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(21223) Roll No. .....

B.C.A.-I Sem.

18005

B.C.A. Examination, Dec.-2023

MATHEMATICS-I

(BCA-101)

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

Note : Attempt **all** the 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. Find the rank of matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 4 & 6 \end{bmatrix}$
2. Evaluate $\lim_{x \to 0} \frac{\sin 4x}{x}$
3. Differentiate xe^x function w.r. to x.
4. **Evaluate** $\int \frac{1}{\sqrt{4x+3}} dx$
5. If $\vec{a} = 2\hat{i} + 4\hat{j} + 7\hat{k}$ and $\vec{b} = -\hat{i} + 2\hat{j} - 5\hat{k}$ Find $\vec{a}.\vec{b}$.

Section-B

(Short Answer Type Questions)

Note : Attempt any two questions out of the following three questions. Each question carries 7½ marks.

7.5×2=15

6. Expand e^x in ascending powers of x upto four terms.
7. If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ show that $A^{-1} = \frac{1}{19} A$
8. Show that $f(x)=|x|$ is continuous at $x=0$.

Section-C

(Long Answer Types Questions)

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

9. Obtain the characteristic equation of the matrix $A = \begin{vmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{vmatrix}$ and verify that it is satisfied by A.

10. Find :

(a) $D^n(x^3e^x)$

(b) If $y=(\sin^{-1}x)^2$ prove that

$(1-x^2)y_2-xy_1-2=0$

11. Find 'C' of the Lagrange's mean value theorem for the function $f(x)=2x^2-10x+29$ in [2, 7].

12. Evaluate :

(a) $\int \frac{dx}{x(x^3+1)}$.

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

(c) $\int (x^2+1)e^x\,dx$

13. If $|\vec{a}| = 2$, $|\vec{b}| = 7$ and $\vec{a}\times\vec{b} = 3\hat{i} + 2\hat{j} + 6\hat{k}$, Find the angle between vectors $\vec{a}$ and $\vec{b}$.