| VIT-AP UNIVERSITY | Continuous Assessment Test - 1 | Fall Semester (2025-26) - August 2025 | |
|---|---|---|---|
| | Maximum Marks: 50 | | Duration: 90 Minutes |
| Course Code: MAT1007 | Course Title: Discrete Mathematics | | |
| Set No: 4 | Exam Type : Closed Book | | |
| Date: 18/08/25 | Slot: A1 | | School: SAS |
| | | | Session: FN |

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

General Instructions: 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)** Are these statements consistent: "If Miranda does not take a course in discrete mathematics, then she will not graduate." "If Miranda does not graduate, then she is not qualified for the job." "If Miranda reads this book, then she is qualified for the job." "Miranda does not take a course in discrete mathematics but she reads this book." Justify your answer.
   **(b)** Show that $\neg(p \vee (\neg p \wedge q))$ and $\neg p \wedge \neg q$ are logically equivalent by developing a series of logical equivalences. **(10 M)**

2. Use quantifiers and predicates to express these statements.
   **(a)** Every computer science student needs a course in discrete mathematics.
   **(b)** There is a student in this class who owns a personal computer.
   **(c)** Every student in this class has taken at least one computer science course.
   **(d)** There is a student in this class who has taken at least one course in computer science.
   **(e)** Every student in this class has been in every building on campus. **(10 M)**

3. Use the rule of inferences to get the conclusion.
   (1) If it is Saturday today, then we play soccer or basketball.
   (2) If the soccer field is occupied, we don't play soccer.
   (3) It is Saturday today, and the soccer field is occupied.
   Conclusion: "We play basketball or volleyball". **(10 M)**

4. **(a)** One student is asked to verify whether the following statements about an integer $x$ are equivalent: (i) $3x + 2$ is even, (ii) $x + 5$ is odd, (iii) $x^2$ is even. Can you make a conclusion? Answer with explanation.
   **(b)** Convert the following formula into a CNF using equivalent transformations. **(10 M)**
   $$(p \to q) \leftrightarrow (p \to r)$$

5. **(a)** Use the Euclidean algorithm to express gcd $(26, 91)$ as a linear combination of 26 and 91. **(10 M)**
   **(b)** Convert $(7345321)_8$ to its binary expansion.