UTM
UNIVERSITI TEKNOLOGI MALAYSIA

ASSIGNMENT 1

SECI1013 – Discrete Structure

Semester 2024/2025-1

Instructions:

This is a group assignment. Each group should consist of no more than 4 members.

Please write all your answers by hand using a pen. Ensure that your answers are well-structured and that your handwriting is neat and easy to read. Submissions in printed form will not be accepted.

Please submit your assignment by **17/11/2024, 8:00 AM**, in room **N28-346-05**.

Question 1 **[16 marks]**

a. To study the ownership of electronic devices among FC students, we surveyed 150 students to determine whether they own a laptop, smartphone, or tablet. Based on their responses, we found that 25 students own only a laptop, 30 own only a smartphone, and 20 own only a tablet. Additionally, 15 students own both a laptop and a smartphone, but not a tablet, and 5 students own all three devices. After conducting the survey, we found that 65 students own a laptop, 55 own a smartphone, and 50 own a tablet.

i. Draw a Venn diagram to represent the problem described above. [2 m]

ii. How many students do not own any of the devices? [2 m]

iii. How many students own exactly two (2) devices? [2 m]

iv. How many students own devices other than a laptop? [2 m]

b. Suppose $A = \{n \in N | n \text{ odd}, 1<n<10\}$, where $N = \{\text{natural number}\}$

$B = \{n \in N | n \text{ is prime}, 1<n<10\}$, $C = \{n \in N | n \text{ divisible by } 3, 1<x<10\}$

i. Find $|A|$, $|B|$ and $|C|$ [3 m]

ii. Find the number of proper subsets of A [3 m]

iii. Find $C \times B$ [2 m]

Question 2 **[24 marks]**

a. Verify $\sim(p \vee q) \vee (\sim p \wedge q) \equiv \sim p$, using both truth table and logic property law. [6 m]

b. Write the following statement using p and q and logical connective

j: I go camping

k: it is a sunny day

l: it is Saturday

i. I go camping whenever it is Saturday and a sunny day. [2 m]

ii. If it is neither Saturday nor a sunny day, then I do not go camping. [2 m]

iii. If I do not go camping, then it is neither Saturday nor a sunny day. [2 m]

c. Write the negation of $\forall x\ (x^2 + 2x - 3 = 0)$ and determine the resulting proposition is TRUE or FALSE with the domain of discourse is integer. [6 m]

d. Express the following statement using predicates, quantifier, and logical connective with the domain of discourse consist of all students at your school

i. There is a student at your school who can speak Russian but does not know C++. [2 m]

ii. Every student at your school either can speak Russian or knows C++. [2 m]

iii. No student at your school can speak Russian or knows C++. [2 m]

Question 3 **[10 marks]**

a. Prove the following theorem using indirect proof method:

For all integers, if $a^2 - 3b$ is even then a is even and b is even. [5 m]

b. Prove the following theorem using proof by contradiction:

Let A and B be sets such that $A \subseteq B$, then $A \cap B = A$ [5 m]