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B.Tech. (Sem. - 3rd)

DISCRETE STRUCTURES

SUBJECT CODE : CS - 203

Paper ID : [A0452]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section - A

Q1)

(10 x 2 = 20)

- a) What do you mean by chromatic number?
- b) Define Euler graph.
- c) Define Semi-group.
- d) Write down DeMorgan's law for set.
- e) Check whether Relation | of divisibility on the set N of positive integers is an equivalence relation or not? Justify your answer.
- f) Find Chromatic number for bipartite Graph ($K_{2,3}$).
- g) Postfix expression for the infix expression $A + B * (C + D) / F + D * E$ is
- h) Write down the inclusion and exclusion principle on sets.
- i) Define ring with example.
- j) Find the multiplication table for $G = \{1, 2, 3, 4, 5, 6\}$ under multiplication modulo 7.

Section - B

(4 x 5 = 20)

- Q2)** What do you mean by cyclic group? Show that any subgroup of a cyclic group is cyclic.

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- Q3)** Solve the recurrence relation $a_n = -3a_{n-1} + 10a_{n-2}$, $n \geq 2$, given $a_0 = 1$, $a_1 = -4$.
- Q4)** (a) Using Graph Representation of a relation how we can identify that a Relation is Reflexive, symmetric and anti-symmetric.
 (b) Let $X = \{1, 2, 3, 4, 5, 6, 7\}$ and $R = \{(x, y) \mid x - y \text{ is divisible by } 3\}$ Check whether this equivalence Relation or not? Give appropriate reason in support of your answer?
- Q5)** Give an example of a graph and explain for the following :
 (a) A Graph is having Hamiltonian and Euler Circuit.
 (b) A Graph is having Hamiltonian Circuit but not an Euler Circuit.
 (c) A Graph is having Euler Circuit but not an Hamiltonian Circuit.
- Q6)** How many integers between 1 and 300 (inclusive) are
 (a) Divisible by at least one of 3, 5, 7?
 (b) Divisible by 3 and 5, not by 7.
 (c) Divisible by 5 but neither by 3 or 7?

Section - C

(2 x 10 = 20)

- Q7)** Define the following terms with help of example
 (a) Ring
 (b) Fields.
- Q8)** Consider the group $G = \{1, 2, 3, 4, 5\}$ under multiplication modulo 6.
 (a) Find the multiplication table of G.
 (b) Prove that G is a group.
 (c) Find 2^{-1} , 3^{-1} and 1^{-1} .
 (d) Find the orders and subgroups generated by 2 and 3.
 (e) Is G cyclic. Justify your answer.
- Q9)** (a) Let $G = (V, E)$ be an undirected graph with k-components and $|V| = n$, $|E| = m$. Prove that $m \geq n - k$.
 (b) Explain any two applications of Coloring of a Graph.

