BCA-105(N)

B. C. A. (First Semester)

EXAMINATION, Dec., 2016

(New Course)

Paper Fifth

MATHEMATICS-I

Time: Three Hours]   [Maximum Marks: 75

Note: Attempt questions from all Sections as directed.

Inst. The candidates are required to answer only in serial order. If there are many parts of a question, answer them in continuation.

Section-A

(Short Answer Type Questions)

Note: Attempt all questions from this Section. Each question carries 3 marks.

1. (A) Find cofactor of the elements of the first row of the determinant:

$$\begin{bmatrix} 2 & 3 & 5 \\ 4 & 1 & 0 \\ 6 & 2 & 7 \end{bmatrix}$$

(B) Find the rank of matrix:

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 7 \\ 3 & 6 & 10 \end{bmatrix}$$

(C) evaluate:

$$\lim_{x \to a} \frac{x^m - a^m}{x - a}$$

(D) Write the statement of Rolle's theorem with suitable example.

(E) By using Maclaurian's theorem expand".

(F) Evaluate:

$\int \sin(log.x)dx$

(G) Show that:

F (I) = 1

(H) Find the angle between A = 2i + 2j - k and B = 6i − 3j + 2k.

(I) By using Leibnitz theorem find the rth differentiation of x^3 cos.x

Section-B

(Long Answer Type Questions)

Note: Attempt any two questions. Each question carries 12 marks.

2. Use Cramer's rule to solve the following system of equations:

X - 4y - z = 11

2x - 5y + 2x = 39

- 3x + 2y + z = 1

3. Find the Eigen values and the corresponding Eigen vector for the following matrix:

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

4. Examine for continuity at the origin of function:

$$f(x) = \begin{cases} \dfrac{x-|x|}{x} & \text{if } x \neq 0 \\ 1 & \text{if } x = 0 \end{cases}$$

5. Differentiate the following w. r. to x.:

(i) $e^3 + \log_e x + a^3$

(ii) $\cos(\cot x^2)$

(iii) $x\sqrt{x}$

Section C

(Long Answer Type Questions)

Note: Attempt any two questions. Each question carries 12 marks.

6. (a) If f (x) = (x - 1) (x - 2) (x - 3) and a = 0, b = 4, find e using Lagrange's mean value theorem.

(b) Expand sin x in power of $\left(x - \frac{x}{2}\right)$ by using Taylor's series.

7. (a) Find the maximum and minimum value of the function $f(x) = x^3 - 2x^2 + x + 6$

(b) By using L'Hospital rule evaluate:

$$\lim_{x \to \infty} \frac{x^3}{e^x}$$

8. Evaluate the following integral function:

(i) $\int \sin^3 x \cos x \, dx$

(ii) $\int_0^1 \frac{\sin^{-1} x}{\sqrt{1 - x^2}} \, dx$

9. (a) Show that:

$$\int_0^{\pi/6} \cos^6 3\theta \sin^2 6\theta \, d\theta = \frac{7\pi}{384}$$

(b) Show that three vectors 2i + 6j + 7k, 7i − 8j +9k and 3i +20j + 5k are collinear.