

(6 pages)

S.No. 6341

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(For candidates admitted from 2022–2023 onwards)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2023.

Computer Science

**MATHEMATICAL FOUNDATION FOR
COMPUTER SCIENCE**

Time : Three hours

Maximum : 75 marks

PART A — (20 Marks)

Answer ALL questions.

I. (A) Multiple choice questions : (5 × 1 = 5)

1. Which of the following is not a possible ordered pair for a matrix with 6 elements?

- (a) (2, 3) (b) (3, 2)
(c) (1, 6) (d) (3, 1)

2. Find the values of x, y, z in the following system of equations by Gauss Elimination Method

$$2x + y - 3z = -10, -2y + z = -2, z = 6$$

- (a) 2, 4, 6 (b) 2, 7, 6
(c) 3, 4, 6 (d) 2, 4, 5

3. A _____ is an ordered collection of object.

- (a) relation (b) set
(c) function (d) proposition

4. The first three terms of a geometric progression are $m - 2, m + 1$ and $m + 7$. Find the value of m .

- (a) 5 (b) 6
(c) 8 (d) 7

5. The probability that a card drawn from a pack of 52 cards will be a diamond or a kind is

- (a) $2/13$ (b) $4/13$
(c) $1/13$ (d) $1/52$

(B) Fill in the blanks : (5 × 1 = 5)

6. The maximum number of its linearly independent columns (or rows) of a matrix is called the _____ of a matrix.

7. The aim of elimination steps in gauss elimination method is to reduce the coefficient matrix to _____

8. A _____ is a formula which is always true for every value of its propositional variables.

9. _____ series is a series where all terms cancel out except for the first and last one.

10. When we perform an experiment, then the set S of all possible outcomes is called the _____

II. Answer the following : $(5 \times 2 = 10)$

11. What is an Eigen Vector? Give an example.

12. What is the condition of Jacobi Method?

13. Define void relation.

14. What is a first-order recurrence relation?

15. What is T-test?

PART B — $(5 \times 5 = 25)$

Answer ALL the questions, choosing either (a) or (b).

16. (a) How to find the determinant of a 3×3 matrix using diagonals? Elaborate.

Or

(b) Reduce the matrix $\begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}$ to a row-echelon form.

17. (a) Solve Equations $2x + 5y = 21$, $x + 2y = 8$ using Gauss-Jordan Elimination method.

Or

(b) Solve the given system of equation by Gauss Elimination method.

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

$$-2y + 10z = -8$$

$$4y - 2z = -2$$

18. (a) What is the difference between proof by contradiction and counter example?

Or

(b) What are the rules of inference for propositional logic? Explain with suitable examples.

19. (a) Find a generating function for 1, 3, 5, 7, 9,

Or

(b) Use the recurrence relation for the Fibonacci numbers to find the generating function for the Fibonacci sequence.

20. (a) Explain in detail about binomial and Poisson distribution with example.

Or

- (b) A speaks truth in 75% cases and B in 80% of the cases. In what percentage of cases are they likely to contradict each other, narrating the same incident?

PART C — (3 × 10 = 30)

Answer any THREE questions.

21. Find the Eigen values and Eigen Vectors

$$A = \begin{bmatrix} 5 & -10 & -5 \\ 2 & 14 & 2 \\ -4 & -8 & 6 \end{bmatrix}$$

22. Solve equations $2x + 5y = 16$, $3x + y = 11$ using Gauss Jacobi Method.

23. Prove by mathematical induction

$$1 + x + x^2 + \dots x^n = \frac{1 - x^{n+1}}{1 - x}$$

24. Solve the recurrence relation $a_n = 3a_{n-1} + 2$ subject to $a_0 = 1$.

25. A man and his wife appear in an interview for two vacancies in the same post. The probability of husband's selection is $(1/7)$ and the probability of wife's selection is $(1/5)$. What is the probability that only one of them is selected?
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