Avinashilingam Institute for Home Science and Higher Education for Women

(Deemed to be University under Category 'A' by MHRD, Estd. u/s 3 of UGC Act 1956)
Re-accredited with 'A+' Grade by NAAC. Recognised by UGC Under Section 12B
Coimbatore - 641 043, Tamil Nadu, India

Bachelor's Degree Examination –August 2020
VI Semester

Class : III UG **Time : 2 Hours**
Major : Mathematics **Max. Marks: 50**

15BMAC26 Discrete Mathematics

Part A **10 x 1 = 10**
Choose the Correct Answer

1. Identify " Close the door " is a
   a. command b. declarativestatement
   c. semantiepardox d. intesrogative

2. _____ is the symbotie form of the " Jack and Jill went up the Hill".
   a. $P \vee Q$ b.$P \wedge Q$
   c. $7P \vee 7Q$ d. $7P \wedge 7Q$

3. Which of the following is not a tautology?
   a. $P \wedge 7P$ b. $P \vee 7P$
   c. $(P \vee Q) \rightarrow P$ d.$P \vee P$

4. $P \vee (P \wedge Q) \Leftrightarrow P$is called _____ Law.
   a. Associative b. Distributive
   c. Absorption d. Demorgan's

5. The Connective 'NAND' and 'NOR' satisfies Commutative and associative law
   a. Commutative and Associative b.Only Commutative
   c. Only associative d.Commutative but not associative

6. The functionally complete set does not contain any _____ connectives.
   a. normal b. redundant
   c. biconditiona d. none

7. The dual of the poset$< P, \geq >$ is
   a.$< P, \leq >$ b. $< P, <>$
   c. $< P, >>$ d.$< P, \geq >$

8. For a partially ordered set, a Hasse diagram is not necessarilly
   a. equal b. unique
   c. same d. multiple

9.A Lattice, which has both a least element and a greatest element is called
   a.Complete Lattice b. lattice
   c. bounded lattice d. complemented lattice

10.Identify the absorption law of a lattice.
   a. $a \vee (a \wedge b) = a$ b.$a \wedge (a \vee b) = a$
   c.$a \vee (a \vee b) = a$ d. $a \wedge (a \wedge b) = a$

Part B **3 x 6 = 18**

Answer any **Three** questions

Each answer should not exceed 400 words or two pages

11. With an example, define atomic statements and connectives.

12. Constant truth table for $(P \to Q) \wedge (Q \to P)$ and $7(P \wedge Q)$.

13. Examine which ones are tautologies or contradictions.
    i. $((7Q \wedge P) \wedge Q)$ ii. $((P \wedge Q \wedge) \leftrightharpoons P$

14. Show the following implications without constructing truth tables.
    i. $7(P \wedge Q) \to (7P \vee (7P \vee Q)) \Leftrightarrow (7P \vee Q)$
    ii. $P \to (Q \vee R) \Leftrightarrow (P \to Q) \vee (P \to R)$

15. Deleneate about functionally complete set of connectives with examples.

16. Find the minterm normal form of
    i. $(7((P \vee Q) \wedge R)) \wedge (P \vee R)$
    ii. $Q \wedge (P \vee 7Q)$

17. Define poset and explain any four partial order relations.

18. Let A be the set of factors of a particular positive integer 'm' and let $\leq$ be the relation divides (ie)
    $$\leq = \{< x, y > / \, x \in A \wedge \, y \in A(x \; divides \; y)\}$$
    draw Hassedisgrams for i. m=6 ii. m=12, iii. m=45

19. If a,b,c are elements of a distributive lattice $(L,\wedge,\vee)$ then prove that $a \vee b = a \vee c$ and $a \wedge b = a \wedge c \Rightarrow b = c$. .

20. State and prove Demorgan's Law for a complemented distributive Lattice.

Part C **2 x 11 = 22**

Answer any **Two** questions

Each answer should not exceed 800 words or four pages

21. Write the truth table for $(P \to Q) \Leftrightarrow 7P \vee Q$ and $(P \vee Q) \vee R \Leftrightarrow P \vee (Q \vee R)$.

22. Construct truth table for $(P \to Q) \wedge (Q \to P)$ and $7(P \wedge Q) \rightleftharpoons (7P \vee 7Q)$.

23. Give detailed note on equivalence of formulas and its significance. State any eightequivalence formulas.

(or)

24. State and prove Duality Law and its role in obtaining equivalence formulae and verify equivalence if $A(P,Q,R)$ is $7P \wedge 7(Q \vee R)$.

25. Obtain i. dnf and cnf of $P \wedge (P \to Q)$
    ii. pdnf of $(7P \vee Q)$
    pcnf of $(Q \to P) \wedge (7P \wedge Q)$

26. Explain ordering and uniqueness of normal forms with example.

27. Give a detailed note about partially ordered relation and Let.
let $\propto = \{2,3,6,12,24,36\}$and the relation $\leq$ be such that $x \leq y$ if $x$divides y.
draw the Hasse diagram of $< x, \leq >$

28. Let $(L, \leq)$ be a poset and $a1\ a2\ \in <$, Then, if $a1$ and $a2$ have a GLB, then his GLB is unique. If $a1$ and $a2$ have LUB, then this LUB is unique.

29. Which of the two lattices(S_n, D) for n=30 and n=45 are complemented?
are these lattices distributed?

30. Elaborate on any four special lattices with examples.

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