C (Printed Pages 4)

Roll No.

25/1184

B.C.A. (First Sem.) (Regular/Back/ Improvement) Examination, 2025

Fifth Paper

Mathematics-I

Time : Two Hours] *[Maximum Marks : 75*

Note : Attempt **all** sections as per instructions.

Section-A

(Very Short Answer Type Questions)

Note : Attempt all the **five (05)** questions. Each question carries **02 (two)** marks and answer of each question should not exceed **50** words. 5×2=10

1. (a) If A, B be n-rowed orthogonal matrices, then prove that AB is also orthogonal Matrice.

(b) Find $\lim_{x \to 0} \frac{\cos x}{(1 + \sin x)}$

P.T.O.

(c) Differentiate xe^x function w.r. to x.

(d) State fundamental theorem of calculus.

(e) Define vector in 2-dimesion with example.

Section-B

(Short Answer Type Questions)

Note : Attempt any **five(05)** questions out of total **08 (eight)** questions. Each question carries **five** marks and answer of each question should not exceed **100** words. 5×5=25

2. (a) Find the rank of matrix $\begin{pmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{pmatrix}$

(b) Show that $\lim_{x \to 0} (e^{\frac{1}{x}} - e^{-\frac{1}{x}})/(e^{\frac{1}{x}} + e^{-\frac{1}{x}})$ does not exist.

(c) Find the nth differential coefficient of $x^3 e^{ax}$.

(d) Evaluate $\int \frac{(xe^x)}{(x+1)^2} dx$.

(e) Find the volume of a parallelepiped whose sides are given by $a=2i-3j$, $b=i+j-k$ and $c=3i-k$.

(f) Find all points of local maxima and minima of function $f(x)=x^3-6x^2+9x-8$

(g) Trace the curve $r^2\theta=a^2$

(h) Find the Eigen values of the matrix

$$\begin{pmatrix} 1 & -1 & 0 \\ -1 & 2 & 1 \\ 0 & 1 & 1 \end{pmatrix}.$$

Section-C

(Long Answer Type Questions)

Note : Attempt any **two (02)** questions out of total **four (04)** questions. Each question carries **twenty (20)** marks and answer of each question should not exceed **400** words. 2×20=40

3. (a) Describe the Cramer Rule. And also find the solution of the system of equation using Cramer's Rule. 10+10=20

$5x-7y+z=11$

$6x-8y-z=15$

$3x+2y-6z=7$

(b) Explain the continuity at a point and show that function 10+10=20

$$f(x)=\begin{cases} x\sin\left(\frac{1}{x}\right), & x\neq 0 \\ 0, & x=0 \end{cases}$$

Is continuous at $x=0$

(c) State and prove that Rolle's Theorem and discuss applicability of Rolle's theorem on the function 10+10=20

$$f(x)=\begin{cases} x^2+1, & \text{when } 0\le x\le 1 \\ 3-x, & \text{when } 1<x\le 2 \end{cases}$$

(d) Discuss the Beta Function and show that 10+10=20

$B(m, n)=B(m+1, n)+B(m, n+1)$