SECI1013: DISCRETE STRUCTURE
2021/2022 – SEMESTER 1

ASSIGNMENT 1 (Part 2)

Deadline of submission: 17th Nov. 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 $f(x,y) = (2x - y, x - 2y); (x,y) \in \mathbf{R} \times \mathbf{R}$, (**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 → Y* that is one-to-one but not onto.

b) List the three ordered pairs to define function *g: X → 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.