



Department of Inter Disciplinary Studies,
Faculty of Engineering,
University of Jaffna, Sri Lanka
MC 4010 - Assignment 02

30 minutes

30-10-2023

Important instructions:

- Answer all the questions (1-3).
- If it is determined that you have violated any policies during this exam, you will receive a score of zero for this assignment, without any exceptions or considerations.

- Suppose that A is the set of fourth-semester students at the Faculty of Engineering, University of Jaffna, and B is the set of students in discrete mathematics at your faculty. Express each of these sets in terms of A and B .
 - the set of fourth-semester students taking discrete mathematics at the Faculty of Engineering, University of Jaffna
 - the set of fourth-semester students at the Faculty of Engineering, University of Jaffna, who are not taking discrete mathematics
 - the set of students at the Faculty of Engineering, University of Jaffna, who either are fourth-semester students or are taking discrete mathematics
 - the set of students at the Faculty of Engineering, University of Jaffna, who either are not fourth-semester students or are not taking discrete mathematics
 - Show that if A , B , and C are sets, then $\overline{A \cap B \cap C} = \bar{A} \cup \bar{B} \cup \bar{C}$
 - by showing each side is a subset of the other side.
 - using a membership table.
- Show that the function $f(x) = |x|$ from the set of real numbers to the set of non negative real numbers is not invertible, but if the domain is restricted to the set of non negative real numbers, the resulting function is invertible.
 - Suppose that g is a function from A to B and f is a function from B to C .
 - Show that if both f and g are one-to-one functions, then $f \circ g$ is also one-to-one.
 - Show that if both f and g are onto functions, then $f \circ g$ is also onto.
 - Find $f \circ g$ and $g \circ f$, where $f(x) = x^2 + 1$ and $g(x) = x + 2$, are functions from \mathbb{R} to \mathbb{R} .
- Determine whether the relation R on the set of all people is reflexive, symmetric, anti-symmetric, and/or transitive, where $(a, b) \in R$ and justify your answers if and only if
 - a is taller than b .
 - a and b were born on the same day.
 - a has the same first name as b .
 - a and b have a common grandparent.

- (b) Suppose we have a set of workstation computers, denoted as C ($= \{ \text{Workstation 1, Workstation 2, Workstation 3, Workstation 4} \}$), in an engineering lab. The relation R on C is defined as follows:

$R = \{(\text{Workstation 1, Workstation 1}), (\text{Workstation 1, Workstation 3}), (\text{Workstation 2, Workstation 2}), (\text{Workstation 3, Workstation 1}), (\text{Workstation 3, Workstation 3}), (\text{Workstation 4, Workstation 1}), (\text{Workstation 4, Workstation 4})\}$

- i. Create a directed graph that represents the relationship R among the workstation computers in the engineering lab.
- ii. Construct a binary matrix that corresponds to relation R for these workstation computers.
- iii. Decide whether the relation is reflexive, symmetric, or transitive and justify your answer.