

# CH-10

## Function

EE24BTECH11041-Mohit

### I. C: MCQs WITH ONE CORRECT ANSWER

- 1) Suppose  $f(x) = f(x+1)^2$  for  $x \geq -1$ . If  $g(x)$  is the function whose graph is the reflection of the graph  $f(x)$  with respect to the line  $y = x$ , then  $g(x)$  equal (2002S)
  - a)  $-\sqrt{x} - 1, x \geq 0$
  - b)  $\frac{1}{(x+1)^2}, x > -1$
  - c)  $\sqrt{x+1}, x \geq -1$
  - d)  $\sqrt{x} - 1, x \geq 0$
- 2) Let function  $f : R \rightarrow R$  be defined by  $f(x) = 2x + \sin x$  for  $x \in R$ , then  $f$  is (2003S)
  - a) one-to-one and onto
  - b) one-to-one but not onto
  - c) onto but not one-to-one
  - d) neither one-to-one nor onto
- 3) If  $f : [0, \infty) \rightarrow [0, \infty)$ , and  $f(x) = \frac{x}{1+x}$  then  $f$  is (2003S)
  - a) one-one and onto
  - b) one-one but not onto
  - c) onto but not one-one
  - d) neither one-one nor onto
- 4) Domain of definition of the functions  $f(x) = \sqrt{\sin^{-1}(2x) + \frac{\pi}{6}}$  for real valued  $x$ , is (2003S)
  - a)  $[-\frac{1}{4}, \frac{1}{2}]$
  - b)  $[-\frac{1}{2}, \frac{1}{2}]$
  - c)  $(-\frac{1}{2}, \frac{1}{9})$
  - d)  $[-\frac{1}{4}, \frac{1}{4}]$
- 5) Range of the function  $f(x) = \frac{x^2+x+2}{x^2+x+1}; x \in R$  is (2003S)
  - a)  $(1, \infty)$
  - b)  $(1, \frac{11}{7}]$
  - c)  $(1, \frac{7}{3}]$
  - d)  $(1, \frac{7}{5}]$
- 6) If  $f(x) = x^2 + 2bx + 2c^2$  and  $g(x) = -x^2 - 2cx + b^2$  such that  $\min f(x) > \max g(x)$ , then the relations between  $b$  and  $c$ , is (2003S)
  - a) no real value of  $b$  &  $c$
  - b)  $0 < c < b\sqrt{2}$
  - c)  $|c| < |b|\sqrt{2}$
  - d)  $|c| > |b|\sqrt{2}$
- 7) If the function  $f(x) = \sin x + \cos x, g(x) = x^2 - 1$ , then  $g(f(x))$  is invertible in the domain (2004S)
  - a)  $[0, \frac{\pi}{2}]$
  - b)  $[-\frac{\pi}{4}, \frac{\pi}{4}]$
  - c)  $[-\frac{\pi}{2}, \frac{\pi}{2}]$
  - d)  $[0, \pi]$
- 8) If the function  $f(x)$  and  $g(x)$  are defined on  $R \rightarrow R$  such that (2005S)
 
$$f(x) = \begin{cases} 0, & x \in \text{rational} \\ x, & x \in \text{irrational} \end{cases}$$

$$g(x) = \begin{cases} 0, & x \in \text{rational} \\ x, & x \in \text{irrational} \end{cases}$$
 then  $(f - g)(x)$  is
  - a) one-one & onto
  - b) neither one-one nor onto
  - c) one-one but not onto
  - d) onto but not one-one
- 9)  $X$  and  $Y$  are two sets and  $f : X \rightarrow Y$ . If  $\{f(c) = y; c \in X, y \in Y\}$  and  $\{f^{-1}(d) = X; d \in Y, x \in X\}$ , then the true statement is (2005S)

- a)  $f(f^{-1}(b)) = b$   $y$   
 b)  $f^{-1}(f(a)) = a$  d)  $f^{-1}(f(a)) = a, a \subset$   
 c)  $f(f^{-1}(b)) = b, b \subset$   $x$

- 10) If  $F(x) = \left(f\left(\frac{x}{2}\right)\right)^2 + \left(g\left(\frac{x}{2}\right)\right)^2$  where  $f''(x) = -f(x)$  and  $g(x) = f'(x)$  and given that  $F(5) = 5$ , then  $F(10)$  is equal to (2006,-3M,-1)

- a) 5 c) 0  
 b) 10 d) 15

- 11) Let  $f(x) = \frac{x}{(1+x^n)^{\frac{1}{n}}}$  for  $n \geq 2$  and

$$g(x) = \underbrace{(f \circ f \circ \dots \circ f)(x)}_{f \text{ occurs } n \text{ times}}$$

.Then  $\int x^{n-2} g(x) dx$  equals. (2007-3 marks)

- a)  $\frac{1}{n(n-1)}(1+nx^n)^{1-\frac{1}{n}}$  c)  $\frac{1}{n+1}(1+nx^n)^{1+\frac{1}{n}}$   
 b)  $\frac{1}{n-1}(1+nx^n)^{1-\frac{1}{n}}$  d)  $\frac{1}{n+1}(1+nx^n)^{1+\frac{1}{n}}$

- 12) Let  $f, g$  and  $h$  be real-valued functions defined on the interval  $[0, 1]$  by  $f(x) = e^{x^2} + e^{-x^2}$ ,  $g(x) = xe^{x^2} + e^{-x^2}$  and  $h(x) = x^2 e^{-x^2}$ . If  $a, b$  and  $c$  denote, respectively, the absolute maximum of  $f, g$  and  $h$  on  $[0, 1]$ , then (2010)

- a)  $a = b$  and  $b \neq c$  c)  $a \neq b$  and  $c \neq b$   
 b)  $a = c$  and  $a \neq b$  d)  $a = b = c$

- 13) Let  $f(x) = x^2$  and  $g(x) = \sin x$  for all  $x \in R$ . Then the set of all  $x$  satisfying  $(f \circ g \circ g \circ f)(x) = (g \circ g \circ f)(x)$ , where  $(f \circ g)(x) = f(g(x))$ , is (2011)

- a)  $\pm \sqrt{n\pi}, n \in \{0, 1, 2, \dots\}$   
 b)  $\pm \sqrt{n\pi}, n \in \{1, 2, \dots\}$   
 c)  $\frac{\pi}{2} + 2n\pi, n \in \{\dots - 2, -1, 0, 1, 2, \dots\}$   
 d)  $2n\pi, n \in \{\dots - 2, -1, 0, 1, 2, \dots\}$

- 14) The function  $f : [0, 3] \rightarrow [1, 29]$ , defined by  $f(x) = 2x^3 - 15x^2 + 39x + 1$ , is (2012)

- a) one-one and onto  
 b) onto but not one-one  
 c) one-one but not onto  
 d) neither one-one nor onto

## II. D: MCQs WITH ONE OR MORE THAN ONE CORRECT

- 1) If  $y = f(x) = \frac{x+2}{x-1}$  then (2008S)  
 a)  $x = f(y)$   
 b)  $f(1) = 3$   
 c)  $y$  increase with  $x$  for  $x < 1$   
 d)  $f$  is a rational function on  $x$