RELATIONS AND FUNCTIONS

TYPES OF RELATION

EXERCISE

Q.1 Let R be the relation on the set N of natural numbers defined by

R : $\{(x, y)\} : x + 3y = 12 \;\; x \in N, y \in N\}$ Find

(i) R (ii) Domain of R (iii) Range of R

Q.2 If X = $\{x_1, x_2, x_3\}$ and y = $(x_1, x_2, x_3, x_4, x_5\}$ then find which is a reflexive relation of the following :

(a) $R_1 : \{(x_1, x_1), (x_2, x_2)$

(b) $R_1 : \{(x_1, x_1), (x_2, x_2), (x_3, x_3)$

(c) $R_3 : \{(x_1, x_1), (x_2, x_2), (x_3, x_3), (x_1, x_3), (x_2, x_4)$

(d) $R_3 : \{(x_1, x_1), (x_2, x_2), (x_3, x_3), (x_4, x_4)$

Q.3 If x = {a, b, c} and y = {a, b, c, d, e, f} then find which of the following relation is symmetric relation :

R_1 : { } i.e. void relation

R_2 : {(a, b)}

R_3 : {(a, b), (b, a)(a, c)(c, a)(a, a)}

Q.4 If x = {a, b, c} and y = (a, b, c, d, e} then which of the following are transitive relation.

(a) R_1 = { }

(b) R_2 = {(a, a)}

(c) $R_3 = \{(a, a\}.(c, d)\}$

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

Q.5 Let R be a relation on the set N of natural numbers defined by $xRy \Leftrightarrow x$ divides y ′ for all $x, y \in N$.

Q.6 Prove that the relation R on the set Z of all integers numbers defined by $(x, y) \in R \Leftrightarrow$ $x - y$ is divisible by n is an equivalence relation on Z.

Q.7 Let a relation R_1 on the set R of real numbers be defined as $(a, b) \in R_1 \Leftrightarrow 1 + ab > 0$ for all $a, b \in R$. Show that R_1 is reflexive and symmetric but not transitive.

Q.8 Let A be the set of first ten natural numbers and let R be a relation on A defined by $(x, y) \in R \Leftrightarrow x + 2y = 10$ i.e., $R = \{(x, y) : x \in A, y \in A \text{ and } x + 2y = 10\}$. Express R and R^{-1} as sets of ordered pairs. Determine also :

(i) Domains of R and R^{-1}

(ii) Range of R and R^{-1}

ANSWER KEY

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

(ii) Domain of $R = \{9, 6, 3\}$

(iii) Range of $R = \{1, 2, 3\}$

2. (a) non-reflexive because $(x_3, x_3) \notin R_1$

(b) Reflexive

(c) Reflexive

(d) non-reflexive because $x_4 \notin X$

3. R_1 is symmetric relation because it has no element in it.

R_2 is not symmetric because $(b, a) \in R_2$

& R_3 is symmetric.

4. (a) R_1 is transitive relation because it is null relation.

(b) R_2 is transitive relation because all singleton relations are transitive.

(c) R_3 is transitive relation

(d) R_4 is also transitive relation

5. we find that for any non zero integer a a R (a) and (–a) R a, but $a \neq -a$.

8. Thus $R = \{(2, 4), (4, 3), (6, 2), (8, 1)\} \Rightarrow R^{-1} = \{(4, 2), (3, 4), (2, 6), (1, 8)\}$

Clearly, $\text{Dom}(R) = \{2, 4, 6, 8\} = \text{Range}(R^{-1})$

and $\text{Range}(R) = \{4, 3, 2, 1\} = \text{Dom}(R^{-1})$