Printed Page:-04 Subject Code: BMICA0103

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

MCA (Integrated)

SEM: I - THEORY EXAMINATION (2024 - 2025)

Subject: Basic Mathematics-I

Time: 3 Hours Max. Marks: 100

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. This Question paper comprises of three Sections -A, B, & C. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A 20

1. Attempt all parts:-

1-a. The order of the matrix $A=\begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix}$ is (CO1, K2) 1

(a) 2x2

(b) 3x2

(c) 4x4

(d) 2x3

1-b. The determinant of the matrix $A=\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ is.... (CO1, K3) 1

(a) 0

(b) 1

(c) -1

(d) 2

1-c. If U= {1,2,3,4,5,6,7,8,9,10} and A={4,8,10}, Then $(A')'$ is..... (CO2, K2) 1

(a) {4,8,10}

(b) {1,2,3,5,6,7,9,10}

(c) {2,4,8,10}

(d) {2,5,7,8}

1-d. Find the Range of the function f(x) = sin x – cos x. (CO2, K2) 1

(a) [-1,1]

.

(b) R

(c) R - [-1,1]

(d) None of these

1-e. Examine the the continuity of the function $f(x) = \frac{x+3}{x}$. (CO3, K2) 1

(a) Discontinuous at x=1

(b) Discontinuous at x=2

(c) Discontinuous at x=0

(d) Continuous everywhere

1-f. The value of $\lim_{x \to 7} \frac{x^2-49}{x-7}$ is (CO3, K3) 1

(a) 0

(b) 1

(c) 7

(d) 14

1-g. Calculate the derivative of $g(x) = e^x$ at x = 0 (CO4, K3) 1

(a) -1

(b) 1

(c) 0

(d) 2

1-h. Given $f(x) = \sin^2(x)$, derivative of f(x) is (CO4, K3) 1

(a) cos 2x

(b) sin 2x

(c) tan x

(d) cot x

1-i. Find the missing term 0,1,1,2,3,5,8,13,21,___. (CO5, K2) 1

(a) 35

(b) 34

(c) 33

(d) 36

1-j. A student multiplies a number by 5 instead of dividing it by 5. What is the % change in the result of this mistake? (CO5, K2) 1

(a) 96%

(b) 2400%

(c) 95%

(d) None of these

2. Attempt all parts:-

2.a. If A = 2

$\begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix}$ then find $A+A^T$. (CO1, K3)

2.b. Find the domain and range of the function $\frac{1}{(x^2-1)}$. (CO2, K2) 2

2.c. Evaluate the $\lim_{x \to -4} \frac{x^2+3x-4}{x+4}$. (CO3, K3) 2

2.d. Given the function $g(x) = e^{(3x)} + 2e^{(-x)}$, find g'(x). (CO4, K3) 2

2.e. If in a certain code "RANGE" is coded as 12345 and "RANDOM" is coded as 123678. Then the code for the word "MANGO" would be? (CO5, K2) 2

SECTION-B 30

3. Answer any five of the following:-

3-a. Solve the following equations by Cramer's rule (CO1, K3) 6
x - y - z = 1; y - z - x = 1; z - x - y = 1

3-b. Solve the equation $\begin{vmatrix} 3x-8 & 3 & 3 \\ 3 & 3x-8 & 3 \\ 3 & 3 & 3x-8 \end{vmatrix} = 0$. (CO1, K3) 6

3-c. If A = {1,2,3}, B = {2,3,4}, C = {1,3,4} AND D = {2,4,5} then verfiy that $(A \times B) \cap (C \times D) = (A \cap C) \times (B \cap D)$. (CO2, K3) 6

3-d. Let A={1,2,3,4,5,6,7} and R={x-y: x-y is divisible by 3} Show that R is an equivalence relation. (CO2, K2) 6

3.e. A function is defined as 6

$$f(x) = \begin{cases} \frac{x^2-x-6}{x-3}, \text{ for } x \neq 3 \\ 5 \text{ for } x = 3 \end{cases}$$

Discuss the continuity of the function at x=3. (CO3, K2)

3.f. Find the derivative of $f(x) = \frac{e^x}{\cos x}$. (CO4, K3) 6

3.g. A fruit seller had some apples. He sells 40% apples and still has 420 apples. How many apples he had? (CO5, K2) 6

SECTION-C 50

4. Answer any one of the following:-

4-a. Obtain the inverse of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & -2 & 3 \\ 1 & 2 & -3 \end{bmatrix}$. (CO1, K3) 10

4-b. Prove the following identities $\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ x^3 & y^3 & z^3 \end{vmatrix}$ =xyz(x-y)(y-z)(z-x) (CO1, K3) 10

5. Answer any one of the following:-

5-a. Let A = {1,2,3,4}. Give an example of R on A which is (CO2, K2) 10

i. Neither symmetric nor anti-symmetric
ii. Transitive and reflexive but not anti-symmetric.

5-b. Let f(x) = (2x+5) and g(x) = x^2+1. Find (CO2, K3) 10

i. (g o f)(x)
ii. (f o g)(x)
iii. (fof)(x)

6. Answer any <u>one</u> of the following:-

6-a. 10

Examine for continuity at the origin of the function $f(x) = \begin{cases} \frac{x-|x|}{x} & \text{if } x \neq 0 \\ 1 & \text{if } x = 0 \end{cases}$.(CO3, K3)

6-b. 10

Evaluate: (i) $\lim_{x \to 0} \left[\frac{\sin 5x}{\sin 2x}\right]^{\frac{1}{3}}$

(ii) $\lim_{x \to \infty} \frac{2x^2-8}{x^2}$. (CO3, K3)

7. Answer any <u>one</u> of the following:-

7-a. Investigate the maxima and minima of the function t(x) = $2x^3$ - $21x^2$ + 36x - 20. (CO4, K3) 10

7-b. 10

Find the derivative of $x^3y^3 + \frac{x}{y} = 3\cos(x^2y^2)$ with respect to x. (CO4, K3)

8. Answer any <u>one</u> of the following:-

8-a. (i)A can complete a certain work in 4 minutes, B in5 minutes, C in 6 minutes, D in 10 minutes and E in 12 minutes. Find the average number of units of work completed by them per minute? 10
(ii)A can finish a work in 18 days and B can do the same work in half the time taken by A. Then, working together, what part of the same work they can finish in a day? (CO5, K2)

8-b. The mean of 25 numbers is 36. If the mean of the first 13 numbers is 32 and that of the last 13 numbers is 39, find the 13th number. (CO5, K2) 10