Relations Ex 1.1 Q15

We have,

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

Now,

To make R reflexive, we will add $(1, 1)(2, 2)$ and $(3, 3)$ to get

$\therefore \quad R' = \{(1, 2)(2, 3)(1, 1)(2, 2)(3, 3)\}$ is reflexive

Again to make R' symmetric we shall add $(3, 2)$ and $(2, 1)$

$\therefore \quad R'' = \{(1, 2)(2, 3)(1, 1)(2, 2)(3, 3)(3, 2)(2, 1)\}$ is reflexive and symmetric

Now,

To make R'' transitive we shall add $(1, 3)$ and $(3, 1)$

$\therefore \quad R''' = \{(1, 2)(2, 3)(1, 1)(2, 2)(3, 3)(3, 2)(2, 1)(1, 3)(3, 1)\}$

$\therefore \quad R'''$ is reflexive, symmetric and transitive

Relations Ex 1.1 Q16

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

To make R transitive we shall add $(1, 3)$ only.

$\therefore \quad R' = \{(1, 2)(1, 1)(2, 3)(1, 3)\}$

Relations Ex 1.1 Q17

A relation R in A is said to be reflexive if aRa for all a∈A

R is said to be transitive if aRb and bRc ⇒ aRc
for all a, b, c ∈ A.
Hence for R to be reflexive (b, b) and (c, c) must be there in the set R.
Also for R to be transitive (a, c) must be in R because (a, b) ∈ R and (b, c) ∈ R so (a, c) must be in R.
So at least 3 ordered pairs must be added for R to be reflexive and transitive.

Relations Ex 1.1 Q18

A relation R in A is said to be reflexive if aRa for all a∈A, R is symmetric if aRb ⇒ bRa, for all a, b ∈ A and it is said to be transitive if aRb and bRc ⇒ aRc for all a, b, c ∈ A.

- x > y, x, y ∈ N

(x, y) ∈ {(2, 1), (3, 1).......(3, 2), (4, 2)....}
This is not reflexive as (1, 1), (2, 2)....are absent.
This is not symmetric as (2,1) is present but (1,2) is absent.
This is transitive as (3, 2) ∈ R and (2,1) ∈ R also (3,1) ∈ R ,similarly this property satisfies all cases.

- x + y = 10, x, y ∈ N

(x, y)∈ {(1, 9), (9, 1), (2, 8), (8, 2), (3, 7), (7, 3), (4, 6), (6, 4), (5, 5)}
This is not reflexive as (1, 1),(2, 2)..... are absent.
This only follows the condition of symmetric set as (1, 9)∈R also (9, 1)∈R similarly other cases are also satisfy the condition.
This is not transitive because {(1, 9),(9, 1)}∈R but (1, 1) is absent.

- xy is square of an integer, x, y ∈ N

(x, y) ∈ {(1, 1), (2, 2), (4, 1), (1, 4), (3, 3), (9, 1), (1, 9), (4, 4), (2, 8), (8, 2), (16, 1), (1, 16)..........}
This is reflexive as (1,1),(2,2)..... are present.
This is also symmetric because if aRb ⇒ bRa, for all a,b∈N.
This is transitive also because if aRb and bRc ⇒ aRc for all a, b, c ∈ N.

- x + 4y = 10, x, y ∈ N

(x, y) ∈ {(6, 1), (2, 2)}
This is not reflexive as (1, 1), (2, 2).....are absent.
This is not symmetric because (6,1) ∈ R but (1,6) is absent.
This is not transitive as there are only two elements in the set having no element common.

*********** END **********