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.

$$3 \times 5 = 15$$

1. Find the rank of matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 4 & 6 \end{bmatrix}$

2. Evaluate $\lim\limits_{x \to 0} \dfrac{\sin 4x}{x}$

3. Differentiate xe^x function w.r. to x.

P.T.O.

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.

$$7.5 \times 2 = 15$$

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. $3 \times 15 = 45$

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

10. Find :

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

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

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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 $\vec{b}$.