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Total No. of Pages : 03

Total No. of Questions : 09

MCA (Sem.-1)
DISCRETE STRUCTURES AND OPTIMIZATION

Subject Code : PGCA1917

M.Code : 79035

Date of Examination : 10-01-2023

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

I. Write short notes on :

- a) Euclidean domain
- b) POSET
- c) Monoid
- d) Automorphism
- e) Application of pigeon hole principle
- f) Complemented Lattice
- g) Order of a group
- h) Commutative ring
- i) Define anti-symmetric relation with example
- j) State Euler's formula for connected planar graph.

SECTION-B

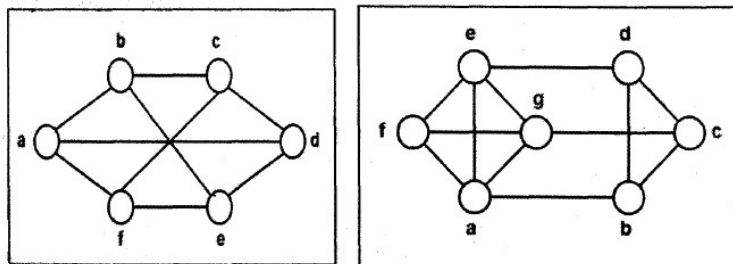
2. Let $A = \{1, 2, 4, 5, 7, 11, 13\}$. Define a relation R on A by writing $(x, y) \in R$ if and only if $(x - y)$ is a multiple of 3.
 - a) Show that R is an equivalence relation on A .
 - b) How many equivalence classes of R are there?
3. Convert the following Boolean expression into standard Sum of Products form:
 - a) $(\bar{A} + B + C)(\bar{B} + C + \bar{D})(A + \bar{B} + \bar{C} + D)$
 - b) Reduce the equation using DeMorgans's law :

$$(\bar{A} + \bar{B}) \overline{[A(B + C)]} + A(\bar{B} + \bar{C})$$
4. Among 50 patients admitted to a hospital, 25 are diagnosed with pneumonia, 30 with bronchitis, and 10 with both pneumonia and bronchitis. Determine:
 - a) The number of patients diagnosed with pneumonia or bronchitis (**or both**).
 - b) The number of patients not diagnosed with pneumonia or bronchitis.

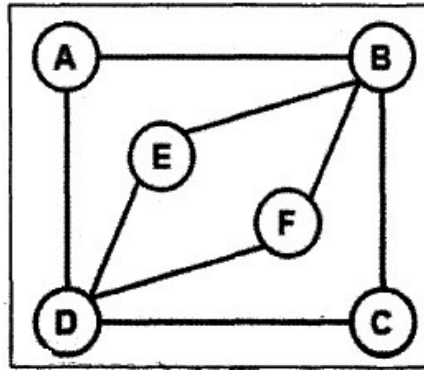
Also draw the Venn diagram.
5.
 - a) State partial order relation with suitable example.
 - b) Show whether the relation $(x, y) \in R$, if, $x \geq y$ defined on the set of positive integers is a partial order relation.

SECTION-C

6. State the clear difference between group, semigroup and monoid with suitable example.
7. Define abelian group with a suitable example. Let G be the set of real numbers and let $a \times b = ab/2$. Show that $(G, *)$ is an abelian group.
8. State the graph colouring problem and state how greedy algorithm has been used to find out the chromatic number. Find out the chromatic number of following graphs.



9. Define euler graph and discuss its applications. Also describe the difference between Euler path and circuit. Find the Euler path and circuit in the following graph.



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.