

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

MCA (Sem.-1)

DISCRETE STRUCTURES & OPTIMIZATION

Subject Code : PGCA/1917

M.Code : 79035

Date of Examination : 11-06-2024

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION - B & C. have FOUR questions each.**
3. **Attempt any FIVE questions from SECTION B & C carrying TEN marks each.**
4. **Select atleast TWO questions from SECTION - B & C.**

SECTION-A

- 1. Write short notes on :**
 - a. How are ordered pairs used to represent relations?
 - b. Define two sets $A = \{a, b, c\}$ and $B = \{1, 2\}$ and find the Cartesian product $A \times B$.
 - c. Define a hashing function and explain its purpose.
 - d. Define rings and discuss their properties.
 - e. Let S be a set having 3 elements. How many binary operations can be defined on S ?
 - f. What are the elements of a dihedral group?
 - g. What is the defining property of a cyclic semigroup?
 - h. Define a congruence relation on a semigroup.
 - i. What is the key difference between directed and undirected graphs?
 - j. Define graph isomorphism and graph homomorphism.

SECTION-B

2. Discuss the concept of rings and their properties, including subrings and morphisms. Provide examples.
3.
 - a. Prove that a set containing n distinct elements has 2^n subsets.
 - b. If A, B, C be any three sets, then show that $A - (B \cap C) = (A - B) \cup (A - C)$.
4. What is Boolean Algebra? Explain in detail different applications of Boolean Algebra.
5. Explain the pigeonhole principle and provide a detailed example of its application in combinatorial mathematics.

SECTION-C

6. Compare and contrast a semigroup, monoid, and group, highlighting their similarities and differences.
7. Explain the concept of cosets and how they relate to subgroups in group theory. Provide an example to illustrate your explanation.
8. **Explain the difference between an :**
 - a. Eulerian circuit and a Hamiltonian cycle.
 - b. Eulerian trail and a Hamiltonian path.
9.
 - a. Explain the concept of graph coloring and its applications.
 - b. Discuss the properties of plane and connected graphs, and their importance in graph theory.

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.