

Roll No.....

**BCA-N105 (N)**

**B. C. A. (Semester-First) Examination– 2011**

**Paper-Fifth**

**Mathematics-I**

Time: Three Hours]

[Maximum Marks: 75

**Note: Section A is compulsory. Attempt seven question out of ten from Section B and one question from Section C.**

**Section-A**

**(10each)**

1. (a) By using Cramer's rule solve the following Equation. (4)

$$x + y + z = 6$$

$$x - y + z = 2$$

$$3x + 2x - 4z = -5$$

- (b) Evaluate  $\lim_{x \rightarrow 0} \left[ \frac{a^x - b^x}{x} \right]$  (3)

2. (a) Evaluate the integral  $\int \frac{2x \sin x^2}{\cos x^2} dx$ . (4)

- (b) Find  $\frac{dy}{dx}$  of the function  $y = \text{sine}^x \log_x$  . (4)

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**Section-B**

3. Prove that  $[a + b, b + c, c + a] = 2[a b c]$  (6)

4. Find the maximum and minimum value of the function  $y = f(x) = x^3 - 12x^2 + 36x + 21$ . (6)

5. State and Prove Rolle's Theorem. (6)

6. Compute  $\int \sin^4 x \cos^5 x dx$ . (6)

7. Discuss the continuity of the function  $f(x)$  defined by (6)

$$f(x) = \begin{cases} x^2, & \text{for } x < -2 \\ 4, & \text{for } -2 \leq x \leq 2 \\ x^2, & \text{for } x > 2 \end{cases}$$

8. Determine the rank of the following matrix. (6)

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 6 & 8 \\ 3 & 6 & 9 & 12 \end{bmatrix}$$

9. Expand  $\sin x$  in power of  $(x - \pi/2)$  with the help Taylor's theorem. (6)

10. (a) Find the  $n^{\text{th}}$  differential coefficient of  $x^3 \cos x$  (3)

(b)  $\int \frac{x+4}{3+2x-x^2} dx$  (3)

11. Find the characteristics roots (or eigen value) of the matrix

(6)

$$\begin{bmatrix} -2 & 2 & 3 \\ 2 & 1 & -6 \\ 1 & -2 & 0 \end{bmatrix}$$

12. Prove that

(6)

$$\hat{i} \times (a \times \hat{i}) + \hat{j} \times (a \times \hat{j}) + \hat{k} \times (a \times \hat{j}) = 2a.$$

### Section-C

13. From the definition of a definite integral as the limit of a

sum evaluate  $\int_a^b e^x dx$ . (18)

14. Obtain the characteristics equation of the matrix. (18)

$$A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$$

and verify that it is satisfied by A and hence find its inverse.

15. Show that the function (18)

$$f(x) = \begin{cases} 0 & \text{for } x = 0 \\ \frac{1}{2} - x & \text{for } 0 < x < 1/2 \\ \frac{1}{2} & \text{for } x = 1/2 \\ 3/2 & \text{for } \frac{1}{2} < x < 1 \\ 1 & \text{for } x = 1 \end{cases}$$

has three point of discontinuity. Find such point.