Registration No. :

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B. Tech

BSCM 3301

Fifth Semester (Special) Examination – 2013

DISCRETE MATHEMATICAL STRUCTURES

BRANCH : CSE, IT

### QUESTION CODE : D 310

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any five from the rest.

The figures in the right-hand margin indicate marks.

1. Answer the following questions :   2×10

    (a) Negate the statement "Every student of BPUT will get a job" in two different way.

    (b) Rewrite the Sentence "Some men are genius" using universal quantifier and existential quantifier.

    (c) What is symmetric closure of a relation ? Find the symmetric closure of the relation R = {(1, 1), (1, 2), (2, 3)} on A = {1, 2, 3, 4}.

    (d) Draw the Hasse diagram for divisibility on the set {2, 3, 6, 12, 24, 36}.

    (e) What is the generating function for the sequence 1, 1, 1, 1, 1, 1 ?

    (f) Determine whether following two graphs are isomorphic.
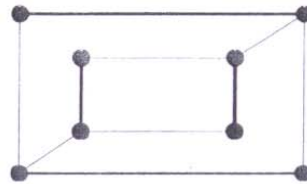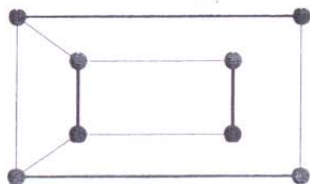
    (g) Give an example of a graph which contains a Hamiltonian circuit but not an Euler circuit.

P.T.O.

(h) What is the maximum and minimum height of a binary tree with 25 vertices ?

(i) Define Semi group and monoid with an example for each.

(j) Define complement of an element and complemented lattice.

2. (a) Show that $(p \rightarrow q) \wedge (q \rightarrow r) \rightarrow (p \rightarrow r)$ is a tautology.   5

(b) Prove the validity of the following argument :   5

Babies are illogical.

Nobody is despised who can manage a crocodile.

Illogical people are despised.

Hence, babies cannot manage crocodiles.

3. (a) Show that $n^2 > 2n + 1$ for $n \geq 3$ by mathematical induction.   5

(b) Using principle of Inclusion and Exclusion find the number of positive integers not exceeding 100 that are not divisible by 2, 5 or 7.   5

4. (a) Solve the following recurrence relation :   5

$a_n = 4a_{n-1} + 5a_{n-2}$ with $a_1 = 2$ and $a_2 = 6$

(b) Let R be the relation on the set of ordered pairs of positive integers such that $((a, b), (c, d)) \in R$ if and only if $ad = bc$. Show that R is an equivalence relation.   5

5. (a) Find the transitive closure of the following adjacency matrix by using Warshall's algorithm :   5

$$M_R = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

(b) Prove that a connected multi graph with at least two vertices has an Euler circuit if and only if each of its vertices has even degree.   5

6. (a) If a connected planar graph G has n vertices, e edges and r regions, then $n - e + r = 2$.   5

(b) Show that the graph K_5 is non-plannar.   5

7. (a) Represent the expression $((x+2) \uparrow 3) * (y-(3+x)) - 5$ using binary tree and then write this expression in Prefix form and postfix form. 5

(b) Prove that the order of any subgroup of a finite group divides the order of the group. 5

8. (a) In any Boolean algebra B, for all a. b $\in$ B

Prove that $a \vee (a \wedge b) = a$ and $a \wedge (a \vee b) = a$. 5

(b) Express the following function in disjunctive normal form and conjunctive normal form. 5

X	Y	Z	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

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