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21254

B. Sc. (Math) (Hons.) 2nd Semester Examination – May, 2019

DISCRETE MATHEMATICS - II

Paper : BHM-124

Time : Three hours] *[Maximum Marks : 60*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt ***five*** questions in all, selecting ***one*** question from each Unit. Question No. 9 is ***compulsory***.

UNIT – I

1. (a) Let $(L, \leq)$ be a lattice. If a, b, c $\in$ L, then

(i) $a \vee (b \wedge c) \leq (a \vee b) \wedge (a \vee c)$

(ii) $a \wedge (b \vee c) \leq (a \wedge b) \vee (a \wedge c)$

(b) Let a, b, c be the elements in a lattice $(L, \leq)$. Show that if $a \leq b$, then $a \vee (b \wedge c) \leq b \wedge (a \vee c)$.

2. (a) Let $(L, \leq)$ be a distributive lattice. Show that if $a \wedge x = a \wedge y$ and $a \vee x = a \vee y$ for some a, then $x = y$.

(b) Consider the set $A = \{k, l, m, n, p\}$ and the corresponding relation $R = \{(k, k), (l, l), (m, m) (n, n), (p, p), (k, m), (k, l), (k, n), (k, p), (m, n) (m, p), (n, p) (l, p)\}$. Construct the directed graph and the corresponding Hasse diagram of this partial order.

UNIT – II

3. (a) Let D_{35} be the set of +ve factors of 35. Two binary operations '+' and '.' are defined as follows $a + b$ = LCM (a,b) and $a.b$ = gcd (a, b) $\forall$ $a,b \in D_{35}$. A unary operation (') on D_{35} is defined as $a' = \frac{35}{a} \forall a \in D_{35}$. Show that $(D_{35}, +, ;', ', 35)$ is a Bolean algebra.

(b) Write the dual of each of the following statements in $(B, +, \cdot, ')$

(i) $[(a'+b).(b'+c)].(a'c)' = 0$

(ii) $a.b' + b = a + b$

(iii) $a + [(b' + a).b]' = 1$

4. (a) Write the function $f(x, y, z) = (x + y), (x + y') (x' + z)$ be given boolean function, find its disfunctive normal form.

(b) Given the Boolean expression $f = ABC + B\bar{C}D + \bar{A}BC$.

(i) Make a truth Table

(ii) Simplify using K-map

(iii) Make the switching circuit of the expression.

UNIT – III

5. (a) Show that there is no graph with 12 vertices and 28 edges in which the degree of each vertex is either 3 or 6.

   (b) Show that K_5 is a non- planer graph.

6. (a) Write an algorithm for the shortest path problem

   (b) A finite graph G has an Euler circuit if and only if it is connected and all vertices have even degree.

UNIT – IV

7. (a) Define the following

   (i) M- ary tree

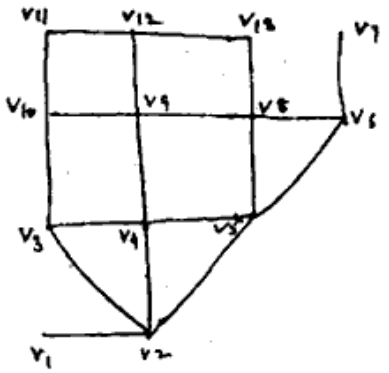
   (ii) Full m- ary tree

   (iii) Full Binary tree

   (iv) Complete Binary tree

   (b) Write a short note on Prim's Algorithm

8. (a) Use depth first search to find the spanning tree of the following connected graph G.



   (b) Draw the unique binary tree for the given in order and post order traversal

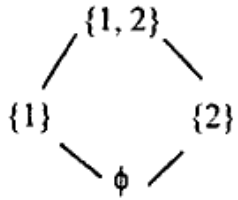
In order	4	6	10	12	8	2	1	5	7	11	13	9	3
Post Order	12	10	8	6	4	2	13	11	9	7	5	3	1

UNIT – V

9. (a) Simplify the following Boolean expression $[a(a+b)+(b'+a)b]'$

   (b) Define Bounded Lattices with example.

   (c) Consider the Hasse diagram given below. Determine the value of set A and also determine the set R (Relation set).



   (d) Using Euler's theorem, find the size of the complete bipartite graph $K_{m,n}$.

   (e) Find the adjacency matrices of $K_{2,3}$.

   (f) If $T_1 = (V_1, E_1)$, $T_2 = (V_2\ E_2)$ be two trees, where $|E_1| = 17$ and $|V_2| = 2|V_1|$. Determine $|V_1|$, $|V_2|$ and $|E_2|$.