

Relations Ex 1.1 Q2

We have,  $A = \{a, b, c\}$ 

 $R_{1} = \{(a,a)(a,b)(a,c)(b,b)(b,c)(c,a)(c,b)(c,c)\}$ 

 $R_1$  is reflexive as  $(a,a) \in R_1$ ,  $(b,b) \in R_1 \otimes (c,c) \in R_1$ 

 $R_1$  is not symmetric as  $(a,b) \in R_1$  but  $(b,a) \in R_1$ 

 $R_1$  is not transitive as  $(b,c) \in R_1$  and  $(c,a) \in R_1$  but  $(b,a) \notin R_1$ 

 $R_2 = \{(a,a)\}$ 

 $R_2$  is not reflexive as  $(b,b) \notin R_2$ 

 $\it R_{\rm 2}$  is symmetric and transitive.

 $R_3 = \{(b,c)\}$ 

 $R_3$  is not reflexive as  $(b,b) \notin R_3$ 

 $R_3$  is not symmetric

 $R_3$  is not transitive.

 $R_4 = \{(a,b)(b,c)(c,a)\}$ 

 $R_4$  is not reflexive on set A as  $(a, a) \notin R_4$ 

 $R_4$  is not symmetric as  $(a,b) \in R_4$  but  $(b,a) \notin R_4$ 

 $R_4$  is not transitive as  $(a,b) \in R_4$  and  $(b,c) \in R_4$  but  $(a,c) \notin R_4$ 

Relations Ex 1.1 Q3

$$\mathcal{R}_1 = \left\{ \left(x,y\right), x,y \in Q_0, x = \frac{1}{y} \right\}$$

Reflexivity: Let,  $x \in Q_0$ 

$$\Rightarrow \qquad \varkappa \neq \frac{1}{\varkappa}$$

$$\Rightarrow \qquad \left( X,X\right) \in \mathcal{R}_{1}$$

 $\therefore$   $R_1$  is not reflexive

Symmetric: Let,  $(x,y) \in R_1$ 

$$\Rightarrow x = \frac{1}{y}$$

$$\Rightarrow$$
  $y = \frac{1}{x}$ 

$$\Rightarrow \qquad \big(y,x\big)\in R_1$$

Transitive: Let,  $(x,y) \in R_1$  and  $(y,z) \in R_1$ 

$$\Rightarrow$$
  $x = \frac{1}{y}$  and  $y = \frac{1}{z}$ 

$$\Rightarrow x = z$$

$$\Rightarrow \qquad \left( X,Z\right) \notin R_{1}$$

 $\therefore$   $R_1$  is not trasitive

Relations Ex 1.1 Q3(ii)

Reflexivity: Let, a ∈ z

$$\Rightarrow |a-a|=0 \le 5$$

$$\therefore \qquad (a,a) \in R_2 \Rightarrow R_2 \text{ is reflexive}$$

Symmetricity: Let,  $(a,b) \in R_2$ 

$$\Rightarrow$$
  $|b,a| \in R_2 \Rightarrow R_2 \text{ is symmetric}$ 

Transitivity: Let,  $(a,b) \in R_2$  and  $(b,c) \in R_2$ 

$$\Rightarrow$$
  $|a-b| \le 5$  and  $|b-c| \le 5$ 

$$\Rightarrow$$
  $R_2$  is not transitive

$$\begin{bmatrix} \therefore & \text{if } a = 15, b = 11, c = 7 \\ \Rightarrow & |15 - 11| \le 5 \text{ and } |11 - 7| \le 5 \end{bmatrix}$$
but  $|15 - 7| \ge 5$ 

Relations Ex 1.1 Q4

(i) We have, 
$$A = \{1, 2, 3\}$$
 and

$$R_1 = \{(1,1)(1,3)(3,1)(2,2)(2,1)(3,3)\}$$

$$(1,1),(2,2) \text{ and } (3,3) \in R_1$$

$$\therefore$$
  $R_1$  is not Reflexive

Now,

∴ 
$$(2,1) \in R_1$$
 but  $(1,2) \notin R_1$ 

Again,

: 
$$(2,1) \in R_1$$
 and  $(1,3) \in R_1$  but  $(2,3) \notin R_1$ 

(ii) 
$$R_2 = \{(2, 2), (3, 1), (1, 3)\}$$

$$\therefore \qquad (1,1) \notin R_2$$

⇒ R2is not reflexive

Now, 
$$(1,3) \in R_2$$
  
 $\Rightarrow (3,1) \in R_2$ 

 $\Rightarrow$  R<sub>2</sub> is symmetric

Again, 
$$(3,1) \in R_2$$
 and  $(1,3) \in R_2$  but  $(3,3) \notin R_1$ 

 $\therefore$   $R_2$  is not transitive

(iii) 
$$R_3 = \{(1,3)(3,3)\}$$

$$\therefore \qquad (1,1) \notin R_3$$

⇒ R3is not reflexive

Now, 
$$(1,3) \in R_3$$
 but  $(3,1) \in R_3$   
 $\Rightarrow R_3$  is not symmetric

Again, It is clear that R3 is transitive

\*\*\*\*\*\*\*\* END \*\*\*\*\*\*\*