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(21121)

B.C.A.-I Sem.

(Printed pages 4)

Roll No.

**18005 (CV-II)
B.C.A. Spl. and Back Paper
Examination, Nov.-2021**

MATHEMATICS-I

(BCA-101)

Time : 1½ Hours]

[Maximum Marks : 75

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

Section-A

Note : Attempt any **two** questions of this section. Each question carries 7.5 marks. Short answer is required.

2 × 7.5 = 15

1. Define Eigen value and Eigen Vector of a matrix.

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2. Evaluate $\lim_{x \rightarrow 0} \left(\frac{1}{x}\right)$.
3. Explain Beta function and Gamma function.
4. Find the second differential coefficient of $x^4 \cdot e^{5x}$.
5. What is the difference between Scalars and Vectors. Explain in brief with some example.

Section-B

Note : Attempt any **one** question out of the following three questions. Each question carries **15** marks. 1 × 15 = 15

6. Find $\lim_{x \rightarrow 1} \left(\frac{x^5 - 2x^3 - 4x^2 + 9x - 4}{x^4 - 2x^3 + 2x - 1}\right)$.
7. By using Maclaurin's theorem, prove that $\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots + (-1)^n \frac{x^{2n+1}}{(2n+1)!} + \dots$
8. If $u_n = \int x^n \cdot (a-x)^{1/2} dx$ then show that $(2n+3) u_n = 2an u_{n-1} - 2x^n (a-x)^{3/2}$.

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Section-C

Note : Attempt any **two** questions out of the following five questions. Each question carries **22.5** marks.

$$2 \times 22.5 = 45$$

9. Check the continuity and differentiability of the function defined by $f(x) = |x|$ at $x=0$.

10. Explain Cramer's Rule. Solve the following equations

$$2x - y + 3z = 9$$

$$x + y + z = 6$$

$$x - y + z = 2 \text{ by Cramer's Rule.}$$

11. If $\vec{r}(t) = 5t^2\hat{i} + t\hat{j} - t^3\hat{k}$, then

Prove that

$$\int_1^2 \left(\vec{r} \times \frac{d^2\vec{r}}{dt^2} \right) dt = -14\hat{i} + 75\hat{j} - 15\hat{k}.$$

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P.T.O.

12. If $I_n = \int_0^{\pi/4} \tan^n x \, dx$ then prove that

$$I_n + I_{n-2} = \frac{1}{n-1}$$

and deduce the value of I_5 .

13. Verify Rolle's theorem for the function $f(x) = (x^2 + 2x - 3)e^x$ in the interval $[-3, 1]$.

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