

2)

Digraph of the relation⑧
7m

* The relation R , on a finite set can be represented pictorially as follows

* A small circle is drawn for each element of A and marked with the corresponding elements

* These circles are called vertices and each is drawn from the vertex a_i to the vertex a_j iff $a_i R a_j$ this is called an edge.

* This pictorial representation of R is called a direct graph or digraph of R .

* Thus if R is a relation on A , the vertices in the digraph of R correspond exactly to the set A and the edges correspond exactly to ordered pairs in R .

* In a digraph of R , the indegree of a vertex is number of edges terminating at a vertex.

* The outdegree of a vertex is the number of edges leaving the vertex.

Example - 1

Let $A = \{a, b, c, d\}$ & R the relation on A that has a matrix

HR

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$$HR = \begin{pmatrix} 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 \end{pmatrix}$$

Sol:

Given:

$$A = \{a, b, c, d\} \text{ and } B = \{a, b, c, d\}$$

$$HR = \begin{pmatrix} a & b & c & d \\ a & 1 & 1 & 0 \\ b & 0 & 0 & 1 \\ c & 0 & 0 & 1 \\ d & 1 & 0 & 0 \end{pmatrix}$$

$$R = \{(a, a), (a, d), (b, c), (c, c), (c, d), (d, a)\}$$

- 2) construct the digraph of R and list the indegree and outdegree of the vertices clearly

$$R = \{(a, a), (a, b), (a, d), (b, c), (c, c), (c, d), (d, a)\}$$

Solu:

Given:

$$R = \{(a, a), (a, b), (a, d), (b, c), (c, c), (c, d), (d, a)\}$$

digraph of the relation:



The in degree and out degree of all the vertices are given in the following table.

	a	b	c	d
indegree	2	1	2	2
out degree	3	1	2	1

- 2) find the relation determined by the following find the in degree and out degree for each vertex.



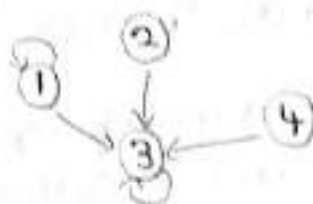
$$A = \{1, 2, 3, 4, 5\}$$

$$R = \{(1, 2), (2, 3), (3, 4), (4, 5), (5, 1), (5, 4), (5, 1)\}$$

	1	2	3	4	5
In degree	1	2	1	3	0
Out degree	1	2	1	1	2

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

Ans:



4) Given $A = \{1, 2, 3, 4\}$ and $B = \{x, y, z\}$ consider the following relation from A to B

$$R = \{(1, y), (1, z), (3, y), (4, x), (4, z)\}$$

Determine the matrix of the relation

Sol:

$$M_R = \begin{matrix} & \begin{matrix} x & y & z \end{matrix} \\ \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \end{matrix} & \begin{pmatrix} 0 & 1 & 1 \\ 0 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix} \end{matrix}$$

5) Let $A = \{1, 2, 3, 4\}$ Find the relation R on A determined by the matrix

$$M_R = \begin{pmatrix} 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 1 \end{pmatrix}$$

Sol:

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

closure
(i) Reflexive

that R
 $\{(a, a)\}$

Reflexive

(ii) Symmetric

Symmetric

(iii) Transitive

As A is

that R

relation

Partial Order

or

R

closure