Code No: MA3511   SRGEC-R20

II B.Tech II Semester Supplementary Examinations, January 2023

DISCRETE MATHEMATICAL STRUCTURES

(Computer Science and Engineering & Artificial Intelligence and Data Science)

Time: 3 Hours   **Max. Marks: 70**

Note: Answer one question from each unit.
All questions carry equal marks.

$5 \times 14 = 70M$

UNIT-I

1. a) Prove that $\sim (p \vee q) \vee ((\sim p) \wedge q) \vee p$ is a tautology.   (8M)

    b) Construct a truth table for the statement $(p \vee q) \wedge (p \to q)$.   (6M)

(OR)

2. a) Let *p* be the statement "Maria learns discrete mathematics" and *q* the statement "Maria will find a good job." Write the following as statements:
        $i. \sim p \qquad ii. p \to q \qquad iii. p \leftrightarrow q$.   (6M)

    b) Determine the statement $[(p \to q) \wedge \neg q] \to \neg p$ is a tautology or not.   (8M)

UNIT-II

3. a) Check whether the following relation R on A is reflexive and/or irreflexive and/or symmetric and/or anti-symmetric and/or transitive. Where $A = \{1, 2, 3, 4\}$ and $R = \{(1, 3), (1, 4), (2, 3), (2, 4), (3, 1), (3, 4)\}$.   (8M)

    b) Define POSET , Minimal and Maximal Elements.   (6M)

(OR)

4. a) verify the relation $R = \{(a, b) | a \ divides \ b\}$ on $A = \{1, 2, 3, 4, 6, 8, 12\}$ is partial ordering or not. If so, draw the Hasse diagram representing the partial ordering.   (7M)

    b) Let $f(x) = x + 2, g(x) = x - 2 \ and \ h(x) = 3x \ for \ x \in R$, where R is the set of real numbers. Find *fog*; *fof*; *goh*; *and fogoh.*   (7M)

UNIT-III

5. a) Define Group. Prove that the set of integers $(Z, +)$ forms a group under addition.   (7M)

    b) Prove that the set $\{1, -1, i, -i\}$ is a cyclic group with respect to multiplication generated by *i* and *–i*.   (7M)

(OR)

6. a) Is the set of all natural numbers 1, 2, 3, ... a group with respect to addition. Justify your answer.   (6M)

b) The set of integers Z, is an abelian group under the composition defined by * such that
a* b = a+b+1 for $a, b \in Z$. Find i. the identity of (Z, *) and ii. Inverse of $a \in Z$.
(8M)

UNIT-IV

7. a) Define Chromatic Number? Find the Chromatic Number for the graphs (i) $K_{m,n}$ (ii) K_3 and (iii) W_5. (6M)

b) Give an outline about representation of graphs. (8M)

(OR)

8. a) Define Isomorphic graphs. Write the necessary and sufficient conditions to have an Isomorphism. (6M)

b) Find the chromatic number of each of the following graphs. (8M)
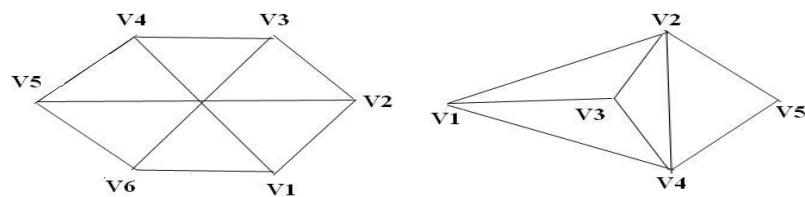
UNIT-V

9. a) Define recurrence relation. Find the first seven terms of the sequence defined by the recurrence relation $a_n = a_{n-1} + a_{n-3}$ for $n \geq 3$ where $a_0 = 1, a_1 = 2, a_2 = 0$. (8M)

b) Solve the recurrence relation $a_n - 9a_{n-1} + 20a_{n-2} = 0, n \geq 2$, given that $a_0 = -3, a_1 = -10$. (6M)

(OR)

10. Solve the recurrence relation $a_n - a_{n-1} - 9a_{n-2} + 9a_{n-3} = 0, \ n \geq 3$, given that $a_0 = 0, a_1 = 1, a_2 = 2$ by using generating functions. (14M)

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