4 JEE Main 2018 (Online) 16th April Morning Slot

MCQ (Single Correct Answer)

Let N denote the set of all natural numbers. Define two binary relations on N as $R_1 = \{(x, y) \in N \times N : 2x + y = 10\}$ and $R_2 = \{(x, y) \in N \times N : x + 2y = 10\}$. Then :

A Range of R_1 is {2, 4, 8).

B Range of R_2 is {1, 2, 3, 4}.

C Both R_1 and R_2 are symmetric relations.

D Both R_1 and R_2 are transitive relations.

Explanation

For R_1; $2x + y = 10$ and $x, y \in N$ possible values for x and y are :

x = 1, y = 8 i.e. (1, 8);

x = 2, y = 6 i.e (2, 6);

x = 3, y = 4 i.e (3, 4);

x = 4, y = 2 i.e (4, 2)

$\therefore$ R_1 = { (1, 8), (2, 6), (3, 4), (4, 2) }

$\therefore$ Range of R_1 is {2, 4, 6, 8}

R_1 is not symmetric.

R_1 is not transitive also as

(3, 4), (4, 2) $\in$ R , but (3, 2) $\notin R_1$

For R_2 : $x + 2y = 10$ and $x, y \in N$

Possible values of x, and y are :

x = 8, y= 1 i.e (8, 1)

x = 6, y = 2 i.e (6, 2)

x = 4, y = 3 i.e (4, 3) and

x = 2, y = 4 i.e (2, 4)

$\therefore$ R_2 = {(8, 1) (6, 2) (4, 3) (2, 4)}

$\therefore$ Range of R_2 = {1,2,3,4}

R_2 is not symmetric and transitive