VIT-AP UNIVERSITY

Continuous Assessment Test - 1 | Fall Semester (2025-26) - August 2025

Maximum Marks: 50	Duration: 90 Minutes

Course Code: MAT1003	Course Title: **Discrete Mathematical Structures**	
Set No: 6	Exam Type : Closed Book	School: SAS
Date: 18 08 2025	Slot: A1	Session: FN

Keeping mobile phone/smart watch, even in 'off' position is treated as exam malpractice

General Instructions if any Open Book/Open Notebook/Closed Book:
1. "fx series" - non Programmable calculator are permitted : YES
2. Reference tables permitted : NO

Answer ALL Questions, Each Question Carries 10 Marks (5×10=50 Marks)

1. (a) Find the contrapositive, the converse, and the inverse of the conditional statement
   "The home team wins whenever it is raining."

   (b) Show that $p \vee (q \wedge r)$ and $(p \vee q) \wedge (p \vee r)$ are logically equivalent.   [3+7 M]

2. (a) Find Principal Disjunctive Normal Form (PDNF) of
   $$p \to ((p \to q) \wedge \sim(\sim q \vee \sim p)).$$
   (b) Find Principal Conjunctive Normal Form (PCNF) of
   $$(\sim p \to r) \wedge (q \leftrightarrow p).$$
   [5+5 M]

3. (a) Show that the premises "A student in this class has not read the book" and "Everyone in this class passed the first exam" imply the conclusion "Someone who passed the first exam has not read the book".

   (b) Determine the negation of each statement
   (i) If John is a poet then he is poor.
   (ii) Only if Marc studies, he will pass the test.   [7+3 M]

4. (a) What is the truth value of $\forall x(x^2 \geq x)$ if the domain consists of all real numbers? What is the truth value of this statement if the domain consists of all integers?

   (b) Test the validity of the following argument using rules of inference.

   It is not sunny this afternoon and it is colder than yesterday. We will go swimming only if it is sunny. If we do not go swimming, then we will take a boat trip, and if we take a boat trip, then we will be home by sunset. Therefore, we will be home by sunset.   [3+7 M]

5. Determine the greatest common divisor (gcd) of 344 and 466. Express this gcd as a linear combination of 344 and 466 and find the Bezout's coefficients.   [10 M]