Bharati Vidyapeeth's
Institute of Computer Applications and Management
A-4, Paschim Vihar, New Delhi-63.

MCA – 1st Semester
Model Paper Discrete Structures

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

Section A (compulsory) (5*5)

1) Suppose that a connected planar graph has 20 vertices each of degree 3 .In how many regions this planar graph split the plane.
2) Prove by mathematical induction that for every positive integer n >=1, (3^n +7^n – 2) is divisible by 8
3) Show that the 4 fourth roots of unity form a group with respect to multiplication.?
4) Construct the binary tree whose in order and pre order traversals are EACIFHDBG and FAEICDHGB respectively.
5) Let L be a lattice then for all a,b,c,d in L show that (avb)=b if and only if a<=b

Unit 1

1) In a group of 20 adults there are 8 females, 9 literate and 6 female literate. Find number of male literate 6
2) If R is the relation on the set of positive integers such that (a,b) belongs to r if and only if a^2 + b is even, prove that R is an equivalence relation. 6.5

OR

1) Investigate the validity of preposition pV (q→p),~p r |- ~q 6

2) Find the transitive closure of the following relations given in matrix form using warshal's algorithm

1 0 0 1 0
0 1 0 0 0
0 0 0 1 1
1 0 0 0 0 6.5

Unit 2

1) Simplify the following Boolean expression using K-map
   x'z' + y'z' + yz'+ xyz 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) Express the following using principle DNF and CNF form

F(a,b,c) = (a'+b)' + a'c 6

2) Find the reccurance relation $a_{n+1} - a_n = 3n^2 - n$; n>=0 6.5

Unit 3

1) If H is a subgroup of G such that x^2 belongs to H for every x belongs to G, prove that H is a normal subgroup of G. 6
2) Show that $2^{340} = 1 \pmod{11}$ by fermett little theorem 6.5

OR

1) Find the code words generated by the parity check matrix

H=1 1 1
1 0 1
0 1 1 12.5
1 0 0
0 1 0
0 0 1

When the encoding function is $B^3 \rightarrow B^6$

Unit 4

1) Draw minimum spanning tree for the weightrd graph by using Kruskals algorithm 6

2) Find minimum spanning of following graph 6.5

OR

1) Explain Konisberg bridge problem. Represent the problem by means of graph. Does the problem have a solution. 6
2) Check for isomorphisim 6.5