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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.

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

$3 \times 5 = 15$

P.T.O

2. Evaluate $\lim_{x \rightarrow 0} \frac{\tan x}{x}$
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 $7\frac{1}{2}$ marks. $7\frac{1}{2} \times 2 = 15$

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 $\int \frac{x+1}{x^2+4} dx$

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Section-C

(Long Answer Type Questions)

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

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 $f(x) = \begin{cases} 1+x & \text{if } x \leq 2 \\ 5-x & \text{if } x > 2 \end{cases}$ 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) $\int \frac{dx}{x(x^2+1)}$

(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 $\vec{b} = -3\hat{i} - 2\hat{j} + \hat{k}$

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