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END OF SEMESTER EXAMINATIONS, NOVEMBER - 2018
DISCRETE MATHEMATICAL STRUCTURES
SUBJECT CODE : 08UAMA16

MAJOR : B.Sc (MATHEMATICS)   SEMESTER : VI
TIME   : 3 HOURS   MAX. MARKS: 75

SECTION A – (5 X 2 = 10)

Answer All the Questions:

1. Define conjunction.

[OR]

2. Express in English the statement $P \rightarrow Q$ where
   P: The sun is shining today.
   $Q: 2 + 7 > 4$

3. Define Elementary product.

[OR]

4. Obtain a conjunctive normal form of $P \wedge (P \rightarrow Q)$.

5. Define Equivalence relation.

[OR]

6. Define Idempotent element.

7. Define Lattice.

[OR]

8. Define Direct product of lattice.

9. Define Regular graph.

[OR]

10. Define Length of the path.

SECTION B – (5 X 4 = 20)

Answer All the Questions:

11. Construct the truth table for $P \vee \neg Q$.

[OR]

12. Write the duals of a) $(P \vee Q) \wedge R$

   b) $(P \wedge Q) \vee T$

   c) $\neg (P \vee Q) \wedge (P \vee \neg (Q \wedge \neg S))$.

13. Obtain a disjunctive normal form of $\neg (P \vee Q) \rightleftarrows (P \wedge Q)$.

[OR]

14. Obtain a conjunctive normal form of $Q \vee (P \wedge \neg Q) \vee (\neg P \wedge \neg Q)$.

15. Let $R = \{(1,2), (3,4), (2,2)\}$ and $S = \{(4,2), (2,5), (3,1), (1,3)\}$. Find
   $R \circ S, S \circ R, R \circ (S \circ R), (R \circ S) \circ R \ R \circ R, S \circ S$ and $R \circ R \circ R$.

[OR]

16. Let A and B be sets. Using characteristic function, prove that $\overline{A \cup B} = \overline{A} \cap \overline{B}$.

17. Let $(L, \leq)$ be a lattice. For any $a, b \in L$, prove that $a \leq b \Leftrightarrow a * b = a \Leftrightarrow a \oplus b = b$.
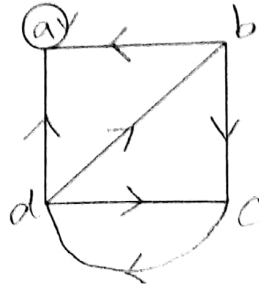
[OR]

18. Prove that any lattice homomorphism is order preserving.

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19. Find the degree of each vertices of the given digraph.

[OR]

20. How many edges are there in a graph with ten vertices each of degree six.

SECTION C – (5 X 9 = 45)

Answer All the Questions:

21. Show that $\left(\neg P \wedge (\neg Q \wedge R)\right) \vee \left((Q \wedge R) \vee / P \wedge R\right) \Leftrightarrow R$.

[OR]

22. Show that $\neg(P \wedge Q) \to \left(\neg P \vee (\neg P \vee Q)\right) \Leftrightarrow (\neg P \vee Q)$.

23. Obtain the principal disjunctive normal form of $P \to \left((P \to Q) \wedge \neg(\neg Q \vee \neg P)\right)$.

[OR]

24. Obtain the principal conjunctive normal form of $P \to \left(\neg P \wedge (Q \to P)\right)$.

25. Prove that composition of functions is associative.

[OR]

26. If A and B are any two subsets of E, then prove that
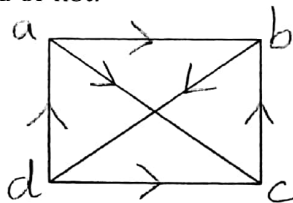$\psi_{A \cup B}(x) = \psi_A(x) + \psi_B(x) - \psi_{A \cap B}(x)$, for all $x \in E$.

27. State and prove distributive inequality of lattice.

[OR]

28. In a lattice if $a \le b \le c$, then show that a) $a \oplus b = b * c$
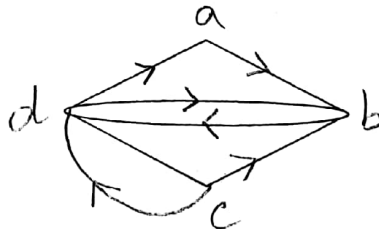b) $(a * b) \oplus (b * c) = (a \oplus b) * (a \oplus c) = b$

29. Check the given digraph is strongly connected, weakly connected and unilaterally connected or not.

[OR]

30. Find the adjacency matrix for the digraph given below.

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