CS/IT 302
B.E. III Semester
Examination, December 2012
Discrete Structure
Time : Three Hours
Maximum Marks : 70/100

Nok: 1. Attempt any one question from each unit.
2. All questions carry equal marks.

Unit- I

1. a) Out of 120 students sun/eyed, it was found that 20 students have studied French, 50 students have studied English, 70 students have studied Hindi, 5 have studied English and French, 20 have studied English and Hindi, 10 have studied Hindi and French. Only 3 students have studied all the three languages. Find how many students have studied.
(i) Hindi alone (ii) French alone (iii) English but not Hindi (iv) Hindi but not French.

b) If n pigeons are assigned to m pigeonhole and m<n show that some pigeonholes contain at least two pigeon also show that among 13 people, there are at least two people.
who were born in the same month.

Or

2. a) Write the principle of mathematical induction and by using this prove that n(n2+5) is an integer multiple of 6 for all positive integer n.
b) Define equivalence relation and prove that the relation a b (mod m); i.e., m divides (a-b) in the set of all integers 1 is an equivalence relation.

Unit - II

3. a) Let (A,*) be a monoid such that for every x in A, x*x -= e where e is the identity element. Show that (A,*) is an abelian group.

b) Define Ring and show that in a ring R (i) (-a)(-b) =- ab
(ii) (-1) (-1) — 1. If R has an identity element.

Or

4. Let (H, .) be a subgroup of (0, .). $N=\left\{x / x \in G, xHx^{-1} = H\right\}$ Let Show that (N, .) is a subgroup of G
b) Let S he the set of real numbers of the form a ±b,h; where a and b are rational numbers. Show that S is a field with respect to addition and multiplication.

Unit-III

5. a) Define tautology and contradiction and show that

$$P \Rightarrow (q \Rightarrow r) \equiv (p \wedge q) \Rightarrow r$$

b) Construct the state diagram for the finite state machine with the state table as given below.

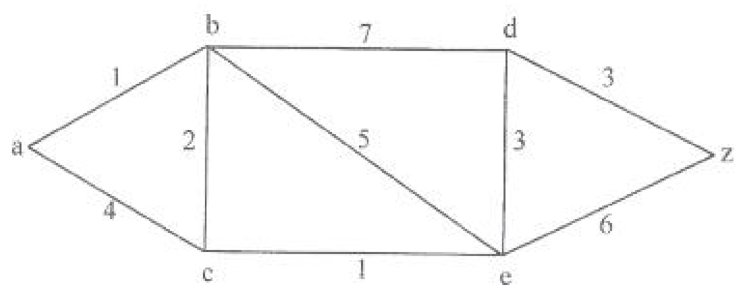
State	f Input		g Output	
	0	1	0	1
S_0	S_1	S_0	1	0
S_1	S_2	S_1	0	1
S_2	S_3	S_1	1	1
S_3	S_2	S_1	0	0

6. a) State and prove De Morgan's Laws.
b) For the finite state machine shown below, find all equivalent states and obtain an equivalent finite state machine with the smallest number of states.

State	Input		Output
	0	1	
⇨ A	F	B	0
B	D	C	0
C	G	B	0
D	E	A	1
E	D	A	0
F	A	G	1
G	C	H	1
H	A	H	1

Unit IV

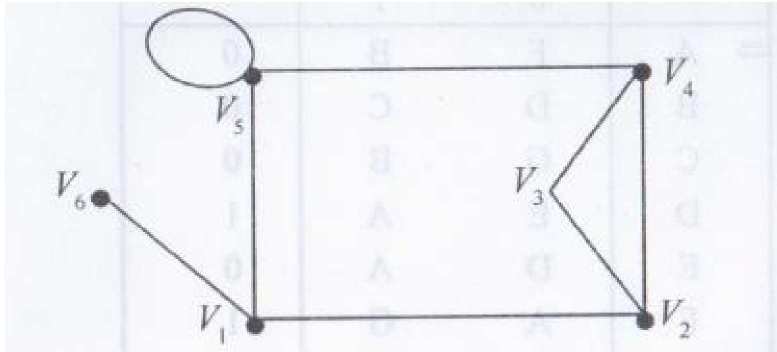
7. a) Write an algorithm for shortest path in weighted graph and use it to find shortest path from a to z in the graph shown in the following figure where numbers associated with the edges are the weights.



b) Define Chromatic polymial. Show that a graph with n vertices is a tree if and only if

8. 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, , V; in G satisfies the condition d(V1) + d(k) >(n-1).

b) Explaining need of the matrix representation of the graph write the adjacency matrix of the following graph.



Unit – V

9. a) Let L be the set of all factors of 12 and 1 be the divisibility relation on L, show that (L,1) is a lattice.

b) Determine the discrete Numeric function corresponding to the following generating functions.

i) $A(z)=\frac{(1+z)^2}{(1+z)^4}$ ii) $A(z)=\frac{1}{1-z^3}$

Or

10. a) Define any three of the following.
i) Hasse diagram of partially ordered set
ii) Well ordered set (iii) Complemented lattice

b) Solve by the method of generating functions the recurrence relation dfasds ssdf