SECI1013: DISCRETE STRUCTURE
2021/2022 – SEMESTER 1

ASSIGNMENT 1 (Part 2)

Deadline of submission: 19 November 2021

1. Determine whether the relation R on set Z (set of integer number) is reflexive, irreflexive, symmetric, asymmetric, antisymmetric, or transitive.

$$a\ R\ b \text{ if and only if } |a-b| = 2$$

2. Given a relation, R on $A = \{a, b, c, d\}$ on as follows:

$$R = \{(a,a),(a,b),(a,d),(b,b),(b,c),(c,c),(c,d),(d,a),(d,d)\}$$

Show the matrix of relation, M_R and determine whether the relation, R is an equivalence relation.

3. Let $f(x,y) = (2x-y, x-2y)$; $(x,y) \in \mathbf{R} \times \mathbf{R}$, ($\mathbf{R}$ is set of real numbers.)

   a) Show that f is one to one.
   b) Find f^{-1}

4. Let a set $X = \{1, 2, 3\}$, $Y = \{1, 2, 3, 4\}$ and $W = \{1,2\}$.

   a) Draw the arrow diagram to define function $f: X \rightarrow Y$ that is one-to-one but not onto.
   b) List the three ordered pairs to define function $g: X \rightarrow W$ that is onto but not one-to-one.

5. Function f and g are defined by formulas as shown below.

$$f(x) = x^3 \quad \text{and} \quad g(x) = x - 1, \text{ for all real number } x.$$

   i) Find $g \circ f$ and $f \circ g$.
   ii) Determine whether $g \circ f$ equals $f \circ g$.

6. Let $A = \{0,1\}$. Give a recurrence relation for the strings of length n in A^* that do not contain 01. Note: A^* is the set of all string over A

7. A game is played by moving a marker ahead either 2 or 3 steps on a linear path. Let c_n be the number of different ways a path of length n can be covered. Given,

$$c_n = c_{n-2} + c_{n-3},\ c_1=0,\ c_2=1,\ c_3=1$$

   Write a recursive algorithm to compute c_n.