NED University of Engineering And Technology
Department of Computer Science and Information Technology
Spring 2024 – First Year Computer Science

CT162 – Discrete Structures

Assignment # 1
Due Date: Monday, May 13, 2024 by 16:00 Hours in Faculty Office

Instructions (Read carefully)

- Handwritten solution on a A4 size paper to be submitted before due date
- Answer questions in the SAME sequence as the questions are given, no need to copy questions
- In case of more than one sheet of paper, each to be numbered and all should be stapled before submission
- First sheet should have your name, roll number, and assignment number clearly mentioned on top
- Late submission would be penalized

Question 1: Use set builder notation to give a description of each of these sets.
a) {0, 3, 6, 9, 12}
b) {−3,−2,−1, 0, 1, 2, 3}

Question 2: For each of these pairs of sets, determine whether the first is a subset of the second, the second is a subset of the first, or neither is a subset of the other.
a) Set of people who speak English, the set of people who speak English with an Australian accent
b) Set of fruits, the set of citrus fruits
c) Set of students studying discrete mathematics, the set of students studying data structures

Question 3: Determine whether these statements are true or false.
a) $\emptyset \in \{\emptyset\}$ b) $\emptyset \in \{\emptyset, \{\emptyset\}\}$ c) $\{\emptyset\} \in \{\emptyset\}$
d) $\{\emptyset\} \in \{\{\emptyset\}\}$ e) $\{\emptyset\} \subset \{\emptyset, \{\emptyset\}\}$ f) $\{\{\emptyset\}\} \subset \{\emptyset, \{\emptyset\}\}$
g) $\{\{\emptyset\}\} \subset \{\{\emptyset\}, \{\emptyset\}\}$

Question 4: Find sets A and B if $A - B = \{1, 5, 7, 8\}$, $B - A = \{2, 10\}$, and $A \cap B = \{3, 6, 9\}$.

Question 5: Find the domain and range of these functions.
a) The function that assigns to each pair of positive integers the maximum of these two integers
b) The function that assigns to a bit string the number of times the block 11 appears

Question 6: What are the terms a_0, a_1, a_2, and a_3 of the sequence $\{a_n\}$, where a_n equals
a) $(-2)^n$? b) $7 + 4^n$?

Question 7: Find the first six terms of the sequence defined by each of these recurrence relations and initial conditions.
a) $a_n = -2a_{n-1}$, $a_0 = -1$
b) $a_n = a_{n-1} - a_{n-2}$, $a_0 = 2, a_1 = -1$

Question 8: State the converse, contrapositive, and inverse of each of these conditional statements.
a) If it snows tonight, then I will stay at home.
b) I go to the beach whenever it is a sunny summer day.
c) When I stay up late, it is necessary that I sleep until noon

Question 9: Construct a truth table for each of these compound propositions.
a) $p \rightarrow \neg p$ b) $p \leftrightarrow \neg p$ c) $p \oplus (p \vee q)$

Question 10: Are these system specifications consistent? "Whenever the system software is being upgraded, users cannot access the file system. If users can access the file system, then they can save new files. If users cannot save new files, then the system software is not being upgraded."