



Avinashilingam Institute for Home Science and Higher Education for Women

Deemed to be University Estd. u/s 3 of UGC Act 1956, Category A by MHRD (now MoE)

Re-accredited with A++ Grade by NAAC. CGPA 3.65/4, Category I by UGC

Coimbatore - 641 043, Tamil Nadu, India

Continuous Internal Assessment Test I – August 2025

Semester V

Class : III UG

Time : 2 Hours

Branch : Special Education & Mathematics

Max.Marks : 60

23BSMC16 – Discrete Mathematics

Course Outcomes:

CO1: Determine the truth value of statements.

CO2: Find tautology and equivalence formula.

CO3: Identify the normal forms.

CO4: Construct Hasse diagram for a given set with relation.

CO5: Apply the concept of lattice in Boolean Algebra

Part A

6 x 1 = 6

Choose the Correct Answer

1. If P and Q are two propositions, then the disjunction of P and Q is denoted by CO1K1
a. $P \vee Q$ b. $P \wedge Q$ c. $P \rightarrow Q$ d. $P \leftrightarrow Q$
2. If $P \rightarrow Q$ is a conditional statement, then $\neg P \rightarrow \neg Q$ is called CO1K2
a. converse b. inverse c. contrapositive d. conjunction
3. Two formulas A and B are equivalent to each other iff CO2K1
a. $A \leftrightarrow B$ b. $A \Rightarrow B$ c. $B \rightarrow A$ d. $A \rightarrow B$
4. $P \vee (P \wedge Q) \Leftrightarrow$ CO2K1
a. P b. Q c. $P \wedge Q$ d. $P \vee Q$
5. If $n=2$, the number of distinct truth tables for formulas involving two variables is then CO3K2
a. 16 b. 4 c. 8 d. 32
6. $P \uparrow Q \Leftrightarrow$ _____. CO3K1
a. $(P \wedge \neg Q)$ b. $\neg(P \vee Q)$ c. $\neg(P \wedge Q)$ d. $(P \vee \neg Q)$

Part B**3 x 6 = 18****Answer ALL questions**

7. a. Construct a truth table for $P \rightarrow (Q \rightarrow R)$. CO1K3
(or)
7. b. Construct a truth table for $(R \wedge P) \rightarrow S$. CO1K3
8. a. Verify that $Q \vee (P \wedge \neg Q) \vee (\neg P \wedge \neg Q)$ is a tautology. CO2K3
(or)
8. b. Prove that $P \rightarrow (Q \rightarrow R) \Leftrightarrow P \rightarrow (\neg Q \vee R) \Leftrightarrow (P \wedge Q) \rightarrow R$ CO2K3
9. a. Show that both implication and equivalence are transitive. CO2K3
(or)
9. b. Show that $\{\uparrow\}$ and $\{\downarrow\}$ are not associative. CO3K3

Part C**3 x 12 = 36****Answer ALL questions**

10. a. (i) Define the following terms with proper example.
(a) Conditional (b) Biconditional (c) Contra-positive
(ii). Construct the truth table for the following compound propositions.
(a) $\neg(P \vee (Q \wedge R)) \Leftrightarrow ((P \vee Q) \wedge (P \vee R))$ (b) $[(P \leftrightarrow Q) \vee (\neg Q \leftrightarrow R)]$ CO1K4
(or)
10. b. (i) Define well-formed formula with an example.
(ii). Construct the truth table for the following compound propositions CO1K4
(a) $(P \wedge Q) \vee (\neg P \wedge Q) \vee (P \wedge \neg Q) \vee (\neg P \wedge \neg Q)$ (b) $(P \wedge Q) \rightarrow (P \vee Q)$
11. a. Show the following implications without constructing the truth table CO2K4
(i) $\neg(P \leftrightarrow Q) \Leftrightarrow (P \vee Q) \wedge \neg(P \wedge Q)$
(ii) $\neg(P \leftrightarrow Q) \Leftrightarrow (P \wedge \neg Q) \vee (\neg P \wedge Q)$
(or)
11. b. (i) If H_1, H_2, \dots, H_m and P imply Q, then show that H_1, H_2, \dots, H_m imply $P \rightarrow Q$.
(ii) Show that $\neg(P \wedge Q) \rightarrow (\neg P \vee (\neg P \vee Q)) \Leftrightarrow (\neg P \vee Q)$ CO2K4
12. a.(i) Show that
$$((P \vee Q) \wedge \neg(\neg P \wedge (\neg Q \vee \neg R))) \vee (\neg P \wedge \neg Q) \vee (\neg P \wedge \neg R)$$
is a tautology.

(ii) Show that $(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$ without using truth table.

CO2K4

(or)

12. b. (i) Show that $\{\downarrow\}, \{\uparrow\}$ are functionally complete set.

(ii) State and prove any 5 tautological implications.

CO3K4

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