Seat No. : _____

MD-225

May-2025

Int. MBA, Sem.-II (NEP)

Basic Mathematics for Data Analytics

Time : 2:00 Hours] **[Max. Marks : 50**

Instructions : (1) Attempt each question on new page.
(2) Graph Papers and Logarithmic Tables shall be provided on request.
(3) Non-Programming Scientific Calculators are allowed.

1. Attempt any **FIVE** of the following : **10**

(A) Find the domain and range of the function $f(x) = |x - 100|$; $0 \leq x < 100$.

(B) The quadratic equation is $3x^2 + 7x - 6 = 0$. Determine the sum and product of the roots.

(C) A company decides to set up a small production plant for manufacturing watches. The total cost for initial set up is ₹ 8 lakhs. The additional cost for producing each watch is ₹ 300. Each watch is sold at ₹ 700. Determine the break-even point of selling watches.

(D) Find the limit of the function $f(x) = \begin{cases} x + 2 & ; x \geq 2 \\ 3.899999 & ; x < 2 \end{cases}$, if exists.

(E) Check whether the function $f(x) = \begin{cases} \frac{\tan x}{x} & ; x \neq 0 \\ 0 & ; x = 0 \end{cases}$ is continuous or not.

(F) Check whether the function $f(x) = 7x^5 + 3x^3 - 100x$ is even or odd.

2. Differentiate with respect to x : (**ANY TWO**) **10**

(A) $f(x) = 5e^x + \frac{3}{x} + 10 \cos x$

(B) $f(x) = \sqrt{x} \cot x$

(C) $f(x) = \frac{x}{\log x}$

3. Attempt any **ONE** of the following : **10**

(A) (i) If $y = \frac{x^2}{(1-x)}$, prove that $(1-x)\frac{d^2y}{dx^2} - 2\frac{dy}{dx} = 2$.

(ii) A manufacturer can sell 'x' items per week. His revenue function is $R = 20x - 0.001x^2$ rupees. It costs $C = 5x + 200$ rupees to produce 'x' items. Determine the number of items the manufacturer has to produce per week for maximum profit.

OR

(B) Find the maximum and minimum values of the function $f(x) = \frac{2}{3}x^3 - 4x^2 + 6x + 2$. Also, discuss its nature at $x = 2$.

4. Attempt any **TWO** of the following : **10**

(A) Show that, $A = \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix}$ satisfies the equation $A^2 - 3A - 7I = 0$. Find det A and hence, find the inverse of the matrix using adjoint method.

(B) If $\begin{bmatrix} xy & 4 \\ z+6 & x+y \end{bmatrix} = \begin{bmatrix} 8 & w \\ 0 & 6 \end{bmatrix}$, then find the values of x, y, z and w.

(C) Check whether the matrix is consistent or not and hence, find the solution of the following system of equations :

$2x - y + 3z = 9, \quad x - 3y - 2z = 0, \quad 3x + 2y - z = -1$

5. For the Multiple-Choice Questions, choose one correct option out of given options : **10**

(1) What is the value of the function g(f(2)), if $f(x) = 3$ and $g(x) = x - 1$?

(a) 3 (b) 2

(c) 1 (d) 0

(2) What is the value of $\lim_{x \to 3} \frac{2}{x-3}$?

(a) 0 (b) 2

(c) 3 (d) Limit does not exist.

(3) Which of the following statement is true for the function $f(x) = \begin{cases} 3-x & ; x \leq 2 \\ (x-1)^2 & ; x > 2 \end{cases}$?

(a) Limit exists at $x = 1$. (b) Continuous at $x = 2$.

(c) Limit does not exists at $x = 1$. (d) Continuity does not exists at $x = 2$.

(4) Which of the following is correct ?

(a) $\lim_{h \to 0} \frac{f(x) - f(h)}{h} = f'(x)$ (b) $\lim_{h \to 0} \frac{f(x) - f(h)}{x} = f'(x)$

(c) $\lim_{h \to 0} \frac{f(x) - f(h)}{x - h} = f'(x)$ (d) $\lim_{h \to 0} \frac{f(x + h) - f(x)}{h} = f'(x)$

(5) A function f(x) is differentiable at a point P iff

(a) the curve has P as a corner point

(b) the curve does not have P as a corner point

(c) the function is discontinuous at P

(d) there are more than one tangent at the point P

(6) The derivative of the function y = cosec x is

(a) $\text{cosec}^2 x$ (b) $\sec^2 x$

(c) $-\text{cosec } x \cot x$ (d) $\text{cosec } x \tan x$

(7) For the point of local maxima

(a) even derivative should be negative

(b) even derivative should be positive

(c) even derivative should be zero

(d) odd derivative should be zero

(8) The total cost C(q) of a firm is given by, $C(q) = 25q + 6q^2 - q^3$, then the average cost is

(a) $25 + 6q - q^2$ (b) $25 + 12q - 3q^2$

(c) 25 (d) $6 - 2q - q^2$

(9) What is the value of k, if the matrix $\begin{bmatrix} k & -2 \\ -2 & k + 5 \end{bmatrix}$ is singular ?

(a) 0 (b) 1

(c) 4 (d) –4

(10) If A = diag[1 – 1 2] and B = diag[3 2 1], then which of the following is correct matrix for 2B – A ?

(a) diag[5 5 0] (b) diag[5 5 1]

(c) diag[2 3 – 1] (d) diag[5 3 0]
