SECI1013: DISCRETE STRUCTURE
SEM 1 2023/2024

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Marks 11½/15

Question 1 **[3 Marks]**

Fill in the blank with correct properties that relation could be reflexive/ irreflexive/ symmetric/ anti-symmetric/ transitive. (One answer only)

a. Nothing is related to itself _____ (1m)
b. No one-way streets _____ (1m)
c. Whenever there's a roundabout route, there's a direct route _____ (1m)

Question 2 **[3 Marks]**

Given the relation {(-7,2), (0,4), (2,-1) (-3,0), (-3,3)}

a. State the domain and range of the relation (1m)
b. Determine whether the relation is function and explain (1m)
c. Create a mapping diagram of the relation (1m)

Question 3 **[6 Marks]**

Given a pair of functions, $f(x)=3/(2x+1)$, $g(x)=2/x$. Find:

a. $(g \circ f)(x)$ (3m)
b. Domain of function. (3m)

Question 4 **[3 Marks]**

Given an arithmetic sequence 5, 37/7, 39/7, 41/7 ....

a. Find the sequence recursive formula (1m)
b. Write a Pseudo-code for function a(n) (2m)

No.:

Question 1

a) Irreflexive

b) Symmetric

c) Anti-symmetric

Question 2

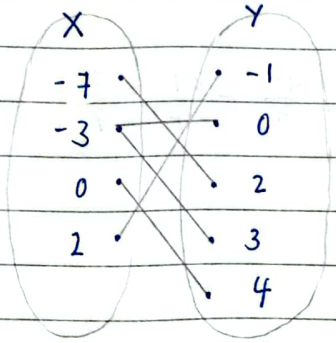
$R = \{(-7,2), (0,4), (2,-1), (3,0), (-3,3)\}$

a) Domain = $\{-7, 0, 2, -3\}$

Range = $\{2, 4, -1, 0, 3\}$

b) Relation is not a function because one of the values in domain which is -3 has two values in codomain (0 and 3). Therefore, relation is one-to-many and not a function.

c)



Question 3

$f(x) = \frac{3}{2x+1}$ $g(x) = \frac{2}{x}$

a) $g \circ f(x)$

$g[f(x)] = g\left(\frac{3}{2x+1}\right)$

$= \frac{2}{\left(\frac{3}{2x+1}\right)}$ $= \frac{2(2x+1)}{3}$

$= \frac{4x+2}{3}$

$= \frac{4}{3}x + \frac{2}{3}$

No.:

b) $f(x) = \frac{3}{2x+1}$ $\quad$ $g(x) = \frac{2}{x}$

$2x + 1 = 0$ $\quad$ $x = 0$

$2x = -1$ $\quad$ $g(x) = \frac{2}{x}, x \neq 0$

$x = -\frac{1}{2}$

$f(x) = \frac{3}{2x+1}, x \neq -\frac{1}{2}$

Domain of $f(x) = (-\infty, -\frac{1}{2}] \cap E\frac{1}{2}, \infty)$

Domain of $g(x) = (-\infty, 0] \cap [0, \infty)$

Question 4

a) $5, 37/7, 39/7, 41/7$ $\quad$ $n = 0, 1, 2, 3 \ldots$

$\frac{2}{7}$ $\frac{2}{7}$ $\frac{2}{7}$

$\frac{37}{7} - 5 = \frac{2}{7}$, $\frac{39}{7} - 5, = \frac{2}{7}$, $\frac{41}{7} - \frac{39}{7} = \frac{2}{7}$

$a_0 = 5$

$a_1 = a_0 + \frac{2}{7}$

$a_1 = 5 + \frac{2}{7} = \frac{37}{7}$

3/4

$a_n = a_{n-1} + \frac{2}{7}$, when initial condition $a_0 = 5$ for n

b) Set $n = 0$

Set $a(0) = 5$

$n = 1$

while $n > 1$,

$a(n) = a(n-1) + (2/7)$

$n = n + 1$

~~end while~~

while $a(0) = 5$,

$a(n) = a(n-1) + 2/7$

$n = n + 1$

1/2