Seat No. : _____

MH-116

May-2022

Int. M.B.A., Sem.-II

Basic Mathematics

Time : 2 Hours] **[Max. Marks : 50**

Instructions : (i) Non-programmable scientific calculator is allowed.

(ii) In Section-I attempt any **three** questions out of **five** questions.

(iii) In Section-II attempt any **eight** MCQs out of **ten** MCQs.

SECTION-I

(Attempt any **three** questions out of **five** questions)

1. (A) (i) Find g[f(x)] if f(x) = cos x and g(x) = $\frac{1}{x}$. **1**

(ii) Write down the inverse of the function y = {(x + 1)/(x + 2)}; x > –2. **2**

(iii) Find the domain and range of the given function y = $\frac{x}{x^2-1}$. **4**

(B) (i) Define the following functions and give an example of each.

Exponential function

Transcendental Function **4**

(ii) A manufacturer is willing to produce and supply 250 units of a product at price ₹ 5 per unit and 430 units at price ₹ 8 per unit. Assuming a linear behaviour, determine the supply function. **3**

2. (A) Evaluate the following : **9**

(i) $\lim_{x \to 3} \left(\frac{1}{x^2 - 5x + 6} - \frac{1}{x-3} \right)$

(ii) $\lim_{x \to 3} \frac{\sqrt{x+6} - 3}{x-3}$

(iii) $\lim_{x \to \infty} \left(\frac{x+9}{x+1} \right)^{x+5}$

(B) (i) If $f(y) = \begin{cases} \frac{1}{2} - y & ; \quad 0 \le y < \frac{1}{2} \\ 1 & ; \quad y = \frac{1}{2} \\ \frac{3}{2} - y & ; \quad \frac{1}{2} < y < 1 \end{cases}$

then discuss the continuity of f(y) at $y = \frac{1}{2}$. **3**

(ii) If $f(y) = \begin{cases} \frac{y^2 - 3y + 2}{y - 1} ; & y \neq 1 \\ k & ; \quad y = 1 \end{cases}$

for what value of k ($k \in R$), f(y) becomes continuous ? **2**

3. (A) Find the derivatives of the following : **12**

(i) $f(x) = (2x^2 - 3x)(x^2 + 4)$

(ii) $f(x) = \frac{(x+3)^3}{2x^2 + 3x + 4}$

(iii) $f(x) = \sqrt{\tan(3x+1)}$

(iv) $f(x) = 3^x + \log\left(\frac{1}{x}\right)$

(B) If for $f(x) = k_1x^2 + k_2x + 12$, $f'(4) = 15$ and $f'(2) = 11$, then find the values of k_1 and k_2. **2**

4. (A) If $y = e^{3x}(ax + b)$, prove that **6**

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = 0$$

(B) (i) Find the intervals in which the function $f(x) = 2x^3 + 9x^2 + 12x + 20$ is increasing or decreasing. **4**

(ii) Suppose the demand function of some article is $p(x) = 75 - 2x$ and the cost function is $C(x) = 350 + 12x + \frac{x^2}{4}$, find the number of units and the price at which the total profit is maximum. What is the maximum profit ? **4**

5. (A) (i) Solve the following equations by Cramer's Rule :

$x + y + z = 3$; $2x + 3y + 4z = 9$; $x + 2y - 4z = -1$ **4**

(ii) If $A = \begin{pmatrix} 1 & 2 & -3 \\ 5 & 1 & 6 \\ 7 & 0 & 2 \end{pmatrix}$; $B = \begin{pmatrix} 4 & -1 & 5 \\ 6 & 2 & 0 \\ 5 & 1 & 3 \end{pmatrix}$ and $C = \begin{pmatrix} 2 & 1 & 0 \\ 4 & -5 & 2 \\ 3 & 0 & 1 \end{pmatrix}$, find $(AB - 2C)$. **4**

(B) Solve the following equations by matrix inversion method :

$x + y + z = 4$; $2x - y + 3z = 1$; $3x + 2y - z = 1$ **6**

SECTION-II

6. Attempt any **Eight** MCQs out of **Ten** MCQs : **8**

(1) If $f(x) = x^2 - x - 1$ and $g(x) = x - 1$, then $f[g(x)]$ is

(a) $x^2 - 3x + 1$ (b) $x^4 - 2x^2 + x$

(c) $x^2 - x - 2$ (d) $x^2 - 2$

(2) The total cost function $C(x)$ of producing x items is given by

$$C(x) = \begin{cases} 1000 + 5x, \text{ when } 0 \le x \le 500 \\ 2000 + 4x, \text{ when } 500 < x \le 2000 \end{cases}$$

The cost of producing 430 items is

(a) 3720 (b) 6870

(c) 3150 (d) 6800

(3) If $\lim_{x \to a^-} f(x) \neq \lim_{x \to a^+} f(x)$, then $f(x)$ is said to have a

(a) Removable Discontinuity (b) Discontinuity of first kind

(c) Discontinuity of second kind (d) $f(x)$ is continuous

(4) The domain of $f(x) = \frac{x}{x^2 - 9}$ is

(a) R (b) $\{-3, 3\}$

(c) $\{0, -3, 3\}$ (d) $R - \{-3, 3\}$

(5) The derivative of a function f(x) at a point x = c is

(a) the angle of the chord to the curve y = f(x) at the point (c, f(c))

(b) the tangent to the curve y = f(x) at the point (c, f(c))

(c) the angle of the tangent to the curve y = f(x) at the point (c, f(c))

(d) the slope of the tangent to the curve y = f(x) at the point (c, f(c))

(6) The derivative of a constant is

(a) 1 (b) 0

(c) constant itself (d) infinity

(7) The average cost function of the total cost function

$TC = 3Q^2 + 7Q + 12$ is

(a) $3Q + 7 + \frac{12}{Q}$ (b) $6Q + 7$

(c) $3Q^2 + 7Q + 12$ (d) $3Q + 7$

(8) For a point of inflection

(a) the even order derivative should be zero and the odd order derivative should be zero.

(b) the even order derivative should be non-zero and the odd order derivative should be zero.

(c) the even order derivative should be zero and the odd order derivative should be non-zero.

(d) the even order derivative should be non-zero and the odd order derivative should be non-zero.

(9) If two rows (or columns) of a determinant are identical, the value of the determinant is

(a) zero

(b) unchanged

(c) (–1) times the value of original determinant

(d) None

(10) For matrices, the following is true

(a) ABC = ABC (b) (AB)C = A(CB)

(c) (AB)C = A(BC) (d) (AB)C ≠ A(BC)