10/A/C/5-19

EE24BTECH11040 - Mandara Hosur

C. MCQs with One Correct Answer

1) If $f(x) = \cos(\ln x)$, then

$$f(x)f(y) - \frac{1}{2}\left[f\left(\frac{x}{y}\right) + f(xy)\right]$$

has the value

(1983 - 1 Mark)

a) -1
b) $\frac{1}{2}$
c) -2
d) none of these

2) The domain of definition of the function

$$y = \frac{1}{\log_{10}(1-x)} + \sqrt{x+2}$$

is

(1983 - 1 Mark)

a) (-3, -2) excluding -2.5
b) [0, 1] excluding 0.5
c) $[-2, 1)$ excluding 0
d) none of these

3) Which of the following functions is periodic?

(1983 - 1 Mark)

a) $f(x) = x - [x]$ where $[x]$ denotes the largest integer less than or equal to the real number x
b) $f(x) = \sin\frac{1}{x}$ for $x \neq 0$, $f(0) = 0$
c) $f(x) = x\cos x$
d) none of these

4) Let $f(x) = \sin x$ and $g(x) = \ln|x|$. If the ranges of the composition functions fog and gof are R_1 and R_2 respectively, then

(1994 - 2 Marks)

a) $R_1 = \{u : -1 \leq u < 1\}$, $R_2 = \{v : -\infty < v < 0\}$
b) $R_1 = \{u : -\infty < u < 0\}$, $R_2 = \{v : -1 \leq v \leq 0\}$
c) $R_1 = \{u : -1 < u < 1\}$, $R_2 = \{v : -\infty < v < 0\}$
d) $R_1 = \{u : -1 \leq u \leq 1\}$, $R_2 = \{v : -\infty < v \leq 0\}$

5) Let $f(x) = (x+1)^2 - 1$, $x \geq -1$. Then the set $\{x : f(x) = f^{-1}(x)\}$ is

(1995)

a) $\left\{0, -1, \frac{-3+i\sqrt{3}}{2}, \frac{-3-i\sqrt{3}}{2}\right\}$
b) $\{0, 1, -1\}$
c) $\{0, -1\}$
d) empty

6) The function $f(x) = |px - q| + r|x|$, $x \in (-\infty, \infty)$ where $p > 0$, $q > 0$, $r > 0$ assumes its minimum value only on one point if

(1995)

a) $p \neq q$
b) $r \neq q$
c) $r \neq p$
d) $p = q = r$

7) Let $f(x)$ be defined for all $x > 0$ and be continuous. Let $f(x)$ satisfy $f\left(\frac{x}{y}\right) = f(x) - f(y)$ for all x, y and $f(e) = 1$. Then

(1995S)

a) $f(x)$ is bounded
b) $f\left(\frac{1}{x}\right) \to 0$ as $x \to 0$
c) $xf(x) \to 1$ as $x \to$ 0
d) $f(x) = \ln x$

8) If the function $f : [1, \infty) \to [1, \infty)$ is defined by $f(x) = 2^{x(x-1)}$, then $f^{-1}(x)$ is

(1999 - 2 Marks)

a) $\left(\frac{1}{2}\right)^{x(x-1)}$
b) $\frac{1}{2}\left(1 + \sqrt{1 + 4\log_2 x}\right)$
c) $\frac{1}{2}\left(1 - \sqrt{1 + 4\log_2 x}\right)$
d) not defined

9) Let $f : R \to R$ be any function. Define $g : R \to R$ by $g(x) = |f(x)|$ for all x. Then g is

(2000S)

a) onto if f is onto
b) one-one if f is one-one
c) continuous if f is continuous
d) differentiable if f is differentiable

10) The domain of definition of the function $f(x)$ given by the equation $2^x + 2^y = 2$ is

(2000S)

a) $0 < x \leq 1$ c) $-\infty < x \leq 0$
b) $0 \leq x \leq 1$ d) $-\infty < x < 1$

11) Let $g(x) = 1 + x - [x]$ and

$$f(x) = \begin{cases} -1, & x < 0 \\ 0, & x = 0. \\ 1, & x > 0 \end{cases} \quad (1)$$

Then for all x, $f(g(x))$ is equal to

(2001S)

a) x c) $f(x)$
b) 1 d) $g(x)$

12) If $f : [1, \infty) \to [2, \infty)$ is given by $f(x) = x + \frac{1}{x}$ then $f^{-1}(x)$ equals

(2001S)

a) $\frac{(x+\sqrt{x^2-4})}{2}$ c) $\frac{(x-\sqrt{x^2-4})}{2}$
b) $\frac{x}{(1+x^2)}$ d) $1 + \sqrt{x^2-4}$

13) The domain of definition of $f(x) = \frac{\log_2(x+3)}{x^2+3x+2}$ is

(2001S)

a) $R \setminus \{-1, -2\}$ c) $R \setminus \{-1, -2, -3\}$
b) $(-2, \infty)$ d) $(-3, \infty) \setminus \{-1, -2\}$

14) Let $E = \{1, 2, 3, 4\}$ and $F = \{1, 2\}$. Then the number of onto functions from E to F is

(2001S)

a) 14 b) 16 c) 12 d) 8

15) Let $f(x) = \frac{\alpha x}{x+1}$, $x \neq -1$. Then, for what value of α is $f(f(x)) = x$?

(2001S)

a) $\sqrt{2}$ b) $-\sqrt{2}$ c) 1 d) -1