

**Topic :- RELATIONS AND FUNCTIONS**

- Let  $f:R \rightarrow R$  be defined by  $f(x) = 3x - 4$ . Then,  $f^{-1}(x)$  is
  - $\frac{x+4}{3}$
  - $\frac{x}{3} - 4$
  - $3x + 4$
  - None of these
- The interval in which the function  $y = \frac{x-1}{x^2-3x+3}$  transforms the real line is
  - $(0, \infty)$
  - $(-\infty, \infty)$
  - $[0, 1]$
  - $[-1/3, 1] - \{0\}$
- The domain of definition of the function  $f(x) = x^{\frac{1}{\log_{10} x}}$ , is
  - $(0, 1) \cup (1, \infty)$
  - $(0, \infty)$
  - $[0, \infty)$
  - $[0, 1) \cup (1, \infty)$
- Let  $W$  denote the words in the English dictionary. Define the relation  $R$  by  $R = \{(x, y) \in W \times W : \text{the words } x \text{ and } y \text{ have at least one letter in common}\}$ . Then,  $R$  is
  - Reflexive, symmetric and not transitive
  - Reflexive, symmetric and transitive
  - Reflexive, not symmetric and transitive
  - Not reflexive, symmetric and transitive
- The function  $f:C \rightarrow C$  defined by  $f(x) = \frac{ax+b}{cx+d}$  for  $x \in C$  where  $bd \neq 0$  reduces to a constant function, if
  - $a = c$
  - $b = d$
  - $ad = bc$
  - $ab = cd$
- Let  $A = \{x, y, z\}, B = \{u, v, \omega\}$  and  $f:A \rightarrow B$  be defined by  $f(x) = u, f(y) = v, f(z) = \omega$ . Then,  $f$  is
  - Surjective but not injective
  - Injective but not surjective
  - Bijjective
  - None of these
- Consider the following relations  $R = \{(x, y) \mid x, y \text{ are real numbers and } x = wy \text{ for some rational number } w\}; S = \left\{ \left( \frac{m}{n}, \frac{p}{q} \right) \mid m, n, p \text{ and } q \text{ are integers such that } n, q \neq 0 \text{ and } qm = pn \right\}$ . Then
  - $R$  is an equivalence relation but  $S$  is not an equivalence relation
  - Neither  $R$  nor  $S$  is an equivalence relation
  - $S$  is an equivalence relation but  $R$  is not an equivalence relation
  - $R$  and  $S$  both are equivalence relations
- Which of the following functions has period  $\pi$ ?
  - $|\tan x| + \cos 2x$

- b)  $2\sin\frac{\pi x}{3} + 3\cos\frac{2\pi x}{3}$   
 c)  $6\cos\left(2\pi x + \frac{\pi}{4}\right) + 5\sin\left(\pi x + \frac{3\pi}{4}\right)$   
 d)  $|\tan 2x| + |\sin 4x|$

9. The range of the function  $f(x) = \sqrt{(x-1)(3-x)}$  is  
 a)  $[0, 1]$                       b)  $(-1, 1)$                       c)  $(-3, 3)$                       d)  $(-3, 1)$
10. Let  $A = \{x, y, z\}$  and  $B = \{a, b, c, d\}$ . Which one of the following is not a relation from  $A$  to  $B$ ?  
 a)  $\{(x, a), (x, c)\}$               b)  $\{(y, c), (y, d)\}$               c)  $\{(z, a), (z, d)\}$               d)  $\{(z, b), (y, b), (a, d)\}$

11. If  $f(x)$  defined on  $[0, 1]$  by the rule

$$f(x) = \begin{cases} x, & \text{if } x \text{ is rational} \\ 1-x, & \text{if } x \text{ is irrational} \end{cases}$$

Then, for all  $x \in [0, 1], f(f(x))$  is

- a) Constant                      b)  $1+x$                       c)  $x$                       d) None of these

12. Let  $f(x) = \min\{x, x^2\}$ , for every  $x \in R$ . Then,

a)  $f(x) = \begin{cases} x, & x \geq 1 \\ x^2, & 0 \leq x < 1 \\ x, & x < 0 \end{cases}$

b)  $f(x) = \begin{cases} x^2, & x \geq 1 \\ x, & x < 1 \end{cases}$

c)  $f(x) = \begin{cases} x, & x \geq 1 \\ x^2, & x < 1 \end{cases}$

d)  $f(x) = \begin{cases} x^2, & x \geq 1 \\ x, & 0 \leq x < 1 \\ x^2, & x < 0 \end{cases}$



13. If  $X = \{1,2,3,4\}$ , then one-one onto mappings  $f:X \rightarrow X$  such that  $f(1) = 1, f(2) \neq 2, f(4) \neq 4$  are given by

- a)  $f = \{(1,1), (2,3), (3,4), (4,2)\}$   
 b)  $f = \{(1, 2), (2, 4), (3, 3), (4, 2)\}$   
 c)  $f = \{(1, 2), (2, 4), (3, 2), (4, 3)\}$   
 d) None of these

14. The domain of the function  $f(x) = \exp(\sqrt{5x-3-2x^2})$  is

- a)  $[3/2, \infty)$                       b)  $[1, 3/2]$                       c)  $(-\infty, 1)$                       d)  $(1, 3/2)$

15.  $f(x) = x + \sqrt{x^2}$  is a function from  $R$  to  $R$ , then  $f(x)$  is

- a) Injective                      b) Surjective                      c) Bijective                      d) None of these

16. If  $f(x) = \frac{\sin^4 x + \cos^2 x}{\sin^2 x + \cos^4 x}$  for  $x \in R$ , then  $f(2010) =$

- a) 1                      b) 2                      c) 3                      d) 4

17. If  $b^2 - 4ac = 0, a > 0$ , then the domain of the function  $f(x) = \log\{ax^3 + (a+b)x^2 + (b+c)x + c\}$  is

- a)  $R - \{-\frac{b}{2a}\}$
- b)  $R - \{-\frac{b}{2a}\} \cup \{x \mid x \geq -1\}$
- c)  $R - \{-\frac{b}{2a}\} \cap (-\infty, -1]$
- d) None of these

18. The inverse of the function  $y = \frac{10^x - 10^{-x}}{10^x + 10^{-x}}$  is

- a)  $\frac{1}{2}\log_{10}\left(\frac{1+x}{1-x}\right)$
- b)  $\frac{1}{2}\log_{10}\left(\frac{2+x}{2-x}\right)$
- c)  $\frac{1}{2}\log_{10}\left(\frac{1-x}{1+x}\right)$
- d) None of these

19. If  $f:R \rightarrow R$  is given by

$$f(x) = \begin{cases} -1, & \text{when } x \text{ is rational} \\ 1, & \text{when } x \text{ is irrational} \end{cases}$$

Then  $(f \circ f)(1 - \sqrt{3})$  is equal to

- a) 1
- b) -1
- c)  $\sqrt{3}$
- d) 0

20. The function  $f:R \rightarrow R$  defined by  $f(x) = 6^x + 6^{|x|}$ , is

- a) One-one and onto
- b) Many one and onto
- c) One-one and into
- d) Many one and into

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