

CHOICE BASED CREDIT SYSTEM

B.Sc. FOURTH SEMESTER DEGREE EXAMINATION AUGUST 2022

COMPUTER SCIENCE

Computer Science Theory IV

Duration:3 Hours

Max Marks:80

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

1. What are bitwise operators? Mention the operators.
2. What are Java statements? How are they classified?
3. List any two differences between class and interface.
4. What are labelled loops? Give an example.
5. How is java more secure than other languages?
6. What is the use of paint() method in an Applet class?

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

7. Explain logical and assignment operators with an example each.
8. Write the benefits & applications of OOP.
9. What is an array? Explain different types of arrays with examples.
10. Write a note on API packages.
11. Explain exception handling mechanism in Java.
12. How do you add and run an applet? Explain.

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

13. Explain different datatypes available in Java?
14. a) How do you implement a java program? Explain.
b) Explain constants and variables.
15. Explain the following
i) nested if ii) else if ladder
16. What is inheritance? Explain multilevel inheritance with a programming example.
17. a) With a transition diagram explain the life cycle of a thread.
b) How do you create, declare and implement a thread? Explain.

CHOICE BASED CREDIT SYSTEM
B.Sc. FOURTH SEMESTER DEGREE EXAMINATION AUGUST 2022
CHEMISTRY
General Chemistry IV

Duration:3 Hours

Max Marks:80

PART - A

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

- 1 Chromium exhibits $3d^54s^1$ configuration instead of $3d^44s^2$. Give reason.
- 2 Write the bond angle and shape of ammonia molecule.
- 3 Give two applications of adsorption.
- 4 How are nanomaterials classified?
- 5 What is addition polymerisation? Give an example for addition polymer.
- 6 How is benzene diazonium chloride formed?

PART - B

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

UNIT I

- 7 a. With the help of molecular orbital energy level diagram explain why the bond order of N_2^+ ion is less than N_2 molecule.
b. Draw the structures of the complexes of d block elements with co-ordination number 4.
c. Explain the conditions for the linear combination of atomic orbitals. (4+3+3)
- 8 a. Explain complex formation tendencies of elements of 3d series.
b. Explain the magnetic property of d-block elements.
c. With a suitable example explain sp^3d^2 hybridisation. (4+3+3)
- 9 a. Write the postulates of valence bond theory. Give its limitations.
b. Compare the second and third transition series with their 3d analogues in respect of oxidation state, ionic radii and magnetic behaviour.
c. Explain the geometry, hybridisation and shape of BF_3 molecule using VBT. (4+3+3)

UNIT II

- 10 a. State Nernst distribution law. Explain its application in solvent extraction.
b. How is the distribution law modified when the solute molecules dissociate in one of the solvents?
c. Give the applications of adsorption. (4+3+3)
- 11 a. Explain sol-gel method of synthesis of nanomaterials.
b. Explain the factors affecting adsorption of gases by solids.
c. Discuss a system that shows positive deviation from Raoult's law. (4+3+3)

- 12 a. Explain phenol- water system.
b. How are liquid mixtures classified? Give one example for each type.
c. Write BET equation. How is it applied in the determination of the surface area of the adsorbents. (4+3+3)

UNIT III

- 13 a. Explain the separation of amines by Hinsberg method.
b. How is benzene diazonium chloride converted to (i) arylhydrazine (ii) p- aminoazobenzene (5+5)
- 14 a. Explain any two methods of formation of amines.
b. How is Nylon-6,6 prepared? Give one application.
c. How is benzene diazonium chloride converted to nitrobenzene? (4+3+3)
- 15 a. Write the preparation and two applications of epoxy resins.
b. Explain the action of nitrous acid on various amines?
c. Explain the synthesis of polyurethanes. (4+3+3)

CHOICE BASED CREDIT SYSTEM

B.Sc. FOURTH SEMESTER DEGREE EXAMINATION AUGUST 2022

MATHEMATICS

Mathematics Theory IV

Duration:3 Hours

Max Marks:80

I. Answer any EIGHT of the following :

(8×3= 24 Marks)

- a. Prove that $(\mathbb{Z}, +)$ is an infinite abelian group.
- b. Define identity element.
Find the identity element for $a * b = \frac{ab}{4}$ in the set of rational numbers.
- c. Define subgroup. Prove that the set Q of all rational numbers form a subgroup of $(\mathbb{R}, +)$ where \mathbb{R} is the set of all real numbers.
- d. Let $\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 2 & 4 & 1 \end{pmatrix}$. Find σ^{-1} and $\sigma^{-1}\sigma$.
- e. Let \mathbb{R}^* be the multiplicative group of non-zero reals. Which of the following mapping of \mathbb{R}^* into \mathbb{R}^* are group homomorphisms? Find the kernel in case of a homomorphism.
(i) $x \rightarrow \frac{1}{x}$ (ii) $x \rightarrow |x|$
- f. Simplify : $\frac{5i}{(1-i)(2-i)(3-i)}$
- g. Find the derivative of $f(z) = z^2$ by using definition.
- h. Find the singular points of $f(z) = \frac{z^3+i}{z^2-3z+2}$.
- i. Find all values of z such that $\exp(2z - 1) = 1$.
- j. Show that $\text{Log}(-ei) = 1 - \frac{\pi}{2}i$.

II. Answer any EIGHT of the following :

(8×7= 56 Marks)

- a. Let G be a set with a binary operation which is associative.
Assume that G has a right unit element and every element of G has a right inverse. Prove that G is a group.

- b. For any group G , prove that the set $H = \{x|x \in G, xa = ax, \forall a \in G\}$ is a subgroup of G .
- c. Prove that any subgroup of a cyclic group is cyclic.
- d. Prove that any two left cosets of H in G have the same number (finite or infinite) of elements.
- e. 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 .
- f. Find the 4th roots of unity.
- g. Prove that $f'(z)$ and $f''(z)$ exist everywhere and find $f''(z)$ for $f(z) = z^3$.
- h. Prove that the function $u(x, y) = 2x(1 - y)$ is harmonic and find its harmonic conjugate.
- i. Prove that $|\sin z|^2 = \sin^2 x + \sin^2 y$ and $|\cos z|^2 = \cos^2 x + \sin^2 y$.
- j. Prove that $-i \sin(iz) = \sin hz$ and $\cos(iz) = \cosh z$.

19BOT401

Reg No :

CHOICE BASED CREDIT SYSTEM
B.Sc. FOURTH SEMESTER DEGREE EXAMINATION AUGUST 2022
BOTANY
Botany Theory IV

Duration:3 Hours

Max Marks:80

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

1. Give the components of Nucleosome.
2. Define Vesicles. Where is it found?
3. What are intercalary meristems? Mention its position in plants.
4. Why did Mendel choose Pea Plants for his experiment?
5. What is unisexuality? Give an example for unisexual flowers.
6. Write the features of stele in dicot stem.

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

7. Describe the mineral crystals found in plant cells.
8. Discuss the difference between Collenchyma and Sclerenchyma.
9. Explain in detail about the living mechanical tissue of plant body with their types and functions.
10. Discuss the types of stomata based on the arrangement of subsidiary cells.
11. Explain the morphology of pollen grains in detail.
12. Describe the structure of dicot seed.

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

13. Comment on complete and incomplete linkage.
14. Explain the ultra structure of a chloroplast with a diagram. Add a note on its functions.
15. With the help of a neat labelled diagram explain the structure of xylem.
16. Describe the prophase I of meiosis.
17. Explain structure and types of ovules in detail.

CHOICE BASED CREDIT SYSTEM
B.Sc. FOURTH SEMESTER DEGREE EXAMINATION AUGUST 2022
PHYSICS
Physics Theory IV

Duration:3 Hrs

Max Marks:80

PART - A

Answer any TWELVE from the following:

(12×1= 12 Marks)

1. What are flux lines?
2. Gradient of a scalar field is a vector field. Give one example.
3. What is an irrotational field?
4. Give the significance of the equation $\nabla \cdot \vec{B} = 0$
5. Write the expression for momentum density in terms of Poynting vector.
6. State Maximum power theorem for an electrical network.
7. What is the importance of superposition theorem?
8. What is the voltage division rule?
9. Write the expression of growth of current in LR circuit.
10. What is a transient current?
11. Define power factor of an ac circuit.
12. What is a high pass filter?
13. Give the relation between power factor and load current.
14. What is the current through the neutral wire when the three phases are equally loaded?
15. Give the expression for self-inductance of a coil using Anderson's bridge.

PART - B

Answer any TWO from the following:

(2×8= 16 Marks)

UNIT I

16. a) State Gauss theorem and express it in vector form.
b) Describe line integral, surface integral and volume integral. (2+6)
17. a) State Stokes's theorem and express it in vector form.
b) Explain in detail about scalar field, point function and level surfaces and give an example for each of these parameters. (2+6)
18. a) Write down Maxwell's field equations for an isotropic homogeneous dielectric medium.
b) Arrive at the differential form of Faraday's law of electromagnetism. Show that it is incompatible with the equation of continuity. How it is corrected? (2+6)

UNIT II

Answer any TWO from the following:

(2×8= 16 Marks)

19. a) State and explain Kirchhoff's current law.

- b) Explain with circuit diagram the division of voltage in series circuits. (2+6)
20. a) Define active circuit element. Give one example.
 b) State and explain Thevenin's theorem by considering a general network. (2+6)
21. a) A RC series circuit is excited by a dc voltage source of 80 V by closing the switch at $t = 0$. Determine the voltage across the capacitor in a time constant of one second.
 b) Obtain an expression for the charge on the capacitor when it is charged through series LCR circuit and discuss cases. (2+6)

UNIT III

Answer any TWO from the following:

(2×8= 16 Marks)

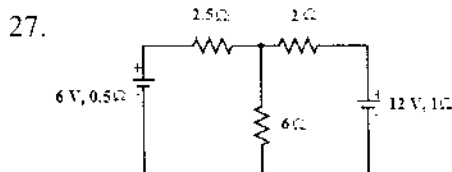
22. a) What is phase of an ac? Explain.
 b) Draw the parallel LCR circuit and obtain the expression for the resonant frequency for a parallel LCR circuit. (2+6)
23. a) Draw the diagram for star configuration and give the expression for line voltage.
 b) Define line current and phase current. Show that line current is $\sqrt{3}$ times the phase current in delta configuration. (2+6)
24. a) Draw the labeled circuit diagram for De-Sauty bridge.
 b) With the necessary theory explain the experiment to determine the charge sensitivity of a BG. (2+6)

PART - C

Answer any FOUR from the following:

(4×5= 20 Marks)

25. Show that $\phi = x^2 - y^2 + 2z$ satisfies Laplace's equation.
26. A radio station on the surface of the earth radiates a sinusoidal wave with an average total power of 50 kW. Assuming the transmitter radiates equally in all directions above the ground, find the amplitude of E_{\max} and B_{\max} detected by a satellite at a distance of 100 km from the antenna.



Using Superposition theorem, find the branch currents in the given network.

28. A capacitance of $2 \mu\text{F}$ is first charged and then discharged through a resistance of $1 \text{ M}\Omega$. Calculate the time in which the charge on the capacitor will fall to 50% of its initial value.
29. A series LCR circuit contains a coil of inductance 2 H , resistance 1000Ω and a capacitor $0.2 \mu\text{F}$. The circuit is connected in series with a 2 V , 100 Hz AC supply. Calculate impedance, current and resonant frequency.
30. Calculate the cut off frequency for a simple high pass filter consisting of an 100 pF capacitor connected in series with a $280 \text{ K}\Omega$ resistor. Also design a RC high pass filter for a cut off frequency 1.5 kHz using a capacitor of $0.2 \mu\text{F}$.

19PHY601

Reg No :

CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022
PHYSICS
Paper - VII: Nuclear Physics

Duration:3 Hrs

Max Marks:80

PART - A

Answer any TWELVE from the following:

(12×1= 12 Marks)

1. Give examples for isobars.
2. Who proposed the liquid drop model?
3. In what form is most of the fission energy released?
4. Mention any two uses of nuclear reactors.
5. What is the role of control rods in a nuclear reactor?
6. What is radioactive equilibrium?
7. Give one property of gamma rays.
8. Give an example for artificially radioactive series.
9. Give the expression for mass energy conservation.
10. What is a nuclear reaction?
11. What is the principle of working of Cyclotron?
12. Why the length of drift tubes in LINAC gradually increases?
13. Mention two methods of quenching.
14. Which geomagnetic effect proves that primary cosmic rays are made up of charged particles and not electromagnetic radiation?
15. What are hadrons?

PART - B

UNIT I

Answer any TWO from the following:

(2×8= 16 Marks)

16. a) Write a note on charge and penetrating power of neutron.
b) Explain in detail nuclear size, nuclear charge, nuclear mass and nuclear density. (2+6)
17. a) Give any two merits and demerits of shell model of the nucleus.
b) Obtain the expression for the semi empirical formula of nuclear mass based on liquid drop model. (2+6)
18. a) Explain with necessary equations the c-n cycle of nuclear fusion.
b) With a neat diagram explain the working of a nuclear reactor. (2+6)

UNIT II

Answer any TWO from the following:

(2×8= 16 Marks)

19. a) Mention the various types of Beta decay in elements.
b) Explain Rutherford's experiment on first artificial transmutation of elements. (2+6)
20. a) State decay law and draw the decay curve.
b) Write in detail about film badges and pocket dosimeter. (2+6)
21. a) Explain about Somatic and genetic effect of radiation.
b) What is a nuclear reaction? Explain different types of nuclear reactions with examples. (2+6)

UNIT III

Answer any TWO from the following:

(2×8= 16 Marks)

22. a) What are the differences between cyclotron and a betatron?
b) Deduce the expression for the energy of the particle and length of cylinder in terms of the constants of the linear accelerator. (2+6)
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? (2+6)
24. a) Distinguish between nucleons and hyperons .
b) With relevant diagram describe about cosmic ray shower. (2+6)

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. Calculate the power output of a nuclear reactor which consumes 10 kg of U-235 per day. Given that the average energy released per fission is 200 MeV.
27. How much time will it take for a 8 mCi source to be reduced to 1 mCi source? Half life of the source is 10 years.
28. Calculate the range and energy of alpha particles moving with a velocity of 2×10^7 m/s. $a = 9.6 \times 10^{-24}$, $b = 3.18 \times 10^{-3}$
29. Deuterons in a cyclotron describe a circle of radius 0.32 m just before emerging from the dees. The frequency of the applied cmf is 10 MHz. Find the flux density of the magnetic field and the velocity of the deuterons emerging out of the cyclotron. Mass of the dueteron = 3.32×10^{-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.

19COS601

Reg No :

CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022
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 Identity operators in Python.
2. How do you create a set in Python?
3. How do you use negative indexing in tuple?
4. What is lower() method in strings? Give an example.
5. How do you connect Python to mysql database ?
6. Write an example to return the year from a specified date.

II. Answer any FIVE of the following :

(5×6= 30 Marks)

7. Explain Java Vs Python.
8. a) What are the advantages of functions?
b) What is the difference between a function & a method?
9. How do you create a child class? Explain with an example.
10. Write a note on Frozen binaries.
11. Explain the shuffle() method and uniform () method to generate random number in Python.
12. What are the features of Python? Explain.

III. Answer any FOUR of the following :

(4×10= 40 Marks)

13. a) Explain the continue statement with example.
b) Explain with example for loop in Python.
14. a) Explain function arguments in Python.
b) Explain arbitrary arguments in Python.
15. a) Explain object methods with an example.
b) Explain with example self parameter.
16. a) Explain Deletion operation in an array.
b) Explain Search operation in an array.
c) Explain Update operation in an array.
17. Explain with example inserting rows into a table through Python.

19BOT601

Reg No :

CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022
BOTANY
Paper - VII: Plant Biotechnology

Duration:3 Hours

Max Marks:80

I. Answer any FIVE of the following :

(5×2= 10 Marks)

1. Differentiate between dedifferentiation and redifferentiation.
2. What is a suspension culture? Mention its importance.
3. What are Reverse Transcriptase? Mention its significance.
4. Name the type of chemicals used in the production of synthetic seeds. Specify their functions.
5. Mention the significance of Bt Cotton.
6. State any two guidelines for IPR.

II. Answer any FIVE of the following :

(5×6= 30 Marks)

7. What is somatic hybridization? Describe the methodology of production of somatic hybrids.
8. Explain the steps involved in Genetic engineering.
9. What is a nutrient medium? Explain inorganic nutrients and PGR's.
10. Describe i) Biolistic method ii) cDNA libraries
11. Briefly Explain i) Ageing of wine ii) Ripening of Cheese iii) Hydrometer and Refractometer
12. Differentiate between Chemostat and Turbidostat.

III. Answer any FOUR of the following :

(4×10= 40 Marks)

13. Explain the concept of cell theory and Totipotency. Add a note on aseptic culture of *Datura* anther.
14. Define fermentation? Explain the types of submerged fermentation.
15. What are the techniques used to screen the transformed cells? Describe them.
16. Write a note on:
i) T-DNA ii) Replacement vector iii) Plasmids iv) Amp^r v) DNA Polymerases
17. Write a note of:
i) *psy* Gene ii) Golden rice 2 iii) Polyhydroxy butyrate iv) Biofertilizers

19CHE601

Reg No :

CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022
CHEMISTRY
General Chemistry VII

Duration:3 Hours

Max Marks:80

PART - A

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

- 1 What is spectrochemical series?
- 2 What is trans effect ? Among Cl and NH₃ which has more trans directing effect?
- 3 Give the relation between free energy change and equilibrium constant for a cell reaction and explain the terms.
- 4 What is meant by hydrogen over voltage?
- 5 Give one example for an electrophilic substitution reaction in pyrrole.
- 6 What is a base peak ?

PART - B

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

UNIT I

- 7 a. Explain the following types of electronic transitions:
i) d-d transition ii) metal to ligand charge transfer spectra.
b. Explain the properties of alkyl aluminium compounds.
c. Write the advantages of crystal field theory. (4+3+3)
- 8 a. Discuss the crystal field splitting in case of tetrahedral complexes.
b. Give four applications of organoaluminum compounds. (6+4)
- 9 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)

UNIT II

- 10 a. What is a concentration cell? Differentiate between concentration cell with transference and without transference.
b. The EMF of the cell Ag/AgI in 0.045M KI / 0.045M AgNO₃ / Ag is 0.788 at 25⁰C.
Calculate the solubility product of AgI .
c. What are the primary and secondary photochemical reactions? (4+3+3)
- 11 a. Explain the construction and working of quinhydrone electrode.
b. State and explain the law of photochemical equivalence and calculate the value of 1 einstein for light having $\lambda = 2000 \text{ \AA}^0$
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 photoinhibitors. (4+3+3)

UNIT III

- 13 a. What is the principle of IR spectroscopy?
b. Write a note on the functional group region. (5+5)
- 14 a. Give the synthesis of pyridine from acetylene.
b. Give any three nucleophilic substitution reactions of pyridine.
c. Compare the basicity of pyridine, piperidine and pyrrole. (3+3+4)
- 15 a. Explain the molecular orbital picture of thiophene and justify its aromatic character.
b. Explain why thiophene undergoes electrophilic substitution at 2 and 5 positions.
(6+4)

CHOICE BASED CREDIT SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022

MATHEMATICS

Mathematics VII - Numerical Methods

Duration: 3 Hours

Max Marks: 80

I. Answer any EIGHT of the following :

(8×3= 24 Marks)

- a. Round off the following number to 3 decimal places and 3 significant figures:
(i) 38.46235 (ii) 0.70029 (iii) 0.0022218
- b. Find an interval in which the equation $xe^x - 1 = 0$ has a real root.
- c. Find $\phi(x)$ of iteration method for the equation $xe^x - 1 = 0$ with $x_0 = 0$.
- d. (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.
- e. (i) What is the degree of interpolating polynomial which interpolates n distinct points?
(ii) When is Lagrange's interpolation formula used?
- f. Write the formula for $\frac{d^2y}{dx^2}$ at $x = x_0$ when Newton's forward difference formula is used.
- g. Find the approximate value of $\int_0^1 \frac{dx}{x+1}$ correct to 3 decimal places, using trapezoidal rule with $h = 0.5$
- h. If $y' = -y$, $y(0) = 1$, find $y(0.1)$ using Euler's method.
 - i. (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_2 .
- j. Write Adam-Bashforth prediction formula.

II. Answer any EIGHT of the following :

(8×7= 56 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 the equation by Gauss-Jacobi method, carry out 3 iterations.

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

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

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

- c. Find a real root of the equation $x^3 - 5x + 3 = 0$ by bisection method, correct to 3 decimal places.
- d. Using divided difference, derive Newton's general interpolation formula.
- e. Using Lagrange's interpolation formula, express the function $\frac{x^2+x-3}{x^3-2x^2-x+2}$ as the sum of partial fractions.
- f. In the table given below, the value of y are consecutive terms of a series. Find the first and the 10th terms of the series :

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

- g. Find $\frac{dJ_0}{dx}$ at $x = 0.1$ from the table:

x	0	0.1	0.2	0.3	0.4
$y=J_0(x)$	1	0.9975	0.99	0.9776	0.9604

- h. 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 $h = 0.1$
- 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. 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 prediction formula.

CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022
STATISTICS - VII
Design of Experiments

Duration:3 Hours

Max Marks:80

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

1. State Cochran's Theorem in Design of Experiments.
2. State expressions for the least square estimates of the parameters μ and α_i in the model of One way ANOVA.
3. What are Experimental Errors in Design of Experiment?
4. Why LSD is considered as a better design as compared to RBD?
5. Give any two advantages of Factorial Experiments.
6. Identify a situation for the application of 2^3 factorial experiment.

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

7. Deduce an expression for expected sum of squares of error under One way Classified Data.
8. Stating the conditions, Split the total variation under Two way classified data and obtain its components.
9. Derive an expression for expected value of sum of squares due to Treatments and blocks in case of RBD.
10. Stating the conditions, derive an expression for estimating one missing observation in case of L.S.D .
11. Derive expressions for interaction effects AB and AC under 2^3 factorial experiment.
12. Explain the procedure for identifying the confounded factorial effects under 2^3 factorial experiment.

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

13. Stating the assumptions, derive the Expected sum of squares due to error in Three way Classified data.
14. Stating the assumptions, derive the expected sum of squares due to factors B and C in Three way ANOVA .
15. Briefly explain the model, layout, hypothesis to be tested and analysis with ANOVA table in case of Completely Randomized Design.
16. Stating the assumptions, deduce the expected sum of squares due to treatments and Rows under LSD.
17. What do you mean by factorial experiments? Derive expressions for main effects and interaction effects in 2^2 factorial experiment.

19ZOO601

Reg No :

CHOICE BASED CREDIT SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022

ZOOLOGY

Paper - VII: Genetics, Evolution and Palaeontology

Duration:3 Hours

Max Marks:80

I. Answer any FIVE of the following :

(5×2= 10 Marks)

1. What is test cross? Give an example.
2. What is pleiotropism. Give an example.
3. What are mutagens? Give examples.
4. What is amniocentesis?
5. Explain the term Homology.
6. What is organic evolution?

II. Answer any FIVE of the following :

(5×6= 30 Marks)

7. Explain the significances of crossing over.
8. Explain nature and nurture with reference to Human twins.
9. Write short notes on i) Alkaptonuria ii) Albinism
10. Explain the role of p53 gene in DNA repair.
11. Comment on sympatric and allopatric speciation.
12. Write explanatory notes on Mesohippus.

III. Answer any FOUR of the following :

(4×10= 40 Marks)

13. Define multiple alleles. Discuss the legal aspects of blood group genetics.
14. What is interaction of genes? Explain the phenomenon with reference to comb pattern in fowls.
15. Explain the molecular basis of mutation.
16. Explain sex limited and sex influenced traits with examples.
17. Explain the role of Natural Selection and Isolation in evolution.

19MIC601

Reg No :

CHOICE BASED CREDIT SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022

MICROBIOLOGY

Paper VII: Food, Dairy and Industrial Microbiology

Duration:3 Hours

Max Marks:80

I. Answer any FIVE of the following :

(5×2= 10 Marks)

1. What is putrefaction?
2. Expand DMC and write any two uses.
3. List the cocci in milk.
4. List the fermented dairy products.
5. Write the Temperature, Time, Substrate and Organism needed for Penicillin Production.
6. Define Continuous Sterilization.

II. Answer any FIVE of the following :

(5×6= 30 Marks)

7. Write a note on blanching.
8. Write briefly on contamination of fruits and vegetables.
9. Explain stringy milk and pigmented milk.
10. Explain Methylene Blue Reduction Test.
11. Define fermentor and explain about Sampling jar and antifoams.
12. Define Crude media and explain in detail about molasses and C.S.L.

III. Answer any FOUR of the following :

(4×10= 40 Marks)

13. Explain in detail different types of fermented food.
14. Explain food poisoning caused by Staphylococcus aureus and Vibrio.
15. Explain the contamination of milk in detail.
16. Explain the methods of Pasteurization of milk.
17. Explain the Beer Production in Industries.

19CHE612

Reg No :

CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022
CHEMISTRY - PAPER VIII
Industrial Chemistry

Duration:3 Hours

Max Marks:80

PART - A

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

- 1 Write a note on importance of nanomaterials as catalysts.
- 2 Write the significance of calcium as a nutrient.
- 3 Write the name and composition of two ores of Iron.
- 4 Name the method and ore used in the concentration of aluminium.
- 5 What is the advantage of preservation by tetrapack?
- 6 What is a colour additive? Name two permitted food colours.

PART - B

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

(10×7= 70 Marks)

UNIT I

- 7 a. What are the different types of conducting polymers?
b. How is polyacetylene prepared? (7+3)
- 8 a. Explain sol gel method of synthesis of nanomaterials.
b. What are the different types of nanomaterials. (5+5)
- 9 a. Explain any three applications of biomaterials.
b. What are the different phases present in shape memory alloys? Explain.
c. List the characteristics of biomaterials. (4+3+3)

UNIT II

- 10 a. Explain the desilverisation of lead by Parkes process.
b. Explain Betts electrolytic refining of lead. (5+5)

- 11 a. Explain the extraction of copper with a neat diagram.
b. Explain the extraction of gold from alluvial sand. (5+5)

- 12 a. Explain extraction of silver by cyanide process.
b. Explain hydrometallurgy with an example. (6+4)

UNIT III

- 13 a. Name and explain how the adulterants present in cinnamon and cloves are detected.

b. How is the adulterant present in sugar and ice-cream detected? (6+4)

- 14 a. With examples explain the terms fungicides, herbicides and rodenticides.

b. Explain the preparation of i) Methoxy chlor ii) Parathion (5+5)

- 15 a. Explain the norms set by Essential Commodities Act and control orders like FPO.

b. What are the requisites of a good fertilizer? (6+4)

19ZOO612

Reg No :

CHOICE BASED CREDIT SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022

ZOOLOGY

Paper - VIII: Ecology, Toxicology and Biostatistics

Duration:3 Hours

Max Marks:80

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

1. Give 2 examples for commensalism with continuous contact.
2. Name any four branches of ecology.
3. Name the four types of patches.
4. Define edge effect and edge species.
5. Give two measures to control air pollution.
6. What do you mean by tests of significance?

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

7. Explain the effect of light on metabolism and development of eyes.
8. Write a note on desert adaptations.
9. With an illustration explain phosphorus cycle.
10. Explain population density.
11. Explain the medicolegal classification of toxicants.
12. Enumerate 6 food substances and their adulterants.

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

13. Give an account of ecological classification of marine biota.
14. Give an account of energy flow in an ecosystem.
15. With reference to conservation of the environment, give an account of landscape ecology.
16. With suitable examples and illustrations explain limiting factors.
17. Explain any five commonly adulterated foods and their effects .

19MIC612

Reg No :

CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022
MICROBIOLOGY
Paper - VIII: Bacterial Genetics

Duration:3 Hours

Max Marks:80

I. Answer any FIVE of the following :

(5×2= 10 Marks)

1. What is a genetic code?
2. What is tRNA? Write its function.
3. What is a dimer?
4. Write about mutation rate.
5. What are Nif genes?
6. What is passenger DNA?

II. Answer any FIVE of the following :

(5×6= 30 Marks)

7. Explain the activation of amino acids in Protein synthesis.
8. Describe the semiconservative mode of replication of DNA.
9. Explain base pair substitution type of mutation.
10. Define mutation, mutants and write about DNA repair.
11. Write a note on Restriction Enzymes.
12. Write a note on Principles of Genetic Engineering.

III. Answer any FOUR of the following :

(4×10= 40 Marks)

13. Explain in detail about the Structural components of DNA.
14. Explain Griffith's experiment. Add a note on transformation in bacteria.
15. Explain in detail the spontaneous type of mutation.
16. Define prototrophs and write about replica plating technique.
17. Describe in detail potential hazards and safeguards of genetic engineering.

19BOT612

Reg No :

CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022
BOTANY

Paper - VIII: Environmental Biology and Biometrics

Duration:3 Hours

Max Marks:80

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

1. Define ectoparasites and endoparasites.
2. Mention any two important aspects of ecosystem approach.
3. What is ecesis? Mention the type of processes.
4. Mention two types of Littoral vegetation in Karnataka.
5. Expand NEERI and IUCN.
6. Differentiate between *exsitu* and *insitu* conservation.

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

7. Write the morphological characters of hydrophytes.
8. What is humus? Explain their types.
9. Write note on a) Reed swamp stage b) Sedge Meadow stage
10. Write a note on waste management.
11. Write the economic and biological uses of forests.
12. Find out the median from the data recorded on the weight of grain yield during 10 consecutive days.

Grain Weight in Grams	4.0	5.7	3.9	4.2	6.6	7.0	7.9	8.0	9.0	10.0
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III. Answer any FOUR of the following : (4×10= 40 Marks)

13. Write the effects of Light and Wind on vegetation.
14. Explain pyramid of biomass and energy in detail.
15. What is water pollution? Mention its causes and effects.
16. Explain the different methods of rain water harvesting in rural areas.
17. Find the standard deviation for the following distribution (both direct and short- cut method).
11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21

CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022
COMPUTER SCIENCE
Computer Science Theory VIII

Duration:3 Hours

Max Marks:80

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

1. Which tools are used to perform administrative tasks in ASP.NET?
2. Expand a) IIS b) FTP
3. What are server controls? List the types of server controls.
4. What are the two views for displaying data in a Menu control?
5. What is ADO.NET?
6. Write any two advantages of 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 a) Application Domain b) Application Lifetime
9. What are HyperLink server controls? Explain with the help of an example.
10. What is LoginView control? Explain the templates of LoginView control.
11. Write a note on i) SqlDataSource control ii) ObjectDataSource control
12. Explain i) ConnectionZone ii) AppearanceEditorZone iii) LayoutEditorPart

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

13. a) Explain the methods used to store state information at client end.
b) Write a note on i) Application state ii) Session state
14. Write a note on a) CheckBoxList server control b) RadioButtonList server control
15. Write a note on a) Calendar server control b) Panel server control
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) DataList control ii) DetailsView control

CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022
PHYSICS
Paper - VIII: Electronics

Duration:3 Hrs

Max Marks:80

PART - A

Answer any TWELVE from the following:

(12×1= 12 Marks)

1. Why is a p-n-p transistor called bipolar?
2. Define β_{ac} of a transistor.
3. What are the disadvantages of voltage-divider biasing method?
4. Define voltage regulation as applied to rectifiers.
5. Draw the input & output waveforms for a LC filter.
6. What is meant by ac equivalent circuit?
7. What is an ac load line?
8. What is an amplifier?
9. What is the input impedance of ideal operational amplifier?
10. Define cut-off frequency in an OPAMP.
11. What is a Flip –flop ?
12. Why digital circuits are called as logic circuits?
13. What is a receiver?
14. What is interlaced scanning?
15. What is horizontal amplifier in a CRO?

PART - B**UNIT I**

Answer any TWO from the following:

(2×8= 16 Marks)

16. a) Explain briefly the construction of n-channel D- MOSFET.
b) Draw and explain the drain characteristics and transfer characteristics of a JFET. (2+6)
17. a) Explain in brief CC configuration of a transistor.
b) Explain the model of r_e transistor. (2+6)
18. a) How does a resistor in the emitter circuit stabilize the operating point?
b) With a neat diagram, explain the working of a bridge rectifier. (2+6)

UNIT II

Answer any TWO from the following:

(2×8= 16 Marks)

19. a) Obtain the expressions for current gain and power gain of a CE amplifier using r_e transistor model.
b) Draw and explain the practical circuit of CE amplifier. Discuss the various currents flowing in it. (2+6)

20. a) Define input offset voltage and input offset current and give their ideal & practical values.
 b) What is a non-inverting amplifier? How can an OPAMP be used as a non-inverting amplifier? Derive expression for its voltage gain and mention the values of input & output resistances. (2+6)
21. a) Explain the Barkhausen criterion for oscillations.
 b) With a neat circuit diagram, explain the working of a Wein -bridge oscillator. (2+6)

UNIT III

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

22. a) Draw the diagram and write the truth table for a two input NOR gate.
 b) What is a shift register? Explain with diagram the working of a serial shift register using D flip-flop. (2+6)
23. a) Draw the circuit diagram and truth table for half adder.
 b) What is sum of products? Explain how it is used to solve a Boolean expression. (2+6)
24. a) What are side band frequencies in AM ? What are the frequency components in them?
 b) Explain amplitude modulation and frequency modulation using wave diagram. (2+6)

PART - C

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

25. Transistor with voltage divider bias uses the following components $R_1 = 23\text{k}\Omega$, $R_2 = 6\text{k}\Omega$, $R_E = 250\Omega$, $R_C = 2\text{k}\Omega$, $V_{BE} = 0.8\text{V}$, $V_{CC} = 14\text{V}$. Determine the operating point.
26. A bridge rectifier has a transformer secondary voltage $20V_{\text{rms}}$. If supplied power to load resistance 1000Ω and diode forward resistance 10Ω Calculate (i) output voltage (ii) rectifier efficiency.
27. Draw dc and ac load line for CE amplifier circuit $R_1 = 8\text{K}\Omega$, $R_2 = 2\text{K}\Omega$, $R_C = 1.5\text{K}\Omega$, $R_E = 1\text{K}\Omega$, $R_L = 1\text{K}\Omega$, $V_{CC} = 20\text{V}$, $V_{BE} = 0.7\text{V}$.
28. If $R_1 = 100\text{k}\Omega$, $r_f = 500\text{k}\Omega$, $V_{in} = 2\text{V}$. Find output voltage in inverting and non- inverting mode.
29. *Simplify the boolean expression and draw the logic diagram for $Y = (AB + C)(AB + D)$*
30. A 15 KHz audio signal is used to frequency modulate a 100 MHz carrier causing a carrier deviation of 75 KHz. Determine 1) modulation index 2) bandwidth of FM signal.

CHOICE BASED CREDIT SYSTEM
B.A./B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022
ECONOMICS
Mathematical Economics

Duration:3 Hours

Max Marks:120

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

1. Write a note on Parabolic Law.
2. Find dy/dx of the following functions:
 - i. $y = (2x + 3)^3$
 - ii. $y = \sqrt{(5x - 3)}$
 - iii. $y = (1 - 2x)^6$
 - iv. $y = (2x - 5)^8$
3. Find the area under the curve $y = x^4$, x axis and the ordinates at $x = 1$ and $x = 5$.
4. Evaluate the following determinants:

$$\begin{vmatrix} 1 & 3 & 1 \\ 2 & 5 & 4 \\ 6 & 1 & 1 \end{vmatrix}$$
5. If $A = \begin{vmatrix} 1 & 3 & 4 \\ 2 & 4 & 8 \\ 3 & -2 & 1 \end{vmatrix}$ and $B = \begin{vmatrix} 4 & 0 & 0 \\ 1 & 3 & 5 \\ 0 & 1 & 6 \end{vmatrix}$
 Then find $A + B$

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

6. Pareto's law for the distribution of incomes for a particular group is
 $N = (216 \times 10^{10}) / x^{3/2}$
 - a. How many people have incomes between \$3600 and \$10,000?
 - b. What is the lowest income of the 80 people with the highest incomes?
7. Given the total cost function:
 - a. $C = 60 - 12q + 2q^2$
 Find AC function and MC function
 - b. $C = .005x^3 - .02x^2 - 30x + 3000$
 Find: i. Total cost when $x = 4$
 ii. AC when output = 10
 iii. MC when output = 3
8. If $z = 3x^3 - 5x^2y + 2y^3$, show that $x \cdot \partial z / \partial x + y \cdot \partial z / \partial y = 3z$.
9. Solve graphically the following LPP:

Maximise $Z = 4x + 5y$
 Subject to constraint
 $2x + 3y \leq 12$
 $2x + y \leq 8$ and $x, y \geq 0$
10. The marginal revenue of a commodity is given by $MR = 9 - 2x + 4x^2$.
 Find the total revenue and the corresponding demand function.

III. Answer any THREE of the following :

(3×20= 60 Marks).

11. If the demand and supply functions for a certain commodity are

$$D = -50p + 260$$

$$S = 100 - 10p$$

Tax rate is rs 4 per unit.

- a. Determine the equilibrium values of price and quantity.
 - b. Determine the equilibrium values when a specific tax is imposed on the producer.
 - c. What is the amount of tax revenue received by government?
 - d. What is the amount of tax rate shared between consumer and the producer?
12. Define Differentiation. Explain the various rules of Differentiation.
13. Solve the following system of equations by Cramer's rule:

$$x + y + z = 1$$

$$x + 2y + 3z = 6$$

$$x + 3y + 4z = 6$$

14. If the demand and supply functions for a certain commodity are

$$D = 120 - 5p$$

$$S = -30 + 10p$$

- a. Determine the equilibrium values of price and quantity.
- b. If the government gives a subsidy per unit of \$ 3, calculate the new equilibrium price and quantity.
- c. Calculate the amount spent by government on subsidy.
- d. Calculate the revenue received by the firms – before and after subsidy.
- e. Calculate consumer expenditure before and after the subsidy.

19STA622

Reg No :

CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022
STATISTICS - VIII
Statistical Quality Control

Duration:3 Hours

Max Marks:80

I. Answer any FIVE of the following :

(5×2= 10 Marks)

1. Define quality.
2. What is product control?
3. Explain fraction defective.
4. Give any two similarities between R chart and σ chart.
5. What is ASN?
6. What do you mean by Acceptance Sampling?

II. Answer any FIVE of the following :

(5×6= 30 Marks)

7. If the specification limits are 140 ± 3 and the spread of the process is 1.5. Discuss the capabilities of the process.
8. Explain the concept of rational subgroups.
9. When do you modify the control limits of \bar{x} chart? Obtain the expression for modified limits of \bar{x} chart.
10. How is the choice between p and np charts made? Explain the different methods employed to deal with the problem of varying sample size in p-chart.
11. Stating the assumptions construct SSP for variables when upper specification limit is given and σ is unknown.
12. For a system with 3 components connected in parallel, determine the system reliability for 1000 hours of operation and find MTTF. Assume that all three components have an identical time to failure distribution that is exponential with a constant failure rate of 0.00045/hr. What is the MTTF of each component? If it is desired for the system to have a MTTF of 3500 hours, what should be the MTTF of each component?

III. Answer any FOUR of the following :

(4×10= 40 Marks)

13. What are the criteria for lack of control with respect to control charts for variables?
14. Define Statistical Quality Control. Briefly explain the two causes of variation.
15. Stating the assumptions, derive the control limits of p chart when the sample size is constant.
16. By explaining the concept of system reliability, derive the expression for reliability of the system when the components are connected in series.
17. Derive the expressions for the OC function for SSP by attributes when
(i) Hyper Geometric distribution (ii) Binomial distribution (iii) Poisson distribution are used.

CHOICE BASED CREDIT SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022
CHEMISTRY - PAPER VIII
Biological Chemistry

Duration:3 Hours

Max Marks:80

PART - A

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

- 1 Show that citral is an α β unsaturated aldehyde.
- 2 Give two examples for the classification of alkaloids based on source.
- 3 Give the synthesis of chloramine T.
- 4 Define the terms (i) potency (ii) affinity.
- 5 Give the structure of vitamin A and vitamin C.
- 6 What are conjugated proteins? Give one 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. How is the structure of nicotine elucidated?
b. Give the synthesis of coniine. (6+4)
- 8 a. Discuss the classification of terpenoids and give an example for each type.
b. State isoprene rule. Illustrate it with two examples.
c. Give the synthesis of purine. (4+3+3)
- 9 a. What are the general methods followed in structure determination of alkaloids?
b. Give the synthesis of thymine and cytosine and explain their importance. (5+5)

UNIT II

- 10 a. Write a short note on biomaterials.
b. Explain agonist and antagonist with suitable examples.
c. Define the terms (i) drug (ii) active principle (iii) lead compound. (4+3+3)

- 11 a. Explain with example competitive enzyme inhibitor.
b. Write a short note on antineoplastic drugs.
c. Define the terms (i) active site (ii) antiseptic (iii) disinfectant (4+3+3)
- 12 a. Explain the synthesis of (i) paracetamol (ii) sulphapyridine
b. Explain the factors effecting drug metabolism.
c. Write short notes on metabolism of drugs. (4+3+3)

UNIT III

- 13 a. Explain the classification of lipids.
b. Explain the primary structure of proteins.
c. Write short notes on protein denaturation. (4+3+3)
- 14 a. Explain solution phase peptide synthesis with suitable example.
b. What is TFAA and DCC? Explain their role in peptide synthesis. (6+4)
- 15 a. Explain the preparation of amino acids by (i) Malonic ester synthesis
(ii) Gabriel's phthalimide synthesis
b. Write short note on isoelectric point and zwitterion. (6+4)

CHOICE BASED CREDIT SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022

MATHEMATICS

Mathematics VIII - Linear Algebra

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 $T : V \rightarrow V'$ is a subspace of V .
- b. Give one example each for idempotent matrix, non-singular matrix and diagonal matrix.
- c. Define linear transformation. Prove that $T : F_n[x] \rightarrow F$ defined by $T(a_0 + a_1x + a_2x^2 + \dots + a_nx^n) = a_0$ is a linear transformation.
- d. Let $T : V \rightarrow V$ be a linear transformation which is not onto. Show that there exists some $v \in V, v \neq 0$ such that $T(v) = 0$.

e. Show that if A is nilpotent matrix then $I + A$ is non singular.

f. Find the column rank of the matrix $A = \begin{bmatrix} 1 & 0 & 3 \\ -1 & 0 & 4 \\ 3 & 2 & 0 \\ 4 & 1 & 0 \end{bmatrix}$

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

h. Show that the system of equations: $x_1 + x_2 + x_3 = 0$ has only trivial
 $2x_1 + 3x_2 + x_3 = 0$
 $3x_1 + 6x_2 + 5x_3 = 0$

solution.

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

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

II. Answer any EIGHT of the following :

(8×7= 56 Marks)

- a. State and prove First Isomorphism theorem.
- b. Show that $\dim V/W = \dim V - \dim W$.

c. Let $V = R^3$ and let $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 1 & -5 \\ 0 & 0 & 1 \end{bmatrix}$ be the matrix of $T \in L(V, V)$ with respect to the basis $(1, 0, 0), (0, 1, 0)$ and $(0, 0, 1)$. Find the matrix of T with respect to the basis $(1, 1, 0), (0, 1, 0)$ and $(0, 1, 1)$.

d. Let V and V' be vector spaces over F with fixed basis $\{v_1, v_2, \dots, v_m\}$ and $\{v'_1, v'_2, \dots, v'_n\}$ respectively. Then prove that the mapping $m : L(V, V') \rightarrow M_{mn}(F)$ given by $T \rightarrow m(T)$ 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. Let $A, B \in M_n(F)$. Then prove

(i) $rank(AB) \leq \min\{rank A, rank B\}$

(ii) $rank(AB) = rank(BA) = rank A$ if B is non-singular.

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

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

h. State and prove Cayley Hamilton Theorem.

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

j. Find the minimum polynomial of $A = \begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & -9 \\ 0 & 1 & 6 \end{bmatrix}$. Find also the inverses if they are non-singular.

CHOICE BASED CREDIT SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION AUGUST 2022

MATHEMATICS

Paper VIII - Graph Theory

Duration:3 Hours

Max Marks:80

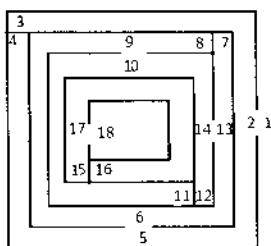
I. Answer any EIGHT of the following :

(8×3= 24 Marks)

a. Define the following with an example each:

incidence, degree, adjacent vertices

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

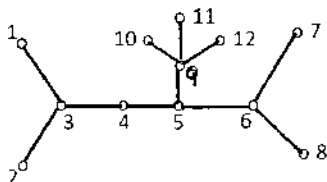


c. Define isomorphic graph. Draw 2 non-isomorphic graphs having 8 vertices and 12 edges.

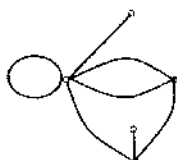
d. Define Euler line and unicursal line with example.

e. Define tree, binary tree. Draw a binary tree having 11 vertices and a height 3.

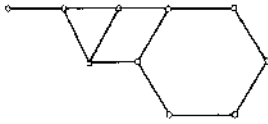
f. Define diameter. Find the centre(s) of the tree given below



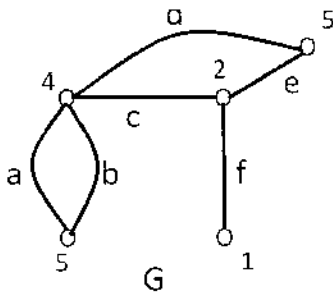
g. Define planar graph. Draw the dual graph of the graph given below.



- h. Define independent set. Properly colour the graph given below with minimum number of colours and list its maximal independent sets.



- i. Define adjacency matrix. Draw a regular graph of 4 vertices and write its adjacency matrix.
- j. Define incidence matrix. Write the incidence matrix of the graph G given below. Write also a reduced incidence matrix of G.



II. Answer any EIGHT of the following :

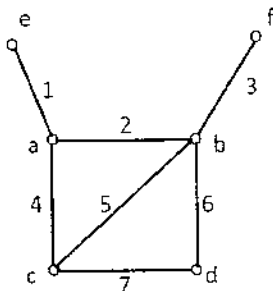
(8×7= 56 Marks)

- a. Prove the following

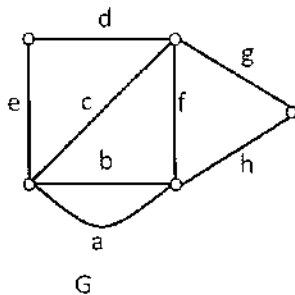
- i) An infinite graph with a finite number of edges must have an infinite number of isolated vertices and an even number of odd vertices, and hence or otherwise determine whether there exists a regular graph having 5 vertices of 3 degree each.
- ii) Prove that the maximum number of edges in a simple graph G with n vertices is $\frac{n(n-1)}{2}$ and hence find the sum of the degrees of vertices in G.

- b. Define edge deletion, vertex deletion and fusion. Draw the graph obtained by

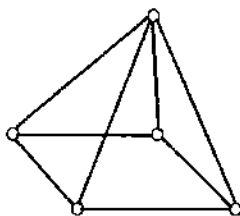
- i) deleting edge 6.
- ii) deleting vertex b.
- iii) fusing vertices c and b.



- c. Prove that a graph G is connected if and only if its vertex set V can be partitioned into two nonempty, disjoint subsets V_1 and V_2 such that there exists no edge in G whose one end vertex is in subset V_1 and the other in subset V_2 .
- d. Prove that a given connected graph G is an Euler graph if and only if all vertices of G are of even order.
- e. Prove the following
 - i) If in a graph G there is one and only one path between every pair of vertices then G is a tree.
 - ii) Any connected graph with n vertices and $n-1$ edges is a tree.
- f. i) Write all the fundamental cutsets of the graph G given below with respect to the spanning tree $T = \{a, e, d, g\}$.



- ii) Prove that every connected graph has at least one spanning tree.
- g. Prove that the complete bipartite graph $K_{3,3}$ is non planar.
- h. Prove that the reduced incidence matrix of a graph is non singular if and only if the graph is a tree.
- i. Find the chromatic polynomial of the following graph.



- j. Define chromatic polynomial.
Prove that a graph with at least one edge is 2-chromatic if and only if it had no circuits of odd length.
