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Q1 (A) False

(B) False

(C) True

(D) True

Q2 False

Q3 (A) True

(B) False

Q4 (A) True

(B) False

(C) False

(D) False

Q1 (A) The relation does not contain (0,0)

∴ Not reflexive

(B) $(1,2)$ and $(2,1)$ belong to the relation $\leq$

$1 \times 2 \geq 0$ & $2 \times 1 \geq 0$

But $1 \neq 2$

∴ Not Anti-symmetric

(C) Let (x_1, y_1) belong to the relation $\leq$

∴ $x_1 y_1 > 0$

$\Rightarrow y_1 x_1 > 0$

∴ (y_1, x_1) belong to the relation $\leq$

∴ Hence symmetric

(D) Let (x, y) and (y, z) belong to relation $\leq$

$\Rightarrow xy > 0$ and $yz > 0$

$\Rightarrow xy^2 z > 0$ (Multipling both equations)

$\Rightarrow xz > 0$ $\left(\because y^2 > 0 \text{ as } y \neq 0 \right)$

Hence (x, z) belong to relation $\leq$

∴ Transitive

Q2

$0 \in$ complex numbers

But $|0| \nless |0|$

Hence $(0, 0)$ does not belong to the relation R

$\therefore$ ~~Ref~~ Relation R is not reflexive

$\therefore$ R is not partial order

Q3 (A) i) Let $x \in X$

$$g(x) = g(x)$$

$$\therefore \quad (x, x) \in R$$

$$\therefore \quad \text{Reflexive}$$

ii) Consider $x R y$ and $y R x$

$$g(x) \leq g(y) \quad \text{and} \quad g(y) \leq g(x)$$

$$\Rightarrow \quad g(x) = g(y) \quad , \quad ((Y, \leq) \text{ is Poset})$$

$$\Rightarrow \quad x = y \quad (g \text{ is one-one})$$

Hence R is antisymmetric

iii) Consider $x R y$ and $y R Z$

$$g(x) \leq g(y) \quad \text{and} \quad g(y) \leq g(z)$$

$$\Rightarrow \quad g(x) \leq g(z) \quad \text{as} \quad (Y, \leq) \text{ is Poset}$$

$$\Rightarrow \quad x R Z$$

Hence R is Transitive

$$\therefore \quad R \text{ is partial order}$$

B) consider $x R y$ and $y R x$

$g(x) \leq g(y)$ and $g(y) \leq g(x)$

$\Rightarrow g(x) = g(y)$ ($(Y, \leq)$ is Poset)

Now if g is onto, it can happen
that $x, y \in X$ but $x \neq y$ and $g(x) = g(y)$

Hence R is not anti-symmetric

∴ R is not partial order.

Q4 (A) Let $(x, x) \in R$

$x \leq 2x \quad \forall x \in N$

$\therefore$ R is reflexive

(B) Consider $(2, 3)$ and $(3, 2)$

$2 \leq 6$ and $3 \leq 4 \Rightarrow (2, 3) \& (3, 2) \in R$

But $2 \neq 3$

$\therefore$ R is not anti-symmetric

c)   Consider $(2,5)$ and $(5,2)$

$$2 \leq 2 + 5 \implies (2,5) \in R$$

$$5 \nleq 2 \times 2 \implies (5,2) \notin R$$

$\therefore R$ is not symmetric

d)   consider $(4,2)$ and $(2,1)$

$$4 \leq 2 \times 2 \implies (4,2) \in R$$

$$2 \leq 2 \times 1 \implies (2,1) \in R$$

But $(4,1) \notin R$ as $4 \nleq 2 \times 1$

$\therefore R$ is not transitive