A

(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. 2×7.5=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. 1×15=15

6. Expand e^x in ascending powers of x by Maclaurin's theorem.

7. Differentiate x^x.

8. Prove that

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

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. 2×22.5=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

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

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 $\int (\sqrt{\sin x} \, . \cos x) dx$.

13. (a) Show that the vectors $\hat{i}-3\hat{j}+4\hat{k}, 2\hat{i}-\hat{j}+2\hat{k}$ 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.

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

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