16th Aug 2025 Lecture 16

Saturday, August 16, 2025 5:10 PM

* Example 20:- Pg 65

a) Solution:-

$A = \{1, 2, 3 \cdots\}$

$A \times A = \{1, 2, 3 \cdots\} \times \{1, 2, 3 \cdots\}$

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

Domain $= \{1, 2, 3 \cdots\}$

Range $= \{1, 2, 3 \cdots\}$

$\therefore$ Dom R = Range $R = A$

b) $T = \{0, \pm 1, \pm 2\}$

$T \times T = \{0, 1, -1, 2, -2\} \times \{0, 1, -1, 2, -2\}$

$= \{(0,0), (0,1), (0,-1), (0,2), (0,-2), (1,0), (1,1), (1,-1), (1,2), (1,-2), (-1,0), (-1,1), (-1,-1), (-1,2), (-1,-2), (2,0), (2,1), (2,-1), (2,2), (2,-2), (-2,0), (-2,1), (-2,-1), (-2,2), (-2,-2)\}$

$R_1 = \{(x,y), x \in T \wedge y \in T \wedge x+y=0\}$

$R_1 = \{(0,0), (1,-1), (-1,1), (2,-2), (-2,2)\}$

$R_1 = \{(0,0), (1,-1), (-1,1), (2,-2), (-2,2)\}$

Dom $R_1 = \{0, \pm 1, \pm 2\}$

Range $R_1 = \{0, \pm 1, \pm 2\}$

Dom $R_1 =$ Range $R_1 = T$

c) Solution:-

$E = \{2,4,6\}$, $F = \{0,1,2\}$ and $R_2 = \{(x,y) |$
$x \in E, y \in F \land x+y = 6\}$

i) $E \times F$

$E \times F = \{2,4,6\} \times \{0,1,2\}$
$= \{(2,0), (2,1), (2,2), (4,0), (4,1), (4,2),$
$(6,0), (6,1), (6,2)\}$

ii) R_2 in tabular form:

$R_2 = \{(4,2), (6,0)\}$

iii) Dom $R_2 = \{4, 6\}$
Range $R_2 = \{2, 0\}$

★ Example 21:-

$A = \{0,2,3\}$, $B = \{0,2,4,6,9,16\}$ and

$A = \{0, 2, 3\}$, $B = \{0, 2, 4, 6, 9, 16\}$ and $R = \{(x, y) \mid x \in A \wedge y \in B \wedge x^2 = y\}$ Verify Dom R^{-1} = Range R and Range R^{-1} = Dom R

Solution:-

$A \times B = \{0, 2, 3\} \times \{0, 2, 4, 6, 9, 16\}$

$= \{(0,0), (0,2), (0,4), (0,6), (0,9), (0,16),$
$(2,0), (2,2), (2,4), (2,6), (2,9), (2,16),$
$(3,0), (3,2), (3,4), (3,6), (3,9), (3,16)\}$

$R = \{(0,0), (2,4), (3,9)\}$

Dom $R = \{0, 2, 3\}$, Range $R = \{0, 4, 9\}$

$R^{-1} = \{(0,0), (4,2), (9,3)\}$

Dom $R^{-1} = \{0, 4, 9\}$, Range $R^{-1} = \{0, 2, 3\}$

* Dom $R^{-1} = \{0, 4, 9\}$ = Range R
* Range $R^{-1} = \{0, 2, 3\}$ = Dom R

* Ex # 3.4

Q 1) (i) $A = \{1, 3\}$, $B = \{0, 2, 4\}$

Solution:-

$n(A) = 2$, $n(B) = 3$

Number of binary relations in $A \times B = 2^{n(A \times B)}$

$n(A) = 2, \; n(B) = 3$

Number of binary relations in $A \times B = 2^{n(A \times B)}$

$= 2^{2 \times 3}$

$= 2^{6}$

$= 64$

(ii) $n(C) = 7$

Number of binary relations in $C \times C = 2^{n(C \times C)}$

$= 2^{7 \times 7}$

$= 2^{49}$

(iii) $D = \{1, 3, 5\}$

$n(D) = 3$

Number of binary relations in $D \times D = 2^{n(D \times D)}$

$= 2^{(3 \times 3)}$

$= 2^{9}$