Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 09

M.Sc. (IT) (Sem.–3)

DISCRETE STRUCTURES AND OPTIMIZATION

Subject Code : PGCA-1917

M.Code : 78393

Date of Examination : 12-12-2022

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 each.**

SECTION-A

1. Write short notes on :

a) Define a reflexive relation. Show with an example.

b) Comment if the Cartesian product of the (Set Y) × (Set X) is equal to the Cartesian product of (Set X) × (Set Y) or not?

c) Mention two important properties of rings.

d) What is understood by sub-Boolean algebra?

e) From a bunch of 4 different cards, how many ways can we permute it?

f) Show that at least two people must have their birthday in the same month if 13 people are assembled in a room.

g) What is meant by finite and infinite group?

h) What is a cyclic subgroup?

i) Let V = {1, 2, 3, 4} and E = {(1, 2), (1, 4), (3, 4), (2, 3)}. Draw the graph.

j) What is chromatic number in a planar graph and a cyclic graph?

SECTION-B

2. What is reflexive and transitive property in a partial order relation? Show with an example. Let A = {1,2,3,4} and R = {(1,1), (1,3), (2,2), (2,4), (3, 1), (3, 3), (4,2), (4,4)}. Show that R is an Equivalence Relation.

3. Minimize the four variable logic function using K-map:

   f (A, B, C, D) = A B C'D + A' BCD+A' B' C'+A' B' D'+AC'+AB' C+B'

4. Explain the concept of pigeon hole principle and also explain its properties.

5. In a town of 10000 families it was found that 40% of families buy newspaper A, 20% family buy newspaper B, 10% family buy newspaper C, 5% family buy newspaper A and B, 3% family buy newspaper B and C and 4% family buy newspaper A and C. If 2% family buy all the newspaper. Find the following:

   a) Number of families which buy all three newspapers.

   b) Number of families which buy None of A, B, C.

   c) Number of families which buy at least two newspapers

   d) Number of fami1ies which buy at most two newspapers

SECTION-C

6. Describe the concept of isomorphism and homomorphism with respect to graph theory by taking a suitable example.

7. What are the properties of a semi-group? Prove that G = {0,1,2,3,4,5,6} is an abelian group of order 7 with respect to addition modulo 7.

8. Briefly explain the following with an example:

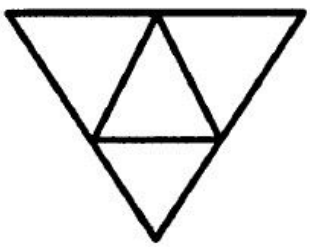
   a) Euler circuit and Hamiltonian Graphs

   b) Normal and Dihedral Groups

9. Show step by step execution to find out number of ways the following diagram can be coloured subject to the following two conditions?

   a) Each of the smaller triangles is to be painted with one of three colours: red, blue or green.

   b) No two adjacent regions have the same colour.



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.