Total No. of Questions : 10] [Total No. of Printed Pages : 4

Roll No. ....

CS/EI/IT–405

B. E. (Fourth Semester) EXAMINATION, June, 2008

(Common for CS, EI & IT Engg.)

DISCRETE STRUCTURE

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt any *one* question from each Unit. All questions carry equal marks.

Unit–I

1. (a) Let A, B, C be any three sets, then prove that : 10

$$A \times (B \cap C) = (A \times B) \cap (A \times C)$$

(b) Explain the principle of inclusion and exclusion. Find the number of integers between 1 and 250 that are divisible by any one of the integers 2, 3, 5, 7. 10

Or

2. (a) Define a lattice, distributive lattice for any a and b in A prove that : 10

$$a \vee (a \wedge b) = 9$$

$$a \wedge (a \vee b) = 9$$

(b) Prove that if A and B are finite sets : 10

$$n(A \cup B) = n(A) + n(B) - n(A \cap B)$$

P. T. O.

Unit–II

3. (a) Construct a finite state acceptor that will accept the set of natural numbers X, which are divisible by 3. 10

(b) Construct the truth table for the following : 10

(i) $(p \to (q \to r)) \to ((p \to q) \to (p \to r))$

(ii) $p \Leftrightarrow (\tilde{p} \vee \tilde{q})$

Or

4. (a) Write the following in disjunctive normal form : 10

$$f(x, y, z) = [(x' \vee y') \wedge z] \vee [x' \wedge (x \vee z)]$$

(b) Define finite state machine and finite state automation. Define the traditional diagram of the machine language L (M) determined by an automation M. 10

Unit–III

5. (a) Write short notes on any *four* of the following : $2\frac{1}{2}$ each

(i) Isomorphic graph

(ii) Hamiltonian graph

(iii) Euler graph

(iv) Binary tree

(v) Cut set

(b) A graph is given by the following adjacency matrix, check whether it is connected or not ? 10

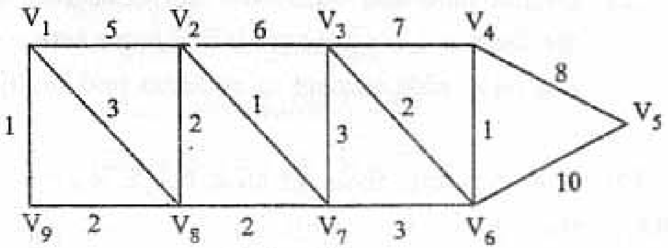
$$\begin{bmatrix} 0 & 1 & 2 & 3 \\ 1 & 0 & 3 & 2 \\ 2 & 3 & 0 & 1 \\ 3 & 2 & 1 & 0 \end{bmatrix}$$

Or

6. (a) Prove that a graph G with n vertices always has a Hamiltonian path if the sum of the degrees of every pair of vertices V_i, V_j in G satisfies the following condition : 10

$$d(V_i) + d(V_j) \geq n - 1$$

(b) Determine minimum weight spanning tree for the following graph using Kruskal's algorithm. 10



Unit – IV

7. (a) Write the Generating function for the sequence $\{a_r\}_{r=0}$ defined by : 10

(i) $a_r = \dfrac{(-1)^r (r+2)(r+1)}{2}$

(ii) $a_r = (r+2)(r+1)\, 3^r$

(b) Determine the particular solution and general solution that satisfies the given condition : 10

$$x_n - 2x_{n-1} = 6n;\ x_1 = 2$$

Or

8. (a) Solve the recurrence relation : 10

$$a_r - 5a_{r-1} + 6a_{r-2} = r(r-1) \text{ for } r \geq 2$$

(b) Solve the difference equation : 10

$$a_r - 4a_{r-1} + 4a_{r-2} = (r+1)\, 2^r$$

Unit – V

9. (a) Write short notes on the following : 5 each

(i) Homomorphism of a group

(ii) Codes and group codes

(b) Show that the intersection of two normal subgroup of a group is a normal subgroup. 10

Or

10. (a) Define field and show that the set of real numbers of the form $a + b\sqrt{3}$ where a and b are rational numbers is a field with respect to addition and multiplication. 10

(b) If R is a ring, then for all $a, b, c \in R$ show that : 10

(i) $a0 = 0a = 0$

(ii) $a(-b) = -(ab) = (-a)b$