SECI 1013 : DISCRETE STRUCTURE

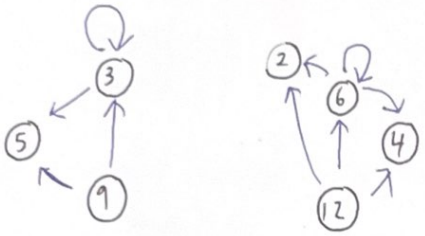
SEM / 1 ASSIGMENT 1.2

GROUP MEMBERS :

1. TAN XIN TIAN (A24CS0198)
2. ANGELA NGU XIN YI (A24CS0226)
3. CHEONG YI SHIEN (A24CS0058)
4. TEOH XIN YEE (A24CS0307)

1. (i) $R = \{(3,3),(3,5),(6,2),(6,4),(6,6),(9,3),(9,5),(12,2),(12,4),(12,6)\}$

(ii)



(iii) domain $= \{3,6,9,12\}$

range $= \{2,3,4,5,6\}$

2. $R = \{(1,8),(8,1),(3,10),(10,3),(8,15),(15,8),(1,1),(3,3),(8,8),(10,10),(15,15),(1,15),(15,1)\}$

	1	3	8	10	15
1	1	0	1	0	1
3	0	1	0	1	0
8	1	0	1	0	1
10	0	1	0	1	0
15	1	0	1	0	1

→ reflexive

$(x,y) \in R$

$(y,x) \in R$

↳ symmetric

Equivalent

$$\begin{bmatrix} 1&0&1&0&1 \\ 0&1&0&1&0 \\ 1&0&1&0&1 \\ 0&1&0&1&0 \\ 1&0&1&0&1 \end{bmatrix} \otimes \begin{bmatrix} 1&0&1&0&1 \\ 0&1&0&1&0 \\ 1&0&1&0&1 \\ 0&1&0&1&0 \\ 1&0&1&0&1 \end{bmatrix} = \begin{bmatrix} 1&0&1&0&1 \\ 0&1&0&1&0 \\ 1&0&1&0&1 \\ 0&1&0&1&0 \\ 1&0&1&0&1 \end{bmatrix}$$

→ transitive

No.: Date:

3(i) (s,s) (u,u)
(s,u) (t,w)
(s,t) (t,t)
(u,s) (t,v)

$$M_R = \begin{array}{c} \\ s \\ u \\ t \\ v \end{array} \begin{array}{c} \begin{array}{cccc} s & u & t & v \end{array} \\ \begin{bmatrix} 1 & 1 & 1 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \end{array}$$

(ii)

	s	u	t	v
in-degree	2	3	2	1
out-degree	3	2	3	0

(iii) Not partial order because not reflexive, not antisymmetric, not transitive.

Not transitive: $(v,v) \notin M_R$

Not antisymmetric: $(s,u) \in M_R \wedge x \neq y \rightarrow (u,s) \in M_R$

$$\begin{bmatrix} 1 & 1 & 1 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \otimes \begin{bmatrix} 1 & 1 & 1 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 0 \\ 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Not transitive

4. $v(-2) = 4-(-2)^2$
$= 0$
$v(0) = 4-(0)^2$
$= 4$
$v(2) = 4-(2)^2$
$= 0$

$w(-2) = 2(-2)$
$= -4$
$w(2) = 2(2)$
$= 4$
$w(0) = 2(0)$
$= 0$

$(-2,0)$ Not one-to-one
$(0,4)$ Not onto Y, range $\neq$ codomain
$(2,0)$ Not bijection

$(-2,-4)$ one-to-one
$(2,4)$ onto Y, codomain = range
$(0,0)$ bijection

QUESTION 5

(i) $g(x) = \frac{2}{3}x$

Let $y = g(x)$

$y = \frac{2}{3}x$

$x = \frac{2}{3}y$

$g^{-1}(y) = \frac{3}{2}y$

$g^{-1}(x) = \frac{3}{2}x$

(ii) $(g \circ g \circ f)(x)$

$= g[g[f(x)]]$

$= g[g(7x-2)]$

$= g[\frac{2}{3}(7x-2)]$

$= g[\frac{14}{3}x - \frac{4}{3}]$

$= \frac{2}{3}[\frac{14}{3}x - \frac{4}{3}]$

$= \frac{28}{9}x - \frac{8}{9}$

QUESTION 6

(i) $F_0 = 5.0$

$F_1 = 4.5$

$F(t) = F(t-1) + \frac{1}{5}F(t-2)$, $t \geq 2$

(ii) $F_0 = 5.0$

$F_1 = 4.5$

$F_2 = F_1 + \frac{1}{5}F_0 = 4.5 + \frac{1}{5}(5.0) = 5.5$

$F_3 = F_2 + \frac{1}{5}F_1 = 5.5 + \frac{1}{5}(4.5) = 6.4$

$F_4 = F_3 + \frac{1}{5}F_2 = 6.4 + \frac{1}{5}(5.5) = 7.5$

$F_5 = F_4 + \frac{1}{5}F_3 = 7.5 + \frac{1}{5}(6.4) = 8.78$

```
n
r : f(n)
) {
if(n = 0)
   return 5
else if (n=1)
   return 7
else
   return 2f(n-1) + f(n-2)
}
```

$f(0) = 5$

$f(1) = 7$

$f(2) = 2f(1) + f(0)$
$= 2(7) + 5$
$= 19$

$f(3) = 2f(2) + f(1)$
$= 2(19) + 7$
$= 45$

$f(4) = 2f(3) + f(2)$
$= 2(45) + 19$
$= 109$