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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: R→ R is defined by $g(x) = 1 - x^2$. Determine whether g is a bijection (explain your reasoning). Here 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 the set of factors of 30, 40 and 100 respectably 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) $P\big((AUC) - B\big) = ?$

iii) (A - C) × (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]

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

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