

University of Information Technology & Sciences (UITS)

Faculty of Science and Engineering

Department of Computer Science & Engineering

Program: B.Sc. in CSE

Mid Term Examination, Spring 2025

Course Title: Discrete Mathematics

Course Code: CSE 0541123 / CSE 105

Marks: 20

Time: 1(one) hour

(Students should answer question no. $\text{mod}(\text{ID}, \text{numberOfQuestion})\text{th}$
(0 means a, 1 means b, 2 means c and so on))

Q.No.

Marks

1. Express these system specifications using the propositions
p: "The user enters a valid password,"
q: "Access is granted," and
r: "The user has paid the subscription fee"
and logical connectives (including negations). (05)
 - a) "The user has paid the subscription fee, but does not enter a valid password."
 - b) "Access is granted whenever the user has paid the subscription fee and enters a valid password."
 - c) "Access is denied if the user has not paid the subscription fee."
 - d) "If the user has not entered a valid password but has paid the subscription fee, then access is granted."

2. Use De Morgan's laws to find the negation of each of the following statements. (05)
 - a) Jan is rich and happy.
 - b) Carlos will bicycle or run tomorrow.
 - c) Mei walks or takes the bus to class.
 - d) Ibrahim is smart and hard working.

3. Show that each of these conditional statements is a tautology by using truth tables. (05)
 - a) $(p \wedge q) \rightarrow p$
 - b) $p \rightarrow (p \vee q)$
 - c) $\neg p \rightarrow (p \rightarrow q)$
 - d) $(p \wedge q) \rightarrow (p \rightarrow q)$
 - e) $\neg(p \rightarrow q) \rightarrow p$

4. Prove the following :

[05]

- a) Prove by contraposition that if n is an integer and $n^3 + 5$ is odd, then n is even.
- b) Prove by contradiction that if n is an integer and $n^3 + 5$ is odd, then n is even.
- c) Prove by contraposition that if n is an integer and $3n + 2$ is even, then n is even.
- d) Prove by contradiction that if n is an integer and $3n + 2$ is even, then n is even.