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(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 110313 Roll No. ☐☐☐☐☐☐☐☐☐☐

B.Tech.

(SEM. III) THEORY EXAMINATION, 2015-16

DISCRETE MATHEMATICAL STRUCTURES

[Time:3 hours] **[Total Marks:100]**

Section-A

1. Attempt **all** parts. All parts carry equal marks. Write answer of all part in short. (10×2=20)

(a) Prove that $(A\cup B)\cap C = A\cup(B\cap C)$ if and only if $A\subseteq C$.

(b) Simplify the following Boolean function using k-map: $f(x,y,z)=\sum(0,2,3,7)$.

(c) Let (A, *) be an algebraic system, where x is a binary operation such that for any a & b in A, a * b=a. Show that this operation is associative,.

(d) Show that $(A-B)\cap(B-A)=\phi$

(e) P(x): x is a person.

F(x,y): x is the father of Y.

M(x,y) x is the mother of Y.

Write the predicate "x is the father of the mother of y"

(f) What is chromatic number? Explain 3-chromatic graph.

(g) Derive the following $P\to(Q\to R)$, $Q\to(R\to S)\Rightarrow P\to(Q\to S)$

(h) If f: $A\to B$ is one-one onto mapping, then prove that $f^{-1}: B\to A$ will be one-one onto mapping.

(i) prove that if every element of a group except identity element is of order two, then G is abelian.

(j) Let R be a relation on the set A = {a,b,c} defined by R = {(a,b), (b,c), (d,c), (d,a), (a,d), (d,d)}. Write the relation matrix of R.

Section-B

Attempt **any five** questions from this section : (5x10=50)

2. Show that the system (E,+,·) of even integers is a ring under ordinary addition and multiplication. Define homomorphism concept with the help of an example

3. Explain Warshall's algorithm in brief. Let A={1,2,3,4} and R={(1,2), (2,3), (3,4), (2,1)}. Find the transitive closure by Warshall's algorithm.

4. Draw the Hasse diagram representing the partial order in {(a,b) / a divides b} on (1, 2, 3,4, 6, 8, 12).

5. Solve the recurrence relation $a_n - 5a_{n-1} + 6a_{n-2} = 3n^2$.

6. Find the GLB of the following {2,10}, {5,25}, {10, 50}, LUB of the following {5,50}, {2,5}, greatest least element and least upper element of D_{60}.

7. If a and b are any two elements of group G then $(ab)^2 = a^2 b^2$ if and only if G is abelian.

8. Find a compound proposition involving the propositional variables p, q, r and s that is true when exactly three of these propositional variables are true and is false otherwise.

9. Simplify the following :

   a) $Y = ((AB)' + A')' + AB)'$

   b) $A'B'C'D' + A'B'C'D + A'B'CD + A'B'CD' = A'B'$

Section-C

Attempt **any two** question in this section (2×15=30)

10. Prove that for the following :

    a) Every distributive lattice is modular lattice.

    b) If R is an equivalence relation on a set X, then R^{-1} is also an equivalence relation.

    c) The edge chromatic number of graph must be at least as large as the maximum degree of a vertex of the graph.

11. Let 'L' be a Bounded distributed lattice. Then prove if a complement exists, it is unique. Is D_{12} is complemented lattice. Draw the Hasse diagram of [P(a, b, c), ⊆]. (Note: '⊆' stands for subset). Find greatest element, least element, minimal element and maximal element.

12. Write short notes on

    a) Modular lattice

    b) Sub lattice

    c) Distributive lattice

    d) Bounded lattice

    e) Complemented lattice