

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.

2×7.5=15

1. Define continuity at a point.
2. State Caley-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 λ 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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