SWOT INSTITUTE
RELATIONS AND FUNCTIONS
XII-TEST

Time : 1 hr.

1. Show that the relation R in **R** defined as R = [(a, b) : a $\leq b^3$), is neither reflexive nor transitive and nor symmetric.
2. Let R be the relation in the set (1, 2, 3, 4) given by R = {(1, 2), (2, 2), (1, 1), (4, 4), (1, 3), (3, 3), (3, 2)}. Choose the correct answer.
   (A) R is reflexive and symmetric but not transitive.
   (B) R is reflexive and transitive but not symmetric.
   (C) R is symmetric and transitive but not reflexive.
   (D) R is an equivalence relation.
3. Let S = {1, 2, 3}. Determine whether the function f : S $\rightarrow$ S defined as below have inverse, Find f^{-1}, if it exists,
   (a) f = {(1, 1), (2, 2), (3, 3)}
   (b) f = {(1, 1), (2, 1), (3, 1)}
   (c) f = {(1, 3), (3, 2), (2, 1)}.
4. Show that f : [–1, 1] $\rightarrow$ R, given by f(x) = $\frac{x}{(x+2)}$ is one-one. Find the inverse of the function f : [–1, 1] $\rightarrow$ Range f.
   (Hint : For y $\in$ Range f, y = f(x) = $\frac{x}{(x+2)}$, for some x in [–1, 1], i.e., x = $\frac{2y}{(1-y)}$)
5. Consider f : $R_+ \rightarrow$ [–5, ∞) given by f(x) = $9x^2$ + 6x – 5. Show that f is invertible with $f^{-1}(y) = \left(\frac{(\sqrt{y+6})-1}{3}\right)$.
6. For each operation * defined below, determine whether * is binary, commutative or associative.
   On Z^+, define a * b = 2^{ab}.
7. Let A = N $\times$ N and * be the binary operation on A defined by
   (a, b) * (c, d) = (a + c, b + d)
8. Determine which of the following binary operations on the set R are associative and which are commutative :
   a * b = $\frac{(a+b)}{2}$ $\forall$ a, b $\in$ R.