Total Pages : 3 **Roll No. ....**

MCS-501

DISCRETE MATHEMATICS

Examination February, 2026

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) Explain the types of function with example.

   (b) If f : A —> B and g : B —> C be one to one onto function , then prove that (gof) is also one to one onto.

2. Prove that (R, +, *) is a ring with zero divisors, where R is 2 × 2 matrix and + and * are usual addition and multiplication operations.

3. If R and S are the equivalence relation on the set A. Show that R ∪ S is also an equivalence relation on A.

4. (a) What are the various types of matrices ? Explain each type with a suitable example.

   (b) In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there ?

5. (a) Define Boolean algebra. What are the main difference between Boolean algebra and algebra of real numbers ?

   (b) Prove that the inverse of each element of a group is unique.

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. Prove that :

$$A \times (B \cup C) = (A \times B) \cup (A \times C)$$

2. Negate the following statement :

   a. For all real x, if "$x > 3$" then "$x^2 > 9$"

3. State and prove pigeonhole principle.

4. How many different 8-bit strings are there that begin and end with one ?

5. Suppose that two distinguishable dice are rolled. In how many ways we get the sum of 6 or 8.

6. Verify that the proposition $p \vee \neg (p \wedge q)$ is tautology.

7. Prove that the complement of the union of two sets is the intersection of their complements.

8. Show that proposition $\sim q \rightarrow \sim p$ is equivalent to $p \rightarrow q$ by using truth table.

****