SCSI1013: Discrete Structure (2015/2016- Semester 1)

Assignment 1.2 (Due 21/11/2024)

1. R defined by $a\ R\ b$ if and only if a - b is an even integer from $A = \{3,\ 6,\ 9,12\}$ to $B = \{2,3,4,5,6\}$

    i)   Write the ordered pair of the relation.

    ii) Draw the digraph of the relation.

    iii) List the domain and range of R

2. Determine whether the relation on set $D = \{1,3,8,10,15\}$ is equivalent relations where $x, y \in D, xRy$ if and only if $y\text{-}x$ is a multiple of 7(Including negative).

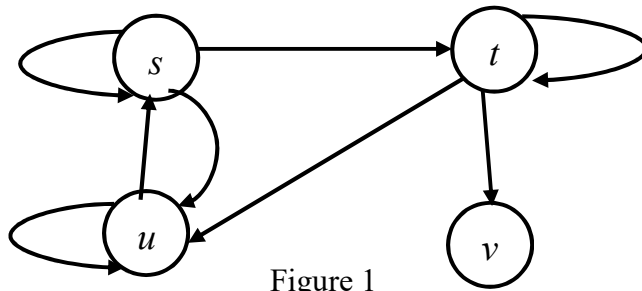3. Given the digraph of relation R as in Figure 1.

Figure 1

    i)   What is matric of the relation, M_R that represent diagraph in Figure 1.

    ii) List in-degrees and out-degrees of all vertices.

    iii) Is it the relation of R is an partial order? Check all variance Justify for answer

4. Let $X=\{-2, 0, 2\}$ and $Y=\{-4, 0, 4\}$. For each $x \in X$, define functions $v: X \rightarrow Y$ and $w: X \rightarrow Y$ by:

    $$v(x) = 4 - x^2$$
    $$w(x) = 2x$$

    Determine if v and w are one-to-one, onto Y, and/or bijection.

5. Let f dan g be functions from the positive integers to the positive integers defined by the equations,

$$f(x) = 7x - 2, \qquad g(x) = \frac{2}{3}x$$

i) Find the inverse of $g(x)$.

ii) Find the compositions $(gogof)(x)$

6. As a lead computer scientist in a chemical industry plant, you are assigned to design and develop algorithms that simulate chemical reaction processes. Two chemicals A and B are combined to produce a third chemical C. The initial temperature F_0, of chemical A, is 5.0 Fahrenheit and the initial temperature F_1 for chemical B is 4.5. When chemicals A and B are combined to produce chemical C, the increment in each minute $t = 0, 1, 2, 3 \ldots$, which chemical C warms up to room temperature is a recurrence sequence, with F_0 and F_1 as initial conditions. For $t \geq 2$, this recurrence sequence is found by summing the previous element of the sequence $(t\text{-}1)$, with one-fifth of the previous two elements of the sequence $(t\text{-}2)$. From the above given information,

i) Find the recurrence relation of chemical C that models the warming to room temperature.

ii) Using the recurrence relation obtained in (a), list down the sequence from $F_0, F_1, F_2, \ldots F_5$.

7. Write a recursive algorithm to find the n term of the sequence defined by $w_0 = 5, w_1 = 7$ and $w_n = 2w_{n-1} + w_{n-2}$ for n $\geq$ 2 .Trace the algorithm for $n = 4$.