

A-0822

Total Pages : 5

Roll No.

MCS-501

DISCRETE MATHEMATICS

(MCA/MSCT)

Examination, June 2025

Time : 2:00 Hrs.

Max. Marks : 70

Note :- This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these sections according to the detailed instructions given therein. *Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.*

Section-A

Long Answer Type Questions 2×19=38

Note :- Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any two (02) questions only.

1. (A) Define partial order relation. Let R be a relation defined on a set of positive integers such that for all $x, y \in \mathbb{Z}^+$ $x R y$ if and only if x divides y . Check whether R is a partial order relation. (10)
- (B) Define one-one onto function. Show that the function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined as $f(x) = 7x - 3$ for all $x \in \mathbb{R}$ is one-one onto. (9)
2. (A) Write truth tables for the following propositions :
 - (i) $P \rightarrow (Q \vee \sim P)$
 - (ii) $(P \rightarrow \sim Q) \wedge P$ (10)
- (B) Define Tautology and Contradiction with the help of suitable examples. (9)
3. (A) Define a valid argument. Check the validity of the following argument : “If I watch a movie, then play football. If I play football, then I read. Therefore, If I watch a movie, then I read. (10)
- (B) Explain the method of proof by contradiction. Prove that the sum of two consecutive integers is odd. (9)
4. (A) Define generating function. Find the generating function of the following series 3, 9, 27, 81, ... (10)

(B) Show that the set of all positive rational numbers forms an abelian group under the composition $x * y = \frac{xy}{2}$.

$$y = \frac{xy}{2}. \quad (9)$$

5. (A) Write predicates for the following sentences : (10)

(i) All lions are animals.

(ii) Some tigers are white.

(iii) Some politicians are not married.

(iv) Not all lawyers are rich.

(B) Solve the following recurrence relation (9)

$$a_r + 5a_{r-1} + 6a_{r-2} = r.5^r$$

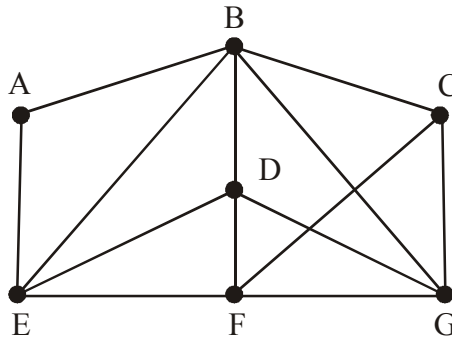
Section-B

Short Answer Type Questions 4×8=32

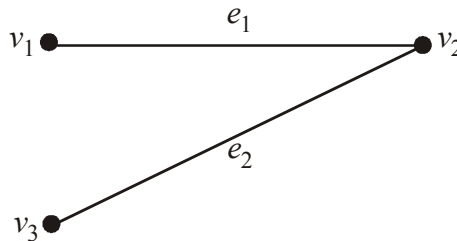
Note :- Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Define Euler's graph and Hamiltonian circuit with the help of suitable examples.

2. Apply Breadth search algorithm to explore all the vertices of the following graph starting from vertex A.



3. Define chromatic number. Find the chromatic polynomial of the following graph :



4. Define grammar of formal languages. Differentiate between deterministic and non-deterministic finite automata.
5. Define a field with the help of a suitable example.
6. Prove that the set $G = \{0, 1, 2, \dots, m-1\}$ of the first m non-negative integers is an abelian group if the composition is addition modulo m .

7. Define permutation and combination with the help of suitable examples.
8. Define the following set operations with the help of suitable examples :
 - (i) Union
 - (ii) Intersection
