear transformations. (6)

7. a) If $\{\beta_1, \beta_2 \ldots \beta_m\}$ is any basis of a vector space V and $\{\alpha_1, \alpha_2 \ldots \alpha_m\}$ are any m vectors in W. Prove that there is one and only one linear transformation of V into W such that $T(\beta_1) = \alpha_1, T(\beta_2) = \alpha_2) \ldots, T(\beta_m) = \alpha_m$ (6)

   b) If the linear transformation $T: V \to W$ is a one-one transformation of V onto W prove that T^{-1} is linear (6)

   c) Find the inverse of the matrix $\begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix}$ using linear transformation (6)

P.T.O.

UNIT-IV

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

   b) If the series $\sum_{n=1}^{\infty} u_n$ is convergent then prove that $\lim_{n\to\infty} u_n = 0$. Hence prove that the series $\sum_{n=1}^{\infty} \frac{n^2+1}{n^2}$ is divergent. (6)

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

9. a) Using the definition prove that the sequence $\frac{n}{2n+1}$ has the limit $\frac{1}{2}$. (6)

   b) Let the series $\sum_{n=1}^{\infty} u_n$ be a series of positive terms. If $\sum v_n$ is a series of positive terms that is known to be convergent and $u_n \leq v_n$ for all positive integers n. Then prove that $\sum_{n=1}^{\infty} u_n$ is convergent. (6)

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

UNIT – V

10. a) Prove that the alternating series $\sum_{n=1}^{\infty}(-1)^{n+1} a_n$ where $a_n > 0$ is convergent if $a_{n+1} < a_n$ and $\lim_{n\to\infty} a_n = 0$. (6)

    b) Determine if the following series is convergent or divergent : $\sum_{n=1}^{\infty} \frac{4}{3^n+1}$ (6)

    c) Determine if the following series is convergent or divergent : $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^2+4n}}$

11. a) Test for convergence of the series $\sum_{n=1}^{\infty}(-1)^{n+1} \frac{n}{2^n}$. (6)

    b) Test for convergence of the series $\sum_{n=1}^{\infty}(-1)^n \frac{3^{2n+1}}{n^{2n}}$ by root test. (6)

    c) Test for convergence of the series $\sum(-1)^n \frac{n!}{2^{n+1}}$ by ratio test. (6)

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18MAT601/19MAT601 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

MATHEMATICS

Mathematics VII: Numerical Methods

Duration:3 Hours **Max Marks:120**

I. Answer any TEN of the following : **(10×3= 30 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 $xe^x - 1 = 0$ 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) When is Newton's forward difference formula specially used?
(ii) What are the advantages of Lagrange's interpolation formula over Newton's interpolation formula.

e. (i) What is the degree of interpolating polynomial which interpolates 6 distinct points?
(ii) When is Lagrange's Interpolation formula specially used?

f. Write the formula for $\frac{dy}{dx}$ at $x = x_0$ when Newton's backward 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_3.

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

i. Obtain the first approximation in Picard's method to solve $y' = 1 + xy, y(0) = 1$.

j. Find the approximate value of $\int_1^2 \frac{1}{x}dx$ by dividing [1,2] into 2 subintervals using trapezoidal rule.

k. (i) What is Simpson's $\frac{1}{3}$rd rule for $\int_a^b f(x)dx$ for $n = 8$?
(ii) In Simpson's $\frac{3}{8}$th rule $\int_{x_0}^{x_3} ydx = \frac{3h}{8}[y_0 + ky_1 + 3y_2 + y_3]$, then $k =$.....?

l. 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 TEN of the following : **(10×9= 90 Marks)**

a. Find a real root of the equation $x^3 - 5x + 3 = 0$ by Newton Raphson method, choose $x_0 = 0.5$.

b. Solve the following system of equations by Gauss Jordan method :

$2x + y + z = 10$
$3x + 2y + 3z = 18$
$x + 4y + 9z = 16$

c. Solve the following system of equations by Gaussian Elimination method :

$5x - 2y + z = 4$
$7x + y - 5z = 8$
$3x + 7y + 4z = 10$

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

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

f. From the following table of values of x and $f(x)$, determine $f(0.23)$:

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

g. Find the cubic Lagrange's polynomial which fits the following data:

x	-2	-1	2	3
y	-12	-8	3	5

h. From the following table of values of x and y , find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ when $x = 1$.

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

i. 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.

j. Determine the value of y when $x = 0.1$, given $y' = x^2 + y, y(0) = 1$, using Euler's modified method. Take $h = 0.05$

k. Given $y' = 1 + y^2, y(0) = 0$, find y(0.2) using Runge-Kutta fourth order formula taking h=0.2.

l. A solid of revolution is formed by rotating about the $x-$axis, the area between the $x-$axis, the line $x = 0$ and $x = 1$ and the curve through the points with the following co-ordinates:

x	0	0.25	0.5	0.75	1
y	1	0.9896	0.9589	0.9089	0.8415

Estimate the volume of the solid formed.

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19MAT601 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

MATHEMATICS

Mathematics VII: Numerical Methods

Duration:3 Hours Max Marks:80

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

a. Calculate the value of $\sqrt{102} - \sqrt{101}$ correct to 4 significant figures.

b. Find an interval of unit length in which the equation $x^3 - 3x - 5 = 0$ has a real root.

c. Find $\phi(x)$ of iteration method for the equation $2x = \cos x + 3$ with $x_0 = \frac{\pi}{2}$.

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

e. If $y_1 = 4, y_3 = 12, y_4 = 19, y_x = 7$, then find x.

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

g. Write the Simpson's $\frac{3}{8}$th rule to evaluate $\int_{x_0}^{x_n} y dx$.

h. If $y' = -y, y(0) = 1$, find $y(0.01)$ using Euler's method, $h = 0.01$.

i. (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.

j. Write adam-Moulton corrector formula.

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

a. Find a real root of the equation $x^3 - 4x - 9 = 0$ by bisection method, correct to 3 decimal places.

b. Solve the following system of equations by Gaussian elimination method :

$2x + y + z = 10$
$3x + 2y + 3z = 18$
$x + 4y + 9z = 16$

c. Find a real root of the equation $x^3 - 3x - 5 = 0$ by Newton Raphson method, choose $x_0 = 2$.

d. Using divided difference, derive newton's general interpolation formula.

e. The table below gives the values of $\tan x$ for $0.10 \leq x \leq 0.30$. Find $\tan 0.12$.

x	0.10	0.15	0.20	0.25	0.30
Y	0.1003	0.1511	0.2027	0.2553	0.3093

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

g. The following table gives the angular displacement θ radians at different intervals of time t seconds. Calculate the angular velocity at instant $t = 0.06$ seconds.

θ	0.052	0.105	0.168	0.242	0.327	0.408	0.489
t	0	0.02	0.04	0.06	0.08	0.10	0.12

h. Given $y' = 1 + y^2, y(0) = 0$, find $y(0.2)$ using Runge-Kutta fourth order formula taking $h = 0.2$

i. A solid of revolution is formed by rotating about the $x-$axis, the area between the $x-$axis, the line $x = 0$ and $x = 1$ and the curve through the points with the following co-ordinates:

x	0	0.25	0.5	0.75	1
y	1	0.9896	0.9589	0.9089	0.8415

Estimate the volume of the solid formed.

j. Using modified Euler's formula, find y(0.1) if $y' = x^2 + y$, $y(0)=1$. Take h=0.05.

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21MATC601 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

MATHEMATICS

Linear Algebra

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

PART - A

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

a. Define linear dependence and linear independence of a set of vectors.

b. Let V be a vector space over a field F where $v \in V$ and $a \in F$. Then show that $(-a) \cdot v = a \cdot (-v) = -(av)$.

c. Determine whether $S = \{(1,0,1),(0,2,2),(3,7,1)\}$ is linearly independent or linearly dependent.

d. Define $T : V_2(R) \to V_2(R)$ by $T(x,y,z) = (x+y, y+z)$. Then show that T is a linear transformation.

e. Find the co-ordinate vector of $(-4,-1,2)$ relative to the ordered basis $\{(1,1,1),(1,2,3),(1,0,0)\}$ of R^3.

f. When is an $n \times n$ matrix diagonizable?

g. Define Invertible Linear transformation.

h. Let W be a subspace of an inner product space V then prove that $W^{\perp}$ is a subspace of V.

PART - B

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

a. Prove that the union of any two subspaces of a vector space V over a field F is a subspace of V if and only if one is contained in the other.

b. Show that the vectors
$e_1 = (1,0,\ldots,0), e_2 = (0,1,0,\ldots,0), \ldots, e_n = (0,0,\ldots,1)$ of the vector space $V_n(R)$ are linearly independent.

c. Let W_1 and W_2 be two subspaces of a vector space $V(F)$ then prove that $V = W_1 \oplus W_2$ if and only if $V = W_1 + W_2$ and $W_1 \cap W_2 = \{0\}$.

d. Let A be any $m \times n$ matrix that is equivalent to a row reduced echelon matrix E. Then show that the non zero rows of E form a basis of the subspace spanned by the rows of A.

PART - C

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

a. Let $T : V \to V'$ be a linear transformation.Then prove that $kerT$ is a subspace of V.

b. Find the linear transformation $T : R^2 \to R^3$ such that $T(1,1) = (0,1,2), T(-1,1) = (2,1,0)$.

c. Given the matrix $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \\ -1 & 3 \end{bmatrix}$, find the linear transformation $T : V_2(R) \to V_3(R)$ relative to bases $B_1 = \{(1,1),(-1,1)\}$ and $B_2 = \{(1,1,1),(1,-1,1),(0,0,1)\}$

d. Let $T : V \to W$ be a linear transformation defined by $T(x,y,z) = (x+y, x-y, 2x+z)$. Find the range, null space, rank, nullity and hence verify the rank-nullity theorem.

PART - D

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

a. Show that two finite dimensional vector spaces on the same field are isomorphic if and only if they are of the same dimension.

b. If λ is the eigen value of an invertible transformation T then show that λ^{-1} is the eigen value of T^{-1}.

c. Find eigen values and eigen vectors for the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.

d. Let $T : V_3(R) \to V_3(R)$ be defined by $T(x,y,z) = (2x+2y+z, x+3y+z, x+2y+2z)$.
1. Find all the eigen values and the corresponding eigen vectors.
2. Find the matrix P such that $P^{-1}AP$ is diagonal, where A is the matrix of T.

PART - E

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

a. Let V be an inner product space. Then prove that $|(v,v')| \leq \|v\|\|v'\|$ where $v, v' \in V$.

b. Let $T : V \to W$ be a linear map and $d[V] = d[W] = n$. Then prove that T is non-singular if and only if T transforms linearly independent vectors of V into linearly independent vectors of W.

c. Let F be a linear operator on R^2 defined by $F(x,y) = (x-y, x-2y)$.
(a) Show that F is nonsingular.
(b) Show that F is invertible.
(c) Find a formula for F^{-1}.

d. Show that if V is a finite dimensional inner product space then V has an orthonormal basis.

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21MATC602 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

MATHEMATICS

Numerical Analysis

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

PART - A

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

a. Round off the following number to 3 decimal places and 3 significant figures :
(i) 50.4551 (ii) 0.0022218

b. Find an interval of unit length in which the equation $x^3 - 3x - 5 = 0$ has a real root.

c. (i)When is Newton's backward difference formula specially used?
(ii) What are the advantages of Lagrange's interpolation formula over Newton's interpolation formula.

d. Find $\Delta^2 3^x$ with $h = 1$.

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

f. Find the approximate value of $\int_1^3 \frac{1}{x} dx$ by dividing $[1, 3]$ into 4 subintervals using trapezoidal rule.

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

h. (i)What is the order of error in Runge-Kutta method of order 4?
(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_3.

PART - B

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

a. Find a real root of the equation $x^3 - 18 = 0$ by bisection method, correct to 3 decimal places.

b. Find a real root of the equation $x^3 + x^2 - 1 = 0$ correct to 3 decimal places by iteration method, choose $x_0 = 0$

c. Solve the following system of equations by Gauss Jordan method :

$5x - 2y + z = 4$
$7x + y - 5z = 8$
$3x + 7y + 4z = 16$

d. Solve the following system of the equation by Gauss-Seidel method , carry out 2 iterations.

$583x + 11y - 4z = 95$
$7x + 52y + 13z = 104$
$3x + 8y + 29z = 71$

PART - C

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

a. Derive the Newton's backward differeence formula to interpolate the set of points $(x_0, y_0), (x_1, y_1), . . , (x_n, y_n)$

b. The table below gives the values of $\tan x$ for $0.10 \leq x \leq 0.30$. Find $\tan 0.50$.

x	0.10	0.15	0.20	0.25	0.30
y	0.1003	0.1511	0.2027	0.2553	0.3093

c. Given the table of values:

x	150	152	154	156
$y=\sqrt{x}$	12.247	12.329	12.410	12.490

Evalute $\sqrt{155}$ using Lagrange's interpolating formula.

d. Given set of tabulated points $(1, -3), (3, 9), (4, 30), (6, 132)$, obtain the values of y when $x = 2$ using divided difference.

PART - D

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

a. From the following table of values of x and y , find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ when $x = 1$.

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

b Derive Simpson's $\frac{1}{3}$rd rule to evaluate $\int_{x_0}^{x_n} f(x)dx$

c. Compute the value of $\int_0^1 \frac{dx}{1+x^2}$ by Simpson's rule with 8 strips. Also calculate the result with true value.

d. A solid of revolution is formed by rotating about the $x-$axis, the area between the $x-$axis, the line $x = 0$ and $x = 1$ and the curve through the points with the following co-ordinates:

x	0	0.25	0.5	0.75	1
y	1	0.9896	0.9589	0.9089	0.8415

Estimate the volume of the solid formed.

PART - E

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

a. Solve $y' = x - y^2, y(0) = 1$ and also find $y(0.1)$ correct to 4 decimal places by Taylor series method (upto 4th degree term).

b. Given y' =y-x, y(0)=2, find y(0.1) using Runge-Kutta fourth order formula taking h=0.1.

c. If $\frac{dy}{dx} + 2y = 0$ with $y(0) = 1$, then obtain $y(0.1), y(0.2)$ and $y(0.3)$ by Euler's method. Take $h = 0.1$

d. With usual notation, derive Adam-Moultan formula.

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19MAT622 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

MATHEMATICS

Mathematics VIII Linear Algibra

Duration:3 Hours Max Marks:80

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

a. Prove that the kernel of of linear transformation $T : V \to V'$ is a subspace of V

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

c. Prove that the mapping $T : C \to R^2$ defined by $T(a+ib) = (a,b)$ is a linear transformation.

d. Prove that the set $L(V,V')$ of all linear transformations of V into V' forms a vectorspace over F.

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

f. Find the column rank of the matrix $A = \begin{bmatrix} 2 & 3 & 1 \\ 1 & \frac{3}{2} & \frac{1}{2} \\ 4 & 6 & 2 \end{bmatrix}$.

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

h. Show that the system of equations: $x_1 - x_2 + x_3 = 0$, has only trivial solution.

$$x_1 + 2x_2 + x_3 = 0,$$
$$2x_1 + x_2 + 3x_3 = 0$$

i. Find the minimum polynomial of $A = \begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$.

j. Prove that A and A^t have the same characteristic roots.

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

a. Let V be an $n-$dimensional vectorspace over F. Then prove that V is isomorphic to the space F^n

b. Prove that $dim(V/W) = dimV - dimW$.

c. Let $V = R^3$ and let $T : V \to V$ be the linear transformation defined by $T(x, y, z) = (x', y', z')$ where $x' = 2x, y' = 4y, z' = 5x$. Find the matrix of T with respect to the basis $(\frac{2}{3}, 0, 0), (0, \frac{1}{2}, 0)$and $(0, 0, \frac{1}{4})$ of V.

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

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

f. If $A = \begin{bmatrix} 1 & 0 & -4 \\ -2 & 2 & 5 \\ 3 & -1 & 2 \end{bmatrix}$, find A^{-1} by using elementary row operations.

g. Let $A \in M_n(F)$ and let $q(x) \in F[x]$, a minimum polynomial of A. If $f(x) \in F[x]$ is any other polynomial satisfied by A, then prove that $q(x)$ divides $f(x)$.

h. i) If A is nonsingular, show that the characteristic roots of A^{-1} are inverses of the characteristic roots of A.
ii) Show that A is nilpotent if and only if all its characteristic roots are zero.

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

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

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18MAT622/18MAT622 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

MATHEMATICS

Mathematics VIII: Linear Algibra

Duration:3 Hours **Max Marks:120**

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

a. Define linear transformation. Prove that $T : F^{(n)} \to F$ defined by $T(v) = a_1$ where $v = (a_1, a_2, \ldots\ldots, a_n) \in F^n$ is a linear transformation.

b. Define idempotent 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 Define dual space of vectorspace V. Prove that the set $L(V, V')$ of all linear transformations of V into V' forms a vectorspace over F.

e. Define a non-singular linear transformation. Prove that the composition of linear transformation is a linear transformation.

f. Let $V = V' = F_n[x]$ the space of all polynomial over F of degree at most n. Find the matrix of the linear transformation $T : V \to V'$ defined by $T(f) = f'$.

g. Find the row rank of $A = \begin{bmatrix} 1 & 2 & 3 & 1 \\ 2 & 1 & 2 & 3 \\ 4 & 8 & 12 & 4 \end{bmatrix}$.

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

i. Show that the system of equations: $x_1 - x_2 + x_3 = 0$, has only trivial solution.

$$x_1 + 2x_2 + x_3 = 0,$$
$$2x_1 + x_2 + 3x_3 = 0$$

j. Find the minimum polynomial of $A = \begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$.

k. Define the characteristic root of a matrix A. Let $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -3 \end{bmatrix}$ and $E_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, E_2 = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}, E_3 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$. Find the characteristic root of A corresponding to E_1, E_2, E_3.

l. Define similar matrices. Prove that similar matrices have same rank.

II. Answer any TEN of the following : **(10×9= 90 Marks)**

a. Define quotient space.Let $T : V \to V'$ be a linear transformation of V onto V' and let $W = kerT$. Then show that $V/W \cong V'$

b. Show that $dimV/W = dimV - dimW$.

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

d. Let V and V' be vectorspaces over F with fixed basis $\{v_1, v_2, \ldots, v_m\}$ and $\{v'_1, v'_2, \ldots v'_n\}$ respectively. Then prove that the mapping $m : L(V,V') \to M_{mn}(F)$ given by $T \to m(T)$ defines an isomorphism of the space $L(V,V')$ of all linear transformations V in V' onto the space $M_{mn}(F)$ of all $m \times n$ matrices over F.

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

f. If $A = \begin{bmatrix} 4 & 0 & 1 \\ 2 & 3 & 6 \\ 6 & -3 & -1 \end{bmatrix}$, find A^{-1} by using elementary row operations.

g. Let $A \in M_n(F)$ and let $q(x) \in F[x]$, a minimum polynomial of A. If $f(x) \in F[x]$ is any other polynomial satisfied by A, then prove that $q(x)$ divides $f(x)$

h. Define a non-singular matrix. Prove that T is an isomorphism if and only if m(T) is non-singular.

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

l. Show that every characteristic root of A is a root of the minimum polynomial of A.

k. Find the characteristic roots of $A = \begin{bmatrix} 2 & 1 & -1 \\ 0 & 3 & -2 \\ 2 & 4 & -3 \end{bmatrix}$.

l. Prove that two similar matrices have the same minimum polynomial.

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18MAT622 Reg. No. .....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION MAY 2025

MATHEMATICS

PAPER VIII: Numerical Methods

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) i) Round 0.0724472 correct to 4 significant figures.
ii) Is the equation $xe^x - tan^{-1}x = 0$ algebraic or transcendental?

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

c) What are the advantages of Lagranges interpolation formula over Newtons formula?

d) Obtain a formula for divided difference $[x_0, x_1, x_2, x_3]$.

e) Write Simpson's $\frac{3^{th}}{8}$ rule to evaluate $\int_a^b f(x)dx$.

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

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

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

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

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

j) Write Adam Bashforth predictor corrector formula.

k) i) When do we say that the system $AX = B$ is consistent?

ii) Which method is also known as the method of simultaneous displacements?

l) Test whether the matrix $\begin{bmatrix} cos\emptyset & sin\emptyset \\ sin\emptyset & -Cos\emptyset \end{bmatrix}$ is orthogonal.

m) Write n^{th}approximation in Picard's method to the solution of $\frac{dy}{dx} = f(x,y)$, $y(x_0) = y_0$.

n) i) Under what conditions does Gauss-Seidel method converge?

ii) Write Runge-Kutta second order formula.

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

PART - B

UNIT-I

2. a) Describe the method of bisection. (6)

   b) Using Newton-Raphson method obtain the real root correct to 3 decimal places of the equation, $x^3 - 2x - 5 = 0$, choose $x_0 = 2$. (6)

   c) Solve $x^3 - 2x - 5 = 0$, using False position method. (6)

3. a) Find a real root of the equation $2x = \cos x + 3$ correct to 3 decimal places using Iteration method (choose $x_0 = \frac{\pi}{2}$) (6)

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

   c) Using the method of bisection, solve $x^3 - x - 1 = 0$ correct to 3 decimal places. (6)

UNIT-II

4. a) In the table below, the values of x and y are given.

x	3	4	5	6	7	8	9
y	2.7	6.4	12.5	21.6	34.3	51.2	72.9

   Find the tenth term of the series. (6)

   b) Derive Newton's forward interpolation formula to interpolate $f(x)$ on the set of points $(x_0, y_0), (x_1, y_1), \ldots, (x_n, y_n)$. (6)

   c) Find the cubic polynomial which takes values $y(0) = 1, y(1) = 0, y(2) = 1, y(3) = 10$ (6)

5. a) Using Lagrange's interpolation formula resolve into partial fractions $\frac{3x^2+x+1}{(x-1)(x-2)(x-3)}$ (6)

   b) Find $\sqrt{155}$ from the following tabular values. (6)

x	150	152	154	156
$\sqrt{x}$	12.247	12.329	12.410	12.490

   c) Find the missing term in the following table.

x	0	1	2	3	4
y	1	3	9	?	81

UNIT-III

6. a) Derive Simpson's $\frac{1}{3}^{rd}$ rule. (6)

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

   c) The following table of values x & y are given, find $\frac{dy}{dx}$ when $x = 1$ (6)

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

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

b) Find $\frac{d^2y}{dx^2}$ at x = 2.2 for the following data.

x	1	1.2	1.4	1.6	1.8	2	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

(6)

c) Evaluate $\int_0^1 \frac{1}{1+x}dx$, $h = 0.125$ using Simpson's $1/3^{rd}$ Rule. (6)

UNIT-IV

8. a) Find whether the following system of equations is consistent or not.
$x - 4y + 5z = 8$
$3x + 7y - z = 3$
$x + 15y - 11z = -14$ (6)

b) Find the inverse of the matrix $A = \begin{bmatrix} 2 & 1 & 1 \\ 3 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$ using Gauss – Elimination method. (6)

c) Solve by Jacobi method.
$10x + y + z = 15$
$x + 10y + z = 24$
$x + y + 10z = 33$ carry out 3 iterations. (6)

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

b) Solve the system of equations by Gauss elimination method.

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

c) Using Gauss-Seidel method solve the system.
$10x_1 - 2x_2 - x_3 - x_4 = 3$
$-2x_1 + 10x_2 - x_3 - x_4 = 15$
$-x_1 - x_2 + 10x_3 - 2x_4 = 27$
$-x_1 - x_2 - 2x_3 + 10x_4 = -9$
Carry out 2 iterations. (6)

UNIT – V

10. a) Solve $y' = x - y^2$; $y(0)1$ and find $y(0,1)$ correct to 4 decimal points by Taylor Series method. (6)

b) Derive Adams – Moulton corrector formula to solve $\frac{dy}{dx} = f(x, y)$. (6)

c) Using modified Euler's formula estimate $y(0.1)$ if $y' = x^2 + y$, $y(0) = 1$ take $h = 0.1$ (6)

P.T.O.

11. a) Given $y' = x + y^2$ with $y = 1$ when $x = 0$, solve by **Picard's** method. (6)

b) Using Predictor corrector formula , for $\frac{dy}{dx} = 1 + y^2$ with $h = 0.2$ compute $y = (0.8)$ Given $y(0) = 0, y(0.2) = 0.2027, y(0.4) = 0.4228, y(0.6) = 0.6841.$ (6)

c) Using Runge – Kutta method of order 4, determine $y(0.1)$ and $y(0.2)$ for $\frac{dy}{dx} = y - x$, $y(0) = 2$ correct to 4 decimal places (take h=0.1) (6)

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21STAC601 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

STATISTICS

Statistical inference II

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

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

1. Define the principle of optimality in decision making.
2. Define the role of prior probabilities in the Bayes minimax decision rule.
3. There is a need for sequential testing. Justify.
4. Explain "Run" and "Length of a Run" in a Run test.
5. Define quality

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

6. Explain the advantages and limitations of the squared error loss function in decision-making.
7. Obtain SPRTP to test H_0:p=p_0 against H_1:p=p_1 for a Binomial Population with parameter n and p.
8. Describe the test procedure for the application of Kruskal Walls H Test .
9. Derive a test statistic for Median Test.
10. Make a comparative study of charts for variables and charts for attributes.
11. Briefly explain Acceptance sampling with one example.

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

12. Explain how decision rules are optimized or derived using optimization techniques, such as maximizing expected utility, minimizing expected loss, or satisfying optimality criteria. Provide examples to illustrate the optimization process.

13. Explain the relationship between ASN and OC functions in the SPRT and how can decision-makers utilize this relationship to optimize the design of SPRT?

14. Derive the test statistic for Wilcoxon Matched-Pair Signed Rank Test.

15. What is the need for control charts in quality control? Stating the assumptions, derive the control limit for u chart when the sample size is constant as well as for varying sample size.

16. Find the control limits for p chart given a) n=82 and $\bar{p}$=0.05 and b) n=97 and 0.42 is the larget value for p

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21STAC602 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

STATISTICS

Sampling Techniques and Statistics for National Development

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

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

1. What do you mean by Nonresponse?
2. Define a measurement scale.
3. Define Stratum population weight and sample weight under Stratified Random Sampling.
4. Define Sampling Interval in case of Systematic Sampling.
5. Distinguish between Cluster Sampling and Stratified Sampling.

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

6. Discuss with example advantages and limitations of sample survey.
7. Under SRSWR prove that $V(\bar{y}) = \frac{\sigma^2}{n}$.
8. Under certain assumptions show that $V(\bar{y})_{SRSWOR} \geq V(\bar{y_{ST}})_{PROP}$.
9. Explain merits and demerits Linear Systematic Sampling with an example.
10. Prove that Systematic sampling is more efficient than SRSWOR if $S^2_{sys} > S^2$.
11. Describe the role of NSSO in the collecton of reliable information.

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

12. Briefly explain the merits and demerits of questionnaire and a schedule with examples.
13. Derive the formula for sample size required for the estimation of population proportion.

14. What is Neymans Allocation? Under Neymans allocation show that sample variance is minimum for a fixed sample size if $n_h \propto N_h S_h$.

15. a) Deduce an expression for $V(\bar{y})_{ST}$ for a population with linear trend. (6)
    b) How do you relate Systematic Sampling to Stratified Random Sampling? (4)

16. For a population with linear trend show that $V(\bar{y})_{ST} \leq V(\bar{y})_{SYS} \leq V(\bar{y})_{SRSWOR}$.

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18CHE601/19CHE601 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

CHEMISTRY

General Chemistry VII

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

PART - A

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

1. Explain Laporte selection rule.
2. Give the relation between μ_s and μ_{eff}. Explain the terms involved.
3. Write the mathematical expression for quantum efficiency.
4. State Stark-Einstein law.
5. How is furan converted to thiophene?
6. Explain Chichibabin reaction with an example.

PART - B

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

UNIT I

7. a. Write the postulates of crystal field theory.
   b. Give four applications of organoaluminum compounds. (6+4)
8. a. Explain any two applications of complexes by volumetric analysis.
   b. Explain any three chemical properties of organolithium compounds.
   c. Give three reactions of alkyl lithium compounds. (4+3+3)
9. a. Explain the nature of bonding in metal carbonyls.
   b. Write a note on stepwise stability constants.
   c. Explain trans effect with suitable examples. (4+3+3)

UNIT II

10. a. Explain briefly the Gouy's method for measuring magnetic susceptibility.
    b. Calculate the energy associated with one photon of radiation of wavelength 8000 $Å^0$.
    c. Write a note on photophysical processes. (4+3+3)

11. a. Explain the construction and working of calomel electrode.
    b. State and explain the law of photochemical equivalence and calculate the value of 1 einstein for light having $\lambda = 2500 Å^0$
    c. State and explain Grothus- Draper law. (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. Explain the nitration and sulphonation reactions of pyrrole.
    b. Explain the terms bathochromic shift, hypsochromic shift and hypochromic shift.
    c. Give two reactions to show that pyrrole behaves as phenol. (4+3+3)

14. a. Explain Skraup synthesis of quinoline.
    b. What is the principle of mass spectrometry?
    c. What happens when quinoline is oxidized with alkaline potassium permanganate? (4+3+3)

15. a. Write three applications of UV spectroscopy.
    b. What are the different types of molecular vibrations. (5+5)

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6/5/25

21CHEC601 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

CHEMISTRY

Inorganic & Physical chemistry IV

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

PART - A

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

1. What is d-d transition?
2. Write any two factors that affect the Crystal field stabilisation energy?
3. State Spin selection rule.
4. What are Orgel diagrams? Draw the Orgel diagram for d^1 system in octahedral field?
5. What are the different phases which exist in NaCl-H_2O system?
6. Define the term Component in Phase equilibria. Give an example.
7. The EMF of the cell $Hg/Hg_2Cl_2/KCl(sat)//$ H+/quinhydrone/Pt was found to be 0.228V at 25^0C. Calculte pH.
8. What are the demerits of hydrogen electrode?

PART - B

II.Answer any SIX of the following choosing at least one question from each unit:(6×8= 48 Marks)

UNIT I

9. a) Explain the limitations of Valence Bond theory?
   b) On the basis of VBT explain the hybridisation,geometrical shape and magnetic properties of $[Co(NH_3)_6]^{3+}$ (4+4)

10. a) How does the nature of the ligand affect the stability of the complex ion?
    b) Derive an expression for stepwise stability constants. (5+3)

UNIT II

11. a) How does the CFT explains the colour of transition metal complexes?
    b) Write the advantages of crystal field theory over VBT. (4+4)

12 a) Write the characteristics of charge transfer spectra.
b) Explain the two types of charge transfer spectra. (4+4).

UNIT III

13. a) Write five applications of Thermogravimetric analysis.
b) What are the different types of Thermobalances ? (5+3)

14 a) What are the factors affecting DTA curves?
b) Explain DTA and the difference between the curves of DTG and DTA. (4+4)

UNIT IV

15. a) Explain the binary mixture which shows positive deviation from Raoult's law.
b) Write a note on Azeotropic mixtures and give any two applications. (4+4)

16 a) Explain the principle and procedure for redox titration by potentiometry.
b) Derive the relationship between EMF and equilibrium constant. (4+4)

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21CHEC602 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

CHEMISTRY

Organic Chemistry & Spectroscopy II

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

PART - A

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

1. With a suitable example explain Benzil-benzilic acid rearrangement.
2. Give one method of preparation of Grignard reagent.
3. What are derived proteins?
4. Explain Strecker's synthesis.
5. Calculate the value of one einstein of energy in kJ/mol.
6. What are organolithium compounds? Give examples.
7. What is the reference solvent used in NMR spectroscopy and write its structure?
8. What is an NMR spectrum?

PART - B

II.Answer any SIX of the following choosing at least one question from each unit: (6×8= 48 Marks)

UNIT I

9. a) Give the synthesis of i) succinic acid ii) propanoic acid from DEM.
   b) Explain Curtius rearrangement and its mechanism with a suitable example (4+4)
10. a) How is 4-methyl uracil prepared from AAE?
    b) Explain Baeyer-Villiger oxidation with a suitable example. (4+4)

UNIT II

11. a) Explain solution phase peptide synthesis with a suitable example.
    b) What is TFAA? Explain its role in peptide synthesis. (5+3)
12. a) Explain the tertiary and quaternary protein structure
    b) What is Sangers reagent? Give its application. (5+3)

UNIT III

13. a) Draw and explain Jablonski diagram.
    b) Write a short note on photoinhibitors. (5+3)

14 a) Write the synthesis of pantothenic acid.
    b) Write the applications of flame photometry. (5+3)

UNIT IV

15. a) Explain the PMR spectra of 1,1,2-tribromoethane.
    b) Explain the factors affecting Chemical shift? (4+4)

16. a) Explain the splitting of signals and relative peak intensities in NMR spectroscopy.
    b) Explain three rules for fragmentation in Mass spectrometry. (5+3)

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21CSCC601 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

COMPUTER SCIENCE

Web Technologies

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

PART A

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

1) What is the purpose of i) div ii) figcaption tags?
2) What is the usage of frameset tag? Give an example.
3) How do you give shadow effect to an HTML element? Give an example.
4) Write any two implementation flaws in the authentication systems.
5) How do you create an object in JavaScript? Give an example.
6) Write the syntax for try-catch block in JavaScript.

PART B

Answer any FIVE questions : **(5×8= 30)**

7) Write a note on a) HTTP Server b) IIS c) Proxy Server
8) Explain image map with an example.
9) How do you add radiobutton, checkbox and dropdownlist to a HTML page? Explain with an example each.
10) Explain with examples: a) CSS Background properties b) CSS Font properties
11. Write a note on XML parser.
12. Explain any three conditional statements in JavaScript with an example.

PART C

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

13. Explain CSS 2D transform methods with an example.
14. Explain Assignment and Comparison operators in JavaScript with an example each.
15. Define a) Java Servlet b) CGI. Explain the benefits of using Java servlet over CGI.

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19COS601 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025.

COMPUTER SCIENCE

Computer Science Theory VII

Duration:3 Hours Max Marks:80

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

1. Mention the various collection data types in Python.
2. How do you use the pop() method in a set?
3. What is search operation in an array?
4. What is negative indexing in strings? Give an example.
5. Give an example to return name of week day.
6. What is polymorhism?

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

7. Explain with an example for loop in Python.
8. How do you rename a module in Python? Explain with an example.
9. Explain operator overloading with an example.
10. Explain with an example Nested IF statements in Python.
11. What is self parameter? Explain with an example .
12. Explain any six differences between C and Python.

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

13. a) Explain the features of Python.
    b) Explain about Python Interactive shell.
14. a) Explain keyword arguments in Python.
    b) Explain arbitrary keyword arguments in Python.

15. a) Explain python tuple count() method.
    b) Explain python tuple index() method.
    c) Explain tuple constructor.

16. a) How do you define and call a function? Explain with an example.
    b) Explain with an example returning multiple values from a function.

17. Explain with an example creating database tables through Python.

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18COS601/19COS601 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025.

COMPUTER SCIENCE

Computer Science Theory VII

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

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

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2. How do you use the pop() method in a set?
3. What is search operation in an array?
4. What is negative indexing in strings? Give an example.
5. Give an example to return name of week day.
6. What is polymorhism?

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8. How do you rename a module in Python? Explain with an example.
9. Explain operator overloading with an example.
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III. Answer any FOUR of the following : **(4×10= 40 Marks)**

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    b) Explain python tuple index() method.
    c) Explain tuple constructor.

16. a) How do you define and call a function? Explain with an example.
    b) Explain with an example returning multiple values from a function.

17. Explain with an example creating database tables through Python.

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21CSCC602 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

COMPUTER SCIENCE

Statistical Computing & R Programming

Duration:2 Hours Max Marks:60

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

1. State the output of sqrt() function in R with an example.
2. Write about read.table() function in R and give one example.
3. Define Poisson distribution and when do we use it?
4. Define a)Null hypothesis and b) Alternative hypothesis.
5. With an example explain seq() function in R .

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

6. Explain the characteristics of data frame in R programming ? Discuss about operations on data frame.
7. Explain Quick sort implementation using Recursion.
8. Briefly explain the scatter plot and histograms with examples? What are its importance?
9. Explain the Regression Analysis with an example.
10. Explain Nominal scale, Ordinal scale and Ratio scale with an example.
11. Write the Properties of Correlation.

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

12. Which are the functions used to add points, lines, text, arrows and legend to the plot? Explain each function with an example.
13. Explain stand alone statements with an example and give one example for switch function in R.

14. What is prbobability distribution? Explain.

a) Marginal probabillity,

b) Joint probability and

c)Conditional probability distributions with an example.

15. Explain t-test and One sample proportion test with an example.

16. How will you find quartile deviation in a grouped data? Find quartile deviation for the following data.

Class Interval	0-2	2-4	4-6	6-8	8-10	10-12
Frequency	20	35	42	25	60	10

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19COS612 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

COMPUTER SCIENCE

Computer Science Theory VIII

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

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

1. Write any two features of Visual Web Developer.
2. Write any two application location options available in ASP.NET.
3. What are web server controls? List any two.
4. List the type of nodes in a TreeView control.
5. What are Datasets?
6. Write any two functions of a Master page.

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

7. How do you compile web application in ASP.NET? Explain.
8. Explain any six methods corresponding to the events that occur in global.asax file.
9. What are HyperLink server controls? Explain with the help of an example.
10. Write a note on a) LoginName b) LoginStatus controls
11. Explain XmlDataSource control with its public property and methods.
12. Explain i) CatalogZone ii) DeclarativeCatalogPart iii) PageCatalogPart

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

13. a) Explain the methods used to store state information at server end.
    b) Write a note on i) Cookies ii) Hidden Fields
14. Explain a) DropDownList server control b) ListBox server control
15. a) Explain any five elements of AdRotator server control.
    b) How do you retrieve a selected date from Calendar server control? Explain with a help of an example.
16. a) Write the steps involved in using a RangeValidator control.
    b) Write a note on i) RequiredFieldValidator control ii)RegularExpression Validation control
17. Explain any five public properties of i) GridView control ii) Repeater control

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21ZOOC601 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

ZOOLOGY

Evolutionary and Developmental Biology

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

SECTION - A

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

UNIT 1

1) Explain the patterns of evolution.

OR

2) Differentiate between Natural and Sexual selection.

UNIT 2

3) Explain allopatric speciation with an example.

OR

4) What are the major causes of mass extinction of the species.

UNIT 3

5) Explain Homeobox genes in Drosophila.

OR

6) Differentaite between Oogenesis and Spermatogenesis.

UNIT 4

7) Write a note on limb development in amphibians.

OR

8) Write a note on menstrual cycle in humans.

SECTION - B

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

UNIT 1

9) Describe the role of evolutionary forces leading to microevolution and macroevolution.

OR

10) Discuss Hardy Weinberg equilibrium.

UNIT 2

11) Define fossil. Explain the types. How is the fossil age determined?

OR

12) Explain the process of horse evolution that lead to the development of modern horse.

UNIT 3

13) Explain developmental genes with reference to segmentation genes.

OR

14) Discuss the function of three germ layers and stages of organogenesis

UNIT 4

15) Define Placenta. Explain different types of placenta based on histological structure. Add a note on its functions.

OR

16) Write a note on biology of aging.

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19ZOO601 Reg No : .....

CHOICE BASED CREDIT SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

ZOOLOGY

Genetics, Evolution and Palaeontology

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

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

1. What is the relationship between nature and nurture?
2. Name any four theories of linkage.
3. Define mutation. Who coined the term mutation?
4. What is sex determination? Name the factors determining sex.
5. Define gene flow & genetic drift.
6. What are vestigial organs? Give examples.

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

7. Define Rh factor. Explain properties of Rh blood factor in humans.
8. Explain the law of independent assortment with a suitable example.
9. Write short notes on i) Alkaptonuria ii) Phenylketotonuria
10. Explain the types of genes linked to cancer.
11. Explain macro evolution with an example.
12. Explain Natural selection with an example.

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

13. Explain polygenic inheritance with reference to eye colour in humans.
14. What is interaction of genes? Explain the phenomenon with reference to comb pattern in fowls.
15. Write an essay on a) Amniocentesis b) Genetic counselling
16. Explain sex limited and sex influenced traits with examples.
17. Give a brief account of the fossil history of *Dinosaurs*.

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21ZOOC602 Reg No : .....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION MAY 2025

ZOOLOGY

Environmental Biology, Wildlife Management and Conservation

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

SECTION - A

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

UNIT 1

1) Write short notes on a) community dominants b) Ecotone and edge effects.

OR

2) Describe trophic levels in an ecosystem.

UNIT 2

3) Define waste management system.Write a note on types of wastes.

OR

4) List any five causes of Ozone layer depletion.

UNIT 3

5) Explain Territory with examples.

OR

6) Write a note on any five protected wild life species.

UNIT 4

7) Describe the role of Indian Board for Wildlife in Conservation of Wild life.

OR

8) Enumerate the challenges to Wild Life Protection Act.

SECTION - B

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

UNIT 1

9) Define man made ecosystem. Give an account of cropland as manmade ecosystem.

OR

10) Give an account of ablotic and biotic components of forest ecosystem.

UNIT 2

11) Describe the mechanism of formation of soil. Add a note on soil texture.

OR

12) Describe the prevention and control measures of water and soil pollution.

UNIT 3

13) Give an account of extinct species of India.

OR

14) Give an account of biodiversity hotspots of India.

UNIT 4

15) Give an account of In Situ conservation.

OR

16) Give an account of Project Tiger.

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