Exercise - CH-1 (Relations & Functions)

(based on two vedio-lessons)

Q.1. Let $A = \{1, 2, 3\}$. How many relations can be defined on A? (1)

Q.2. Show that the relation R on $A = \{1, 2, 3\}$ given by $R = \{(1,1), (2,2), (3,3), (1,2), (2,3)\}$ is reflexive but neither symmetric nor transitive. (2)

Q.3. Let T be the set of all triangles drawn in a plane with R as relation in T given by $R = \{(T_1, T_2) : T_1 \cong T_2\}$ Show that R is an equivalence relation. (4)

Q.4. Let R be a relation defined on Z such that $R = \{(a, b) : a-b \text{ is a multiple of } 5;\ a, b \in Z\}$. Show that R is an equivalence relation. (4)

Q.5. Let $A = \{a, b, c\}$. Construct a relation in A which is

(i) Reflexive & symm but not transitive.

(ii) symm. but neither ref nor trans.

(iii) transitive but neither ref nor symm.

(iv) symm & trans. but not reflexive. (4)

Q.6. Let $A = \{1, 2\}$ & $B = \{3, 6\}$ Function $f: A \to B$ defined by $f(x) = 3x$ & function $g: A \to B$ be defined by $g(x) = x^2 + 2$. Show that $f = g$.

[Hint: find f and g as set of ordered pairs] (2)

Q.7. Check the injectivity & surjectivity of the following functions:

(a) $f: N \to N$ defined by $f(x) = x^2$

(b) $f: Z \to Z$ defined by $f(x) = x^2$

(c) $f: R \to R$ defined by $f(x) = x^2$

(d) $f: N \to Q$ defined by $f(x) = x^3$

(e) $f: Z \to Z$ defined by $f(x) = x^3$

(f) $f: R \to R$ defined by $f(x) = x^3$

(each 4 marks)

Q.8. Let $A = R - \{2\}$ & $B = R - \{1\}$. Show that the function $f = \frac{x-1}{x-2}$ is bijective.

——— Practice makes man perfect ———