Subject: DM (01CE0409)   **SEM: 04**   **AY: 2023-24**

Assignment: 1
Unit: Logic and Predicates

1	Draw the truth table for each of following 1. (p ∨ r) ∧ (q ∧ r) 2. (p ∨ q) ∧ (~r ∧ q) 3. $(p \vee q) \leftrightarrow (q \rightarrow r)$	Evaluate
2	Show that, $p \vee (q \wedge r) \leftrightarrow (p \vee q) \wedge (p \vee r)$ is a tautology. (Using truth table)	Understanding
3	State and prove DE Morgan's law	Analyses
4	State and prove Absorption law	Analyses

5	Check logical equivalence of following compound statement or not.
	    1. $A: p \rightarrow q \quad B: \sim q \rightarrow \sim p$
	    2. $A: p \wedge q \quad B: \sim(p \rightarrow \sim q)$
	    3. $A: (p \rightarrow q) \wedge (p \rightarrow r) \quad B: p \rightarrow (q \rightarrow r)$
	    4. $A: (p \rightarrow r) \vee (q \rightarrow r) \quad B: (p \wedge q) \rightarrow r$
		Application

6	Check validity of argument of following statement or not
	    1. $p \rightarrow q$. $\quad\quad q \rightarrow r \quad\quad \therefore r \rightarrow p$
	    2. $\sim(p \rightarrow q)$. $\quad p \quad\quad\quad \therefore q \rightarrow p$
	    3. $\sim(p \rightarrow q)$. $\quad q \rightarrow p \quad\quad \therefore \sim q$
		Evaluate

7	Let $P(x) : x^2 > x$ be the given predicate and let the domain be the set of all real numbers then find the value of existential quantifier. D =N	Understanding
8	Find the value of universal quantifier and existential quantifier of following predicates. i. Let $P(x) : x^2 \geq x$ and let the domain be the set of all integers ii. Let $P(x) : x \geq 3$ and let the domain be the set of all real numbers iii. $p(x) : x + 1 = 1.$ D=Z	Understanding
9	i. Find the value of $\forall x \, p(x)$ following cases where the domain of discourse is the set of all positive integers (a) p(x): (x+1) (x+2) is an even integer. (b) p(x): x+1 > x. ii. Find the value of $\exists x \, p(x)$ where the domain of the discourse is the set of all real numbers (a) $p(x) : x + 1 = 1.$ (b) $p(x) : x^2 + 2x + 1 < 0$	Application