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(21224) Roll No. ....

BCA - I Sem.

18005

B.C.A. Examination, Dec.-2024

MATHEMATICS-I

(BCA-101)

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

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

Section-A

(Very Short Answer Type Questions)

Note : Attempt **all** questions of this section. Each question carries 3 marks.

3×5=15

1. If $A = \begin{bmatrix} 3 & 5 \\ 4 & 2 \end{bmatrix}$ find $A^2 - 2A$

2. Evaluate $\lim_{x \to 0} \frac{\tan x}{x}$

3. Differentiate x log x

4. Find $\int e^{2x-1} dx$

5. If $\vec{a} = 2\hat{i} + 3\hat{j} + 6\hat{k}$ and $\vec{b} = 3\hat{i} - 6\hat{j} + 2\hat{k}$ show that $\vec{a}$ and $\vec{b}$ are perpendicular vectors.

Section-B

(Short Answer Type Questions)

Note : Attempt any **two** questions out of the following three questions. Each question carries 7½ marks. 7½×2=15

6. Verify Rolle's theorem for the function $f(x)=x^2$, $x \in [-1, 1]$.

7. Solve the Cramer's Rule $2y-3z=0$, $x+3y=-4$, $3x+4y=3$.

8. Find $\int \frac{x+1}{\sqrt{x^2+4}} dx$

Section-C

(Long Answer Type Questions)

Note : Attempt any **three** questions out of the following **five** questions. Each question carries 15 marks. $3\times15=45$

9. Find the characteristics equation of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{bmatrix}$ and verify Cayley-Hamilton theorem.

10. (a) Show that $f(x) = \begin{cases} 1+x & \text{if } x \le 2 \\ 5-x & \text{if } x > 2 \end{cases}$ is continuous at $x=2$.

(b) Show that $f(x)=|x|$ is continuous at $x=0$.

11. (a) Amongst all pairs of positive numbers with sum 24, find those whose product is maximum.

(b) Expand cos x in ascending powers of x upto three terms.

12. Find the following integrals :

(a) $\int \frac{dx}{x(x^4+1)}$

(b) $\int \frac{dx}{(x-1)(x-2)}$

(c) $\int x \log x \, dx$

13. Find the area of a parallelogram whose adjacent sides are determined by the vectors $\vec{a} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{b} = -3\hat{i} - 2\hat{j} + \hat{k}$