

D  
(21223)

(Printed Pages 4)

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  $\lim_{x \rightarrow 0} \frac{\sin 4x}{x}$

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

**P.T.O.**

4. Evaluate  $\int \frac{1}{\sqrt{4x+3}} dx$

5. If  $\vec{a} = 2\vec{i} + 4\vec{j} + 7\vec{k}$  and  $\vec{b} = -\vec{i} + 2\vec{j} - 5\vec{k}$   
Find  $\vec{a} \cdot \vec{b}$ .

**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

**18005/2**

9. Obtain the characteristic equation of the matrix  $A = \begin{pmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{pmatrix}$  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)  $\int \frac{dx}{x(x^2+1)}$

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