Daffodil International University

Department of Computer Science and Engineering
Faculty of Science & Information Technology
Midterm Examination, Semester: Spring - 2019
Course Code: CSE 131 (DAY), Course Title: Discrete Mathematics
Section: All, Course Teachers: All

Time: **1.5 hours** Marks: **25**

[**Answer any 5 of the following questions. You must answer parts of a question sequentially.** The figure in square brace at the right side of a question indicates the marks allocated to the questions. The symbols and notations used carry their usual meanings.]

1.a) Prove that $\neg[r \vee (q \wedge (\neg r \rightarrow \neg p))] \equiv \neg r \wedge (p \vee \neg q)$ by using a series of logical equivalences. [3]

b) Find the Disjunctive Normal Form of $\neg p \rightarrow (q \rightarrow r)$ [2]

2.a) Consider these statements, of which the first three are premises and the fourth is a valid conclusion. [3]

"All hummingbirds are richly colored."

"No large birds live on honey."

"Birds that do not live on honey are dull in color."

"Hummingbirds are small."

Assuming that the domain consists of all birds, express the statements in the argument using quantifiers.

b) Let Q(x) be the statement "$1 - x^2 > 2x$." If the domain consists of all integers, then determine the following truth values? [2]

i) $\forall x \neg Q(x)$

ii) $\exists x Q(x)$

3.a) Use rules of inference to show that the hypotheses "If it does not rain or if it is not foggy, then the sailing race will be held and the lifesaving demonstration will go on," "If the sailing race is held, then the trophy will be awarded," and "The trophy was not awarded" imply the conclusion "It rained." [3]

b) Let, A = {0, a}. Find whether the following expression is true or false. [2]

$\{(0,0,a)\} \subset A^3$.

4.a) Determine whether f is a function or not if $x \in \mathbb{Z}$. If it is a function then define its type. [3]

$f(x) = 1/x$

$f(x) = x^2 + 1$

$f(x) = x - 1$

b) Use a membership table to show that $\overline{A \cap (B \cup C)} = (\bar{A} \cap \bar{B}) \cup (\bar{A} \cap \bar{C})$. [2]

5.a) In a survey of university students, 64 had taken mathematics course, 94 had taken chemistry course, 58 had taken physics course, 28 had taken mathematics and physics, 26 had taken mathematics and chemistry, 22 had taken chemistry and physics course, and 14 had taken all the three courses. Find how many had taken one course only. [3]

b) "No ID, no clearance, no exam". [2]

Write this sentence as a conditional proposition. And convert that to its equivalent converse, contrapositive and inverse.

6.a) Translate these statements into English, where C(x) is "x is a comedian" and F(x) is "x is funny" and the domain consists of all people. [3]

i) $\exists x(C(x) \rightarrow F(x))$

ii) $\exists x(C(x) \wedge F(x))$

b) Write any of the De Morgan's law of propositional equivalences and prove that using truth table. [2]