MCA – 1st Semester
Model Paper Discrete Structures

Note: Answer all Questions
Max. Marks: 75   *Max. Time: 03 Hrs*
Section A compulsory

Section A
1) Find the dual of a(b'c' + bc) and a'bc' +a'b'c
2) Determine whether the relation R on a set A is an equivalence relation. A is a set of all people in the Indian electoral list database and aRb if a and b have the same last name?
3) Show that the 4 fourth roots of unity form a group with respect to multiplication.?
4) Find total number of subgraph and spanning subgraph in K6 & L5
5) Find integers m and n such that 512 m +320 n = 64   25

Section B

Unit 1

1) A survey was conducted among 1000 people. 595 among are democrats, 595 wear glasses and 550 like ice-cream. 395 democrates wear glasses.350 democrates like ice-cream. 400 people wear glasses and like ice-cream.250 democrates wear glasses and like ice-cream.
a) How many people are not democrats who do not wear glasses and do not like ice-cream?
b) How many democrates do not wear glasses and like ice-cream ?   6

2) Prove the following without using truth table   6.5
a) (p v q) (p->r) (q->r)=>r

OR

1) Whether the relation R on a set a is reflexive, irreflexive, symmetric, asymmetric, antisymmetric or transitive.
    aRb ,if and only if ab>=0 where a&b are integers   6

2) From a club of 6 men and 7 women , in how many ways we can select a committee of
a) 3 men and 4 women
b) 4 persons which has atleast one woman
c) 4 persons that has atmost one man   6.5

Unit 2

1) Simplify the following Boolean expression using K-map
    w(x + y(z + x')+ y') + w'x'y'z'   6

2) Let L is a distributive lattice. Show that if there exists an a with

a ∧ x=a ∧ y and a v x = a v y then x=y   6.5

OR

1) Reduce the following using K-map

x(y'z + y(xz+y')) + x'(z+y(z+x'))   6

1) Solve recurrence relation

a)   6.5

Unit 3

1) If * is the binary operation on the set R of real numbers defined by a * b= a + b + 2ab,

a) Find if {R,*} is a semigroup. Is it commutative ?

b) Find the identity element , if exists.

c) Which element has inverses and what they are?   6

2) Use fermet's little theorem to find 5   1(mod12)

OR

1) Prove intersection of 2 normal subgroups is also a normal subgroup   12.5

2) Find prime factorization of 420 and 7007

Unit 4

1) Find minimum spanning tree   6

2) Evaluate postfix expression 72-3 +232 + - 13 - * /   6. 5

OR

1) Give an example of a graph which contains

1) an Eulerian circuit that is also a Hamiltonian circuit.

2) an Eulerian circuit and a Hamiltonian circuit that are distinct.

3) an Eulerian circuit, but not a Hamiltonian circuit

4) a Hamiltonian circuit, but not an Eulerian circuit

5) Neither an Eulerian circuit, nor a Hamiltonian circuit   12.5