Air University
(Mid-Term Examination: Fall-2024)

Subject:	**Discrete Structures**	Total Marks:	**50**
Course Code:	**MA-216**	Date:	
Class:	**BS-CYS**	Time:	
Semester:	**I**	Duration:	**2 Hours**
Section:	**A, B (Afternoon Session)**	FM Name:	**Mr. Umair Habib**

HoD's Signature: _____ FM's Signature: _____

Note:

- **All questions must be attempted. Understanding the question is part of the examination.**
- **This examination carries 25% weight towards the final grade.**
- **Scientific calculator is allowed.**

Q. No. 1 (CLO-1) (PLO-2)		**15 Marks**
a	**Demonstrate** (show) that $(p \wedge q) \rightarrow (p \leftrightarrow q)$ is a Tautology by using truth table.	5
b	Show that $\overline{A \cap B \cap C} = \bar{A} \cup \bar{B} \cup \bar{C}$ by constructing a membership table.	5
c	Find the cartesian product of $A, B, and\ C$ where $A = \{a, b\}$, $B = \{c, d\}, C = \{e, f\}$.	5
Q. No. 2 (CLO-2) (PLO-3)		**15 Marks**
a	**Apply** the series of logical equivalences steps to prove that: $\sim(p \vee (\sim p \wedge q))$ and $(\sim p \wedge \sim q)$ are logically equivalent. **(Note: Do not make use of truth table).**	8
b	**Apply** a direct proof strategy to show that "the product of two odd numbers is odd."	7
Q. No. 3 (CLO-4) (PLO-3)		**20 Marks**
a	**Apply** the Binary Search algorithm to search for "13" in the list 1, 3, 4, 5, 7, 9, 11, 13, 14, 17.	10
b	**Execute** the Bubble Sort algorithm to sort the list of elements d, f, k, m, a, b showing the lists obtained at each step.	10

********** End **********