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

Roll No. 0502C3091004

CS/IT–402(N)

B. E. (Fourth Semester) EXAMINATION, June, 2011

(Common for CS & IT Engg. Branch)

DISCRETE STRUCTURE

[CS/IT–402(N)]

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt *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 :

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

(b) Define relation and partial order relation. Let R be a binary relation on the set of all integers such that $R = \{(a, b) : (a - b)$ is an even integer$\}$. Is R an equivalence relation ?

Or

2. (a) Write principle of mathematical induction. By this principle prove that :

$$2 \cdot 7^n + 3 \cdot 5^n - 5$$

is divisible by 24 for all natural numbers n.

P. T. O.

(b) Define the following :

(i) Function

(ii) Inverse function

(iii) Composition of functions

(iv) Recursively defined functions

(v) Pigeonhole principle

Unit – II

3. (a) Let G be the set of the non-zero real numbers and let $a * b = \frac{ab}{2}$. Then show that (G, *) is an abelian group.

(b) Prove that every finite integral domain is a field.

Or

4. (a) The intersection of any two normal subgroups of a group is a normal subgroup.

(b) Define field. Prove that the set $\{0, 1, 2\}$ (mod 3) is a field with resp. to addition and multiplication (mod 3).

Unit – III

5. (a) Obtain principal disjunctive normal form of $(P \wedge Q) \vee (\sim P \wedge R) \vee (Q \wedge R)$.

(b) Determine whether each of the following is a tautology, contradiction or contingency ?

(i) $(P \rightarrow Q) \leftrightarrow (\sim Q \rightarrow \sim P)$

(ii) $Q \vee (P \wedge \sim Q) \vee (\sim P \vee \sim Q)$

Or

6. (a) Write short notes on the following :

(i) Quantifiers

(ii) Predicates

(b) Minimize the finite state machine given by the following state table :

State	Input		Output
	0	1	
A	D	B	1
B	E	B	0
C	D	A	1
D	C	D	0
E	B	A	1

Unit – IV

7. (a) Find the shortest path between a and z for the graph :

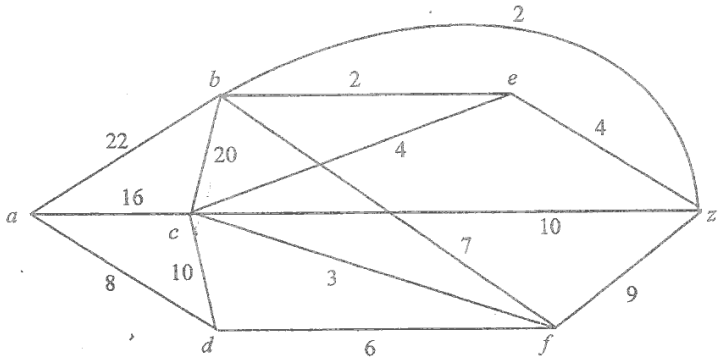

Fig. 1

(b) Define the following :

(i) Planar graphs

(ii) Isomorphic graphs

(iii) Hamiltonion circuit

(iv) Chromatic number

Or

8. (a) Prove that the maximum number of edges in a graph with n vertices is $n(n-1)/2$.

P. T. O.

(b) Determine the minimum weight spanning tree for the following graph :

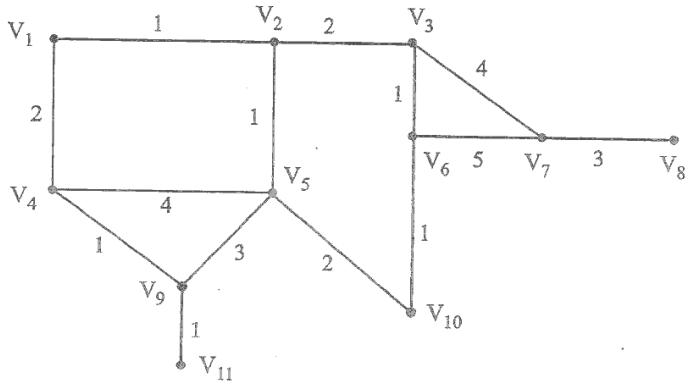

Fig. 2

Unit—V

9. (a) Write short notes on the following :
   (i) Complemented lattice
   (ii) Lattice homomorphism
   (iii) Direct product of lattices
   (iv) Sub-lattice

   (b) Solve the recurrence relation $a_r - 6\,a_{r-1} + 8\,a_{r-2} = 0$ given $a_0 = 3$ and $a_1 = 2$.

Or

10. (a) Solve the recurrence relation :

$$a_r - 5\,a_{r-1} + 6\,a_{r-2} = 2 + r,\ r \geq 2$$

with conditions $a_0 = 1$ and $a_1 = 1$.

   (b) Let L = {1, 2, 3, 4, 6, 8, 9, 12, 18, 24} be ordered by the relation '|' where $x \mid y$ means 'x divides y'. Show that D_{24} the set of all divisors of the integer 24 of L is a sublattice of the lattice (L, 1).