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B.C.A.-I Sem. 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.

P.T.O.



2. Evaluate $\lim_{x\to 0}\left(\frac{1}{x}\right)$.

3. Explain Beta function and Gamma function.

4. Find the second differential coefficient of $x^4.e^{5x}$.

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 $\lim_{x\to 1}\left(\frac{x^5 - 2x^3 - 4x^2 + 9x - 4}{x^4 - 2x^3 + 2x - 1}\right)$.

7. By using Maclaurin's theorem, prove that $\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \ldots\ldots + (-1)^n \frac{x^{2n+1}}{(2n+1)!} + \ldots\ldots$

8. If $u_n = \int x^n.(a-x)^{3/2}\, dx$ then show that $(2n+3)\, u_n = 2an\, u_{n-1} - 2x^n(a-x)^{3/2}$.

## 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

$2x-y+3z=9$

$x+y+z=6$

$x-y+z=2$ by Cramer's Rule.

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

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





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 $[-3, 1]$.