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Total No. of Pages : 02

Total No. of Questions : 09

**MCA (2015 & Onward) (Sem.-2)**  
**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**  
Subject Code : MCA-201  
M.Code : 72876

Time : 3 Hrs.

Max. Marks : 60

**INSTRUCTIONS TO CANDIDATES :**

1. SECTIONS-A, B, C & D contains TWO questions each carrying TEN marks each and students has to attempt any ONE question from each SECTION.
2. SECTION-E is COMPULSORY consisting of TEN questions carrying TWENTY marks in all.

**SECTION-A**

1. What is meant by simple graph? Show that degree of a vertex in a simple graph of n-vertices cannot exceed n-1.
2. a) What is Euler Graph? State and explain the condition for checking whether a given graph is Eulerian or not.  
b) What is meant by Chromatic Number? What are various applications of graph colouring in graph theory?

**SECTION-B**

3. Prove that set of real numbers in the set  $[0, 1]$  is uncountable set. Justify the proof.
4. State and prove the following concepts :
  - a) De-Morgan Laws
  - b) If a relation R on set A is reflexive, so is  $R^{-1}$

**SECTION-C**

5. If P, Q and R are three prepositions.  
Prove that  $(P \rightarrow (Q \rightarrow R)) \rightarrow ((P \rightarrow Q) \rightarrow (P \rightarrow R))$

6. Using Principle of Mathematical Induction, prove that :

$$a + (a + d) + (a + 2d) + \dots + (a + (n - 1)d) = \frac{n}{2}(2a + (n - 1)d)$$

#### SECTION-D

7. Does scalar multiplication of two matrices commutative? (Yes/No), Also justify the result using an appropriate example.
8. Solve the following equations using Gauss Jordan Method :

$$2x - y + 3z = 9, x + y + z = 6, x - y + z = 2$$

#### SECTION-E

9. Write briefly :

- a) Define directed graph.
- b) Write a short note on bipartite graph.
- c) Discuss briefly the concept of Cartesian product of a set.
- d) Define Partition of a set.
- e) What is the application of tautology in algebra of logic?
- f) Discuss the use universal quantifier by taking an example.
- g) Describe the application of transpose of a matrix in Computer Science.
- h) What is meant by rank of a square matrix?
- i) Why matrix inversion is needed in real world Computer Applications?
- j) Define equivalence relation.

**NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.**