C

Roll No. .....

# 2011

## B. E. 3rd Semester (I.T.)

## Examination – December, 2009

### DISCRETE STRUCTURE

Paper : CSE-203-E

*Time : Three hours ]* *[ Maximum Marks : 100*

*Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.*

*Note :* Attempt any *five* questions. All question carry equal marks.

**1.** (a) Define Multi-set. Discuss various operations that can be performed on multi-sets. 4

(b) Determine the power set of the following : 6

(i) {a}

(ii) {{a}}

(iii) {∅}

(iv) {∅, {∅}}

(c) Prove the following statements analytically, where A, B and C are arbitrary sets : 10

(i) $(A \cap B) - C = (A - C) \cap (B - C)$

(ii) $A - B = A \cap B^C$

(iii) $(A \oplus B)^C = A^C \oplus B = A \oplus B^C$

(iv) $(A - B) \cup (B - A) = (A \cup B) - (A \cap B)$

**2.** (a) Let $(A, \leq)$ be a POSET. Let $\leq_R$ be the binary relation on A such that for a and b in A $a \leq_R b$ if and only if $b \leq a$. 10

(i) Show that $\leq_R$ is partial ordering relation.

(ii) Show that if $(A, \leq)$ is lattice, then $(A, \leq_R)$ is also a lattice.

(b) Draw the Hasse diagram representing the partial ordering $\{(A,B) \mid (A \subseteq B)\}$ on the power ser P(S), where S = {a, b, c}. Find the maximal, minimal, greatest and least elements of the POSET. 6

(c) Describe Equivalence relation and Equivalence Class with the help of examples. 4

**3.** (a) Explain Conjunctive and disjunctive normal forms. Find the CNF corresponding to the propositions: 10

(i) $(p \wedge \sim(q \wedge r)) \vee (p \rightarrow q)$

(ii) $\sim((p \vee \sim q) \wedge \sim r)$

(b) Write a compound statement which is true : 6

(i) when exactly two of three statements p, q, r are true

(ii) when none or one or two of three statements p, q, r are true.

(c) Without using truth tables, prove the following : 4

$$p \rightarrow (q \rightarrow p) \equiv \sim p \rightarrow (p \rightarrow q)$$

**4.** (a) How many distinguishable words can be formed from the letters of the word MISSISSIPPI. 6

(b) Suppose repetitions are not permitted : 8

(i) How many three digit numbers can be formed from 6 digits {2, 3, 5, 6, 7, 9}

(ii) How many of them are <400

(iii) How many of them are even.

(iv) How many of them are <600 but >200

(c) Discuss finite, countable infinite and uncountable infinite set with example. 6

**5.** (a) Determine discrete numeric function for the following generating functions : 8

$$G(x) = \frac{1}{5 - 6x + x^2}$$

(b) Find the sum of the following series : 6

$0.7 + 0.77 + 0.777 + 0.7777 + \ldots\ldots\ldots\ldots$

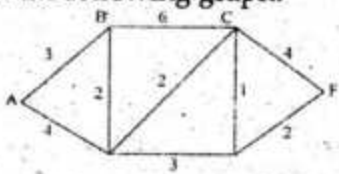
(c) Find an explicit formula for the sequence defined by : 6

$$C_n = 3C_{n-1} - 2C_{n-2},\ C_1 = 5,\ C_2 = 3$$

C

6. (a) A tree has 2n vertices of degree 1, 3n vertices of degree 2 and n vertices of degree 3. Determine the number of vertices and edges in the tree. 6

(b) Write and explain any one algorithm to find shortest path in a weighted graph. Use that algorithm to find shortest path between vertices A and F of the following graph. 14




7. (a) Explain isomorphism, homomorphism and automorphism with the help of suitable examples. 10

(b) State and prove Lagrange's theorem. 10

8. (a) Define Ideal and find it for $(Z_6, \oplus, \Theta)$. 5

(b) Discuss Coset and Ring with example. 5

(c) What is meant by Eulerian and Hamiltonian circuits? Draw a graph which contains: 10

(i) An Eulerian circuit that is also a Hamiltonian circuit.

(ii) Neither Eulerian nor Hamiltonian circuit. Justify user answer.

---