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(20222)  
BCA-I Sem.

(Printed Pages 4)  
Roll No. ....

**18005 (CV-III)**

**B.C.A. Examination, Dec.-2021**

**MATHEMATICS-I**

**(BCA-101)**

*Time : 1½ Hours*      *[Maximum Marks : 75]*

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

**Section-A**

**(Very Short Answer Questions)**

**Note :** Attempt any **two** questions of this Section. Each question carries **7.5** marks. Very short answer is required.

$$2 \times 7.5 = 15$$

1. Define continuity at a point.
2. State Cayley-Hamilton Theorem.

**P.T.O.**

3. If  $y = \sqrt{\frac{1 - \cos 2x}{1 + \cos 2x}}$ , find  $\frac{dy}{dx}$
4. Evaluate  $\int \log_e x \, dx$ .
5. Find  $\lambda$  such that  $\vec{a}$  and  $\vec{b}$  are perpendicular vector where  
 $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ ;  $\vec{b} = \hat{i} - 2\hat{j} + 3\hat{k}$ .

**Section-B**

**(Short Answer Questions)**

**Note :** Attempt any **one** question out of the following **three** questions. Each question carries **15** marks. Short answer is required.  $1 \times 15 = 15$

6. Expand  $e^x$  in ascending powers of  $x$  by Maclaurin's theorem.
7. Differentiate  $x^x$ .
8. Prove that

$$\begin{vmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \end{vmatrix} = (a - b)(b - c)(c - a)(a + b + c).$$

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## Section-C

### (Detailed Answer Questions)

**Note :** Attempt any **two** questions out of the following **five** questions. Each question carries **22.5** marks. Answer is required in detail.  $2 \times 22.5 = 45$ .

9. (a) Find the inverse of the matrix

$$A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$$

- (b) Determine the eigen values of the matrix

$$A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$$

10. (a) Show that the function  $f(x) = |x|$  is continuous at  $x=0$ .

- (b) Evaluate

$$\lim_{h \rightarrow 0} \left( \frac{\sqrt{x+h} - \sqrt{x}}{h} \right)$$

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P.T.O.

11. (a) Differentiate  $y = x \sin x \log x$ .

- (b) Find the maximum and minimum values of  $(3x^4 - 8x^3 + 12x^2 - 48x + 25)$  in  $[0, 3]$ .

12. (a) Evaluate  $\int x^2 \sin x \, dx$ .

- (b) Evaluate  $\int (\sqrt{\sin x} \cdot \cos x) \, dx$ .

13. (a) Show that the vectors

$$\hat{i} - 3\hat{j} + 4\hat{k}, 2\hat{i} - \hat{j} + 2\hat{k} \text{ and } 4\hat{i} - 7\hat{j} + 10\hat{k}$$

are coplanar.

- (b) Find the area of a parallelogram whose adjacent sides are determined by the vectors.

$$\vec{a} = \hat{i} + 2\hat{j} + 3\hat{k} \text{ and } \vec{b} = -3\hat{i} - 2\hat{j} + \hat{k}.$$

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