Manimegalai

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 – June / July 2021
II Semester

Class : I UG | **Time : 3 Hours**
Major : Special Education and Mathematics | **Max. Marks : 100**

18BSMC04 Discrete Mathematics

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

1. Identify "Close the door". CO1K1
 a. Command b. Statement
 c. Semantic Paradox d. Interrogative

2. Which of the following is a well formed formula? CO2K1
 a. $\neg(P \wedge Q)$ b. $\neg P \wedge Q$
 c. $(P \to Q$ d. $(P \wedge Q) \to Q)$

3. $(P \to Q) \Leftrightarrow$ CO2K3
 a. $(\neg P \wedge Q)$ b. $(\neg P \vee Q)$
 c. $(P \vee \neg Q)$ d. $(\neg P \vee \neg Q)$

4. $P \wedge (P \vee Q) \Leftrightarrow P$ is called CO2K3
 a. Idempotent law b. Associative law
 c. Absorption law d. Demorgan's law

5. The sets $\{\uparrow\}$ and $\{\downarrow\}$ are called CO3K2
 a. minimal set b. maximal set
 c. proper set d. equal set

6. The formula consisting of disjunctions of minterms only is known as C03K2
 a. disjunctive normal form b. conjunctive normal form
 c. principal disjunctive normal form d. principal conjunctive normal form

7. Which of the following is not partial order relation? CO3K2
 a. $\leq$ b. $\geq$
 c. $\subseteq$ d. $<$

8. Let $X = \{2, 3, 6, 12, 24, 36\}$ and the relation $\leq$ be such that $x \leq y$ if x divides y. C04K3
 If $A = \{2, 3, 6\}$ then upper bounds for $'A'$ are
 a. $6, 12, 24$ *and* 36 b. Does not exist
 c. $6, 12$ d. $24, 36$

9. For any $a, b \in L, a \oplus (a * b)$ is CO4K3
 a. a b. b
 c. $a * b$ d. $a \oplus b$

10. On a Lattice $(L, \leq), a \oplus b$ is CO4K3
 a. $LUB\{a, b\}$ b. $GLB\{a, b\}$
 c. $UB\{a, b\}$ d. $LB\{a, b\}$

Part B **5 x 6 = 30**

Answer ALL questions
Each answer should not exceed 400 words or two pages

11.a. Construct the truth table for the following formulas: CO2K3
$(i)\ \neg(\neg P \wedge \neg Q)$, $(ii)\ P \wedge (P \vee Q)$

(or)

11.b. Define well formed formula and list the rules for generating well formed formula. CO2K3

12.a Show that $\left(\neg P \wedge (\neg Q \wedge R)\right) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$. CO3K3

(or)

12.b. Prove that $(P \rightarrow Q) \rightleftarrows (\neg P \vee Q)$ is a Tautology. CO3K3

13.a. Obtain disjunctive normal forms of $(a) P \wedge (P \rightarrow Q)$; $(b) \neg (P \vee Q) \rightleftarrows (P \wedge Q)$. CO3K3

(or)

13.b. Obtain the conjunctive normal form of $Q \vee (P \wedge \neg Q) \vee (\neg P \wedge \neg Q)$. CO3K3

14.a. Prove that inclusion relation is a partial ordering relation on the elements of power sets. CO4K5

(or)

14.b. Prove that the set $L = \{1, 2, 3, 4, 5, 6, 12\}$ of factors of 12 under divisibility forms a Lattice. CO4K5

15.a. Prove Independent law and Absorption law of Lattice. CO4K5

(or)

15.b. Prove that every chain is a distributive Lattice. CO4K5

Part C **5 x 12 = 60**

Answer ALL questions
Each answer should not exceed 800 words or four pages

16.a. State and prove De Morgan's law. CO1K4

(or)

16.b. Construct the truth table for the formula: CO2K4
$(i)\left(\left(P \rightarrow (Q \rightarrow R)\right) \rightarrow \left((P \rightarrow Q) \rightarrow (P \rightarrow R)\right)\right)$; $(ii)\left((\neg P \rightarrow Q) \rightarrow (Q \rightarrow P)\right)$.

17.a. Show the following implications: $(i)(P \wedge Q) \Rightarrow (P \rightarrow Q)$; $(ii) P \Rightarrow (Q \rightarrow P)$. CO3K4

(or)

17.b. Show that CO4K5
$(i) P \rightarrow (Q \rightarrow P) \Leftrightarrow \neg P \rightarrow (P \rightarrow Q)$; $(ii) P \rightarrow (Q \vee R) \Leftrightarrow (P \rightarrow Q) \vee (P \rightarrow R)$.

18.a. Find PDNF and PCNF of $\neg P \vee Q$. CO4K5

(or)

18.b. Find PDNF and PCNF of $(P \wedge Q) \vee (\neg P \wedge R) \vee (Q \wedge R)$. CO4K5

19.a. Let n be a positive integer and S_n be the set of all divisors of n, D be the relation divides i.e., for any $a, b \in S_n$ aDb iff a divides b. Draw Hasse diagrams for $(S_6, D), (S_8, D), (S_{24}, D), (S_{30}, D)$. CO5K5

(or)

19.b. Let A be a given finite set and $P(A)$ its power set. Let $\subseteq$ be the inclusion relation on the elements of $P(A)$. Draw Hasse diagrams of $(P(A), \subseteq)$ for $(1) A = \{a\}, (2) A = \{a, b\}$, $(3)\ A = \{a, b, c\}$ and $(4) A = \{a, b, c, d\}$. CO5K5

20.a. Let $(L, \leq)$ be a Lattice. For any $a, b \in L$, prove that the following are equivalent. $(i) a \leq b$, $(ii) a * b = a$ and $(iii) a \oplus b = b$. CO5K5

(or)

20.b. Let $(L, \leq)$ be a Lattice. For any $a, b \in L$, prove that distributive inequalities and modular inequalities hold good. CO5K5

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