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

2. (a) Evaluate the integral $\int \frac{2xSinx^2}{Cosx^2} dx$. **(4)**

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

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 $y = f(x) = x^3 - 12x^2 + 36 + 21$. **(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)**

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

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

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

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

10. (a) Find the nth differential coefficient of $x^3 cosx$ **(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)**

$\hat{\imath} \times (a \times \hat{\imath}) + \hat{\jmath} \times (a \times \hat{\jmath}) + \hat{k} \times (a \times \hat{\jmath}) = 2a.$

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)**

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

has three point of discontinuity. Find such point.