



Daffodil International University

Department of Computer Science and Engineering

Faculty of Science & Information Technology

Midterm Examination, Semester: Spring - 2022

Course Code: CSE 131 (DAY), Course Title: Discrete Mathematics

Section: All, Course Teachers: All

Time: 1.5 hours

Marks: 25

[Answer all of the following questions. You must answer parts of a question sequentially. The figure in a square brace at the right side of a question indicates the marks allocated to the questions. The symbols and notations used to carry their usual meanings.]

- 1.a) He who doesn't work hard is lazy. Some lazy people are rich. Therefore, someone who works hard is not rich. [3]
Verify whether the argument is valid or not?
- b) Assume $g: \mathbb{R} \rightarrow \mathbb{R}$ is defined by $g(x) = 1 - x^2$. Determine whether g is a bijection (explain your reasoning). Here \mathbb{R} represents the set of all real numbers. [2]
- 2.a) By using the rules of logical equivalences show that the compound propositions $(p \wedge (\neg(\neg p \vee q))) \vee (p \wedge q)$ and p are logically equivalent. [3]
- b) Negate "Some integer x is positive and all integers y are negative." And represent both the sentences using predicates and quantifiers. [2]
- 3.a) Let A , B and C be the set of factors of 30, 40 and 100 respectively and the union set consists of all these factors. Draw a Venn diagram and answer the following questions: [3]
 - i) $|A \cap B \cap C| = ?$
 - ii) $P((A \cup C) - B) = ?$
 - iii) $(A - C) \times (C - A) = ?$
- b) Use a membership table to show that $A \oplus B = (A - B) \cup (B - A)$ [2]
- 4.a) Determine whether this argument is valid: [3]

Lynn works part-time or full-time. If Lynn does not play on the team, then she does not work part-time. If Lynn plays on the team, she is busy. Lynn does not work full-time. Therefore, Lynn is busy.
- b) Find the DNF of compound proposition $p \leftrightarrow (q \wedge \neg r)$ [2]
5. Using Mathematical Induction prove for any natural number n that: [5]

$$2^2 + 5^2 + 8^2 + \dots + (3n - 1)^2 = \frac{1}{2}n(6n^2 + 3n - 1)$$