

S.No. 8038

24DLCSA1C01

(For the candidates admitted from 2024–25 onwards)

M.C.A. DEGREE EXAMINATION, AUGUST 2025

First Semester

DISCRETE MATHEMATICS

Time : Three hours

Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL the questions.

1. Define binary relation with an example.
2. Give an example of an injective function.
3. What is well-formed formula?
4. Define universal quantifier.
5. State recurrence relation.
6. Write an example of a linear homogeneous recurrence relation.
7. What is the determinant of 2×2 matrix?
8. Define the rank of matrix.
9. Give example of an Euler graph.
10. Define bipartite graph.

PART B — ($3 \times 5 = 15$ marks)

Answer any THREE questions.

11. Describe equivalence relation with two examples.
12. Explain principal disjunctive normal form with example.
13. Solve the recurrence relation: $a_n = a_{n-1} + 2$ with $a_0 = 1$.
14. Use Cramer's Rule to solve: $x + 2y = 5$ and $3x + 4y = 6$
15. Draw a complete graph with 5 vertices and state its properties.

PART C — (5 × 8= 40 marks)

Answer ALL questions.

16. (a) Explain the types of functions with examples: injective, surjective, bijective.

Or

- (b) Given a relation $R = \{(1, 1), (2, 2), (1, 2), (2, 1)\}$ on set $A = \{1, 2\}$. Draw its digraph and find its matrix.

17. (a) Construct a truth table for the formula $(P \wedge Q) \rightarrow (\neg R \vee P)$. Determine whether it is a tautology or contradiction.

Or

- (b) Use truth table to verify: $(P \wedge (P \rightarrow Q)) \rightarrow Q$ is a tautology.

18. (a) Differentiate between permutations and combinations with examples.

Or

- (b) How many 5-digit numbers can be formed using the digits 1 to 9 if repetition is allowed and digits must be in increasing order?

19. (a) Find the rank of the matrix $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 1 & 0 & 1 \end{pmatrix}$.

Or

- (b) Prove Cayley-Hamilton theorem for a 2×2 matrix and verify.

20. (a) State and prove Euler's Theorem.

Or

- (b) A graph is non-planar iff it contains a sub graph homeomorphic to K_5 or $K_{3,3}$.
