

Tutorial 1

Q1 $N = \{0, 1, 2, 3, \dots\}$

a) $A = \{(0, 0), (2, 2), (4, 4), \dots\}$ Relation

b) $S = \{(x, y) : y = x, x = 2k, k \in N\}$ } same
 $= \{(0, 0), (2, 2), (4, 4), \dots\}$ Relation

c) $T = \{(x, y) : x \in N, y \in N, x+y \text{ is even}\}$
 $= \{(0, 2), (1, 3), (2, 2), (0, 4), (3, 1), \dots\}$ Relation

d) $U = \{(x, y) : x \in N, y \in N, x-y \text{ is even}\}$
 $= \{(2, 0), (3, 1), (4, 2), (5, 3), (4, 0), \dots\}$ Relation

e) $V = \{(1, -1), (2, -2), (3, -3), \dots\}$

Not a Relation (No doesn't contain +ve number)

f) $W = \{x : x \in N, x \text{ is divisible by } 2\}$
 $= \{2, 4, 6, 8, 10, \dots\}$

Not a Relation (No ordered pair)

Q2 $A = \{1, 2, 3, 4\}$

$A \times A = \{ \dots \}$ [For relation]

$\{(0, 0), (1, 1), (2, 2), (3, 3), (4, 4), (0, 1), (1, 0), \dots\}$

a) $R_1 = \{(x, y) : x \in A, y \in A, x > y\}$
 $= \{(2, 1), (3, 1), (3, 2), (4, 1), (4, 2), (4, 3)\}$

b) $R_2 = \{(x, y) : x \in A, y \in A, x+y \text{ is even}\}$
 $= \{(1, 1), (1, 3), (2, 2), (2, 4), (3, 1), (3, 3), (4, 2), (4, 4)\}$

c) $R_3 = \{(x, y) : x \in A, y \in A, y \text{ is divisible by } x\}$
 $= \{(1, 1), (1, 2), (1, 3), (1, 4), (2, 2), (2, 4), (3, 3), (4, 4)\}$

$$d) R_4 = \{(x, y) : x \in A, y \in A, x - y \text{ div by } 3\}$$

$$= \{(1, 4), (4, 1), (1, 1), (2, 2), (3, 3), (4, 4)\}$$

$$Q3 \quad A = \{1, 2, 3, 4\}$$

$$a) S_1 = \{(1, 1), (2, 2), (3, 3), (4, 4)\}$$

$$S_1 = \{(x, y) : x \in A, y \in A, x = y\}$$

$$b) S_2 = \{(1, 2), (2, 1), (1, 3), (3, 1), (1, 4), (4, 1), (2, 3), (3, 2), (2, 4), (4, 2), (3, 4), (4, 3)\}$$

$$S_2 = \{(x, y) : x \in A, y \in A, x \neq y\}$$

$$c) S_3 = \{(1, 2), (2, 1), (1, 4), (4, 1), (2, 3), (3, 2), (3, 4), (4, 3)\}$$

$$S_3 = \{(x, y) : x \in A, y \in A, x + y \text{ is odd}\}$$

$$Q4 \quad B = \{0, 1\}$$

For [relation, (x, y)]

$$B \times B = \{(0, 0), (0, 1), (1, 0), (1, 1)\}$$

$$\text{Here, } n = 4$$

So,

like subset, relation is found out

(i also be empty)

using formula 2^n

$$= 2^4$$

$$= 16$$

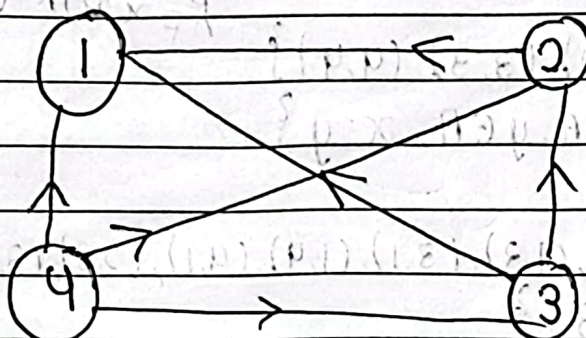
Therefore

16 different relation on set B

Q5

2a) $R = \{(2,1), (3,1), (3,2), (4,1), (4,2), (4,3), (4,4)\}$

Digraph

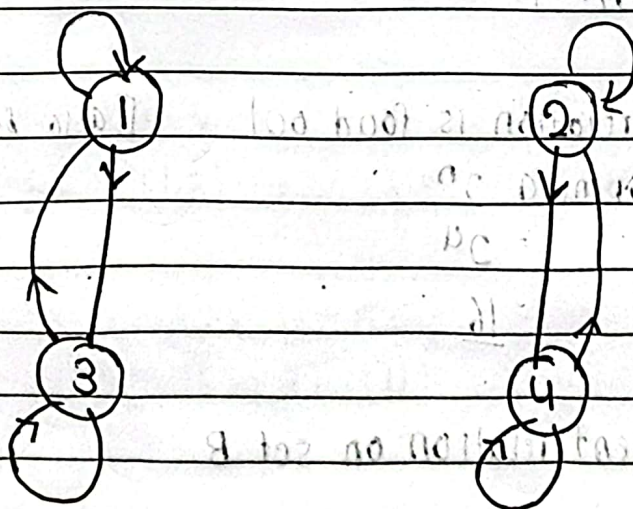


Matrix

$$\begin{matrix}
 & \begin{matrix} 1 & 2 & 3 & 4 \end{matrix} \\
 \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \end{matrix} & \begin{pmatrix}
 0 & 1 & 1 & 1 \\
 0 & 0 & 1 & 1 \\
 0 & 0 & 0 & 1 \\
 0 & 0 & 0 & 1
 \end{pmatrix}
 \end{matrix}$$

b) $R = \{(1,1), (1,3), (2,2), (2,4), (3,1), (3,3), (4,2), (4,4)\}$

Digraph

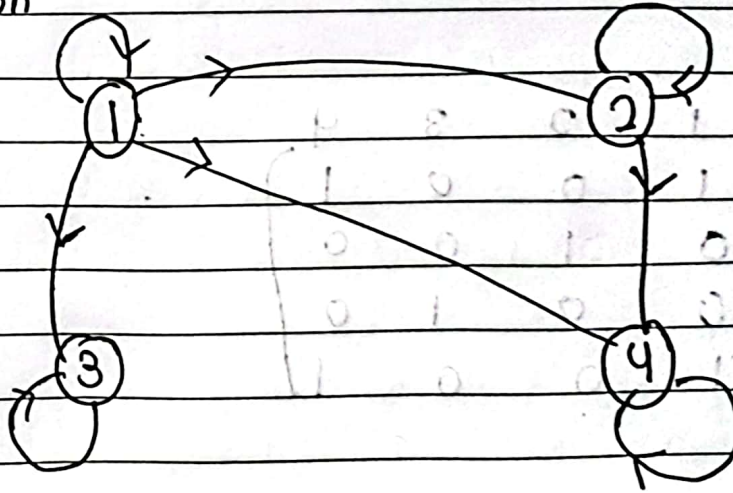


Matrix

	1	2	3	4
1	1	0	1	0
2	0	1	0	1
3	1	0	1	0
4	0	1	0	1

c) $R = \{(1,1), (1,2), (1,3), (1,4), (2,2), (2,4), (3,3), (4,4)\}$

Diagram

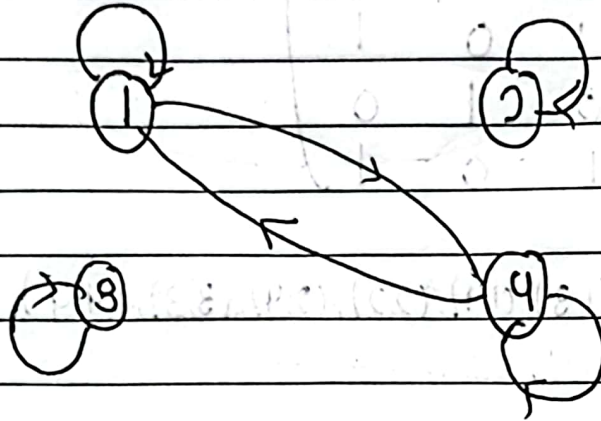


Matrix

	1	2	3	4
1	1	1	1	1
2	0	1	0	1
3	0	0	1	0
4	0	0	0	1

d) $R = \{(1,4), (4,4), (1,1), (2,2), (3,3), (4,1)\}$

Diagraph

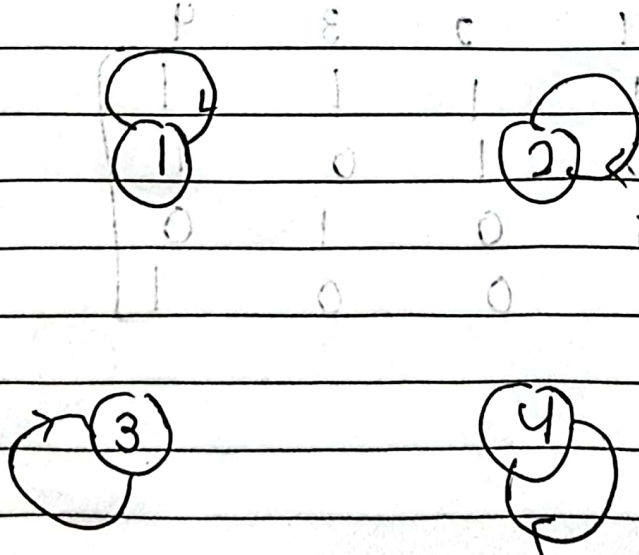


Matrix

	1	2	3	4
1	1	0	0	1
2	0	1	0	0
3	0	0	1	0
4	1	0	0	1

3a) $S_1 = \{(1,1), (2,2), (3,3), (4,4)\}$

Diagraph

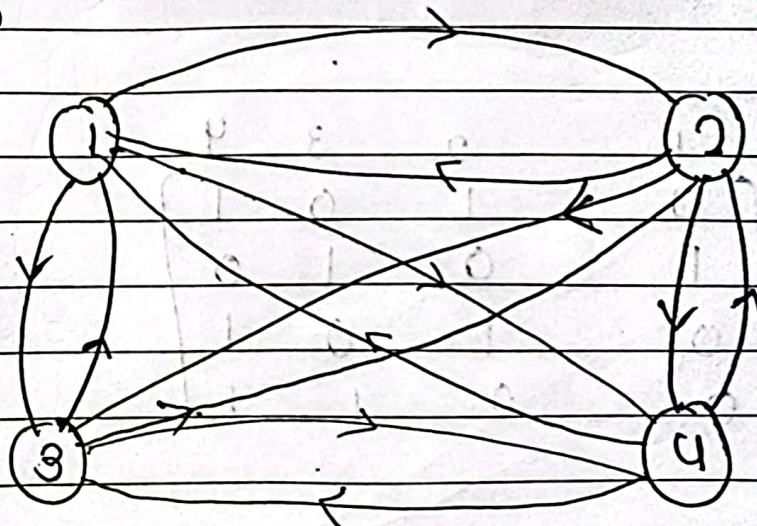


Matrix

$$\begin{matrix} & \begin{matrix} 1 & 2 & 3 & 4 \end{matrix} \\ \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \end{matrix} & \left[\begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array} \right]
 \end{matrix}$$

$$b) S_2 = \{ (1,2), (2,1), (1,3), (3,1), (1,4), (4,1), (2,3), (3,2), (2,4), (4,2), (3,4), (4,3) \}$$

Digraph

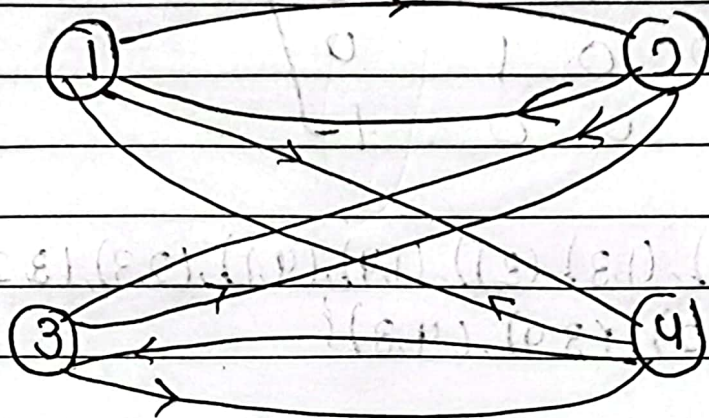


Matrix

$$\begin{matrix} & \begin{matrix} 1 & 2 & 3 & 4 \end{matrix} \\ \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \end{matrix} & \left[\begin{array}{cccc} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{array} \right]
 \end{matrix}$$

c) $S_3 = \{(1,2), (2,1), (1,4), (4,1), (2,3), (3,2), (3,4), (4,3)\}$

Directed graph

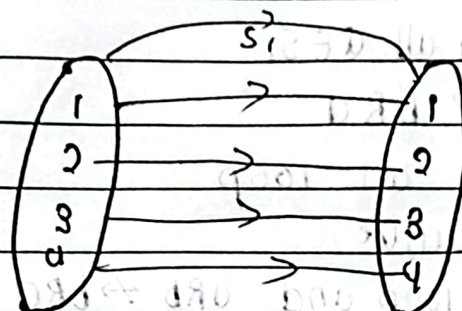


Matrix

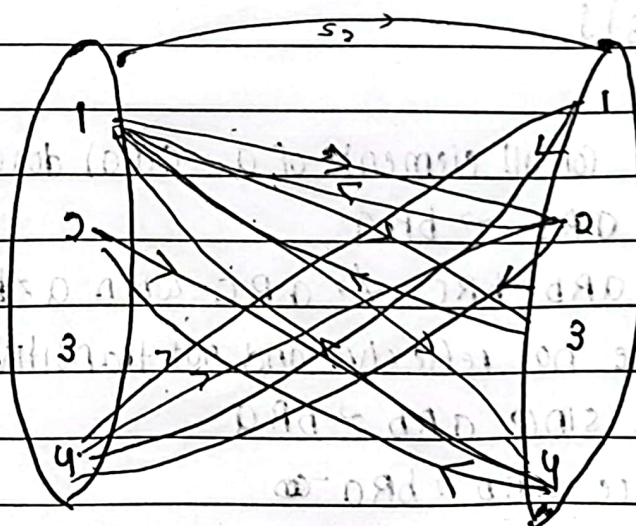
	1	2	3	4
1	0	1	0	1
2	1	0	1	0
3	0	1	0	1
4	0	0	1	1

06.

20) $S_1 = \{ (1,1), (2,2), (3,3), (4,4) \}$



b) $S_2 = \{ (1,2), (2,1), (1,3), (3,1), (1,4), (4,1), (2,3), (3,2), (2,4), (4,2), (3,4), (4,3) \}$



c) $S_3 = \{ (1,2), (2,1), (1,4), (4,1), (2,3), (3,2), (3,4), (4,3) \}$

