(Please write your Exam Roll No.) Exam Roll No. 04921402016

END TERM EXAMINATION

FIRST SEMESTER [BCA] DECEMBER-2015

Paper Code: BCA 101	**Subject: Mathematics-I (Batch 2011 Onwards)**
Time : 3 Hours	**Maximum Marks :75**

Note: Attempt any five questions including Q.No. 1 which is compulsory. Select one question from each unit.

Q1. a) Find matrices A and B if 2A–B= $\begin{bmatrix} 6 & -6 & 0 \\ -4 & 2 & 1 \end{bmatrix}$ and $2B + A = \begin{bmatrix} 3 & 2 & 5 \\ -2 & 1 & -7 \end{bmatrix}$. **(3)**

b) Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 0 & -1 \\ 2 & 4 & 1 & -2 \\ 3 & 6 & 7 & -3 \end{bmatrix}$. **(3)**

c) Evaluate $\lim_{x\to 3} \frac{x^5 - 243}{x^4 - 81}$. **(3)**

d) Evaluate $\lim_{x\to 0}\left(\frac{\sin ax}{\tan bx}\right)^k$, *where* K $\in$ R. (3)

e) Use Taylor's theorem to prove that -

$\log(x+h) = \log x + \frac{h}{x} - \frac{h^2}{2x^2} + \frac{h^3}{3x^3} - \ldots\infty.$ (3)

f) If $y = e^{(x+1)^3}$ find $\frac{dy}{dx}$. (3)

g) Evaluate $\int \frac{dx}{\sqrt{x+a} + \sqrt{x}}$. (3)

h) Obtain the reduction formula for $\int \cos^n x \, dx$. (4)

Unit-I

Q2. a) For what values of 'a' and 'b' does the following system of equations x+2y+3z=1; x+3y+5z = 2 and 2x+5y+az=b has (i) no solution (ii) unique solution and (iii) infinite solution. **(6.5)**

b) If $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & -1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$, find A^{-1} and show that $A^3 = I$ where I is the identity matrix. **(6)**

Q3. a) Solve the following system of equations by Cramer's rule: **(6)**
x -4y – z =1; 2x – 5y + 2z= 39; -3x +2y +z =1.

b) Find the Eigen values and Eigen vectors of the matrix $A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$. **(6.5)**

P.T.O.

BCA-101

P1/2

Unit-II

Q4. a) Evaluate $\lim_{x\to 1}\left([x]+\frac{|x-1|}{x-1}+2\right)$. **(6)**

b) For what choice of 'a' and 'b' is the function continuous $\forall$ x $\in$ R

$$f(x)=\begin{cases} ax^2+b, & x<2 \\ 2 & x=2 \\ 2ax+b, & x>2 \end{cases}$$ **(6.5)**

Q5. a) For what value of 'λ' does the lim $_{x\to 1}$ f(x) exists, where f is defined by the rule $f(x)=\begin{cases} 2\lambda x+3 & \text{if } x<1 \\ 1-\lambda x2 & \text{if } x>1 \end{cases}$. **(6.5)**

b) Discuss the nature of discontinuity at x=0 of $f(x)=\begin{cases} \frac{\sin[x],}{[x]} & x\neq 0 \\ 0, & x=0 \end{cases}$. **(6)**

Unit-III

Q6. a) Find all the asymptotes of $y^4 - 2xy^3 + 2x^3y - x^4 - 3x^3 + 3x^2y + 3xy^2 - 3y^3 - 2x^2 + 2y^2 - 1 = 0$. **(6.5)**

b) If $x^y + y^x = a^b$, find $\frac{dy}{dx}$. **(6)**

Q7. a) If $y = \sin^{-1} x$ then show that **(6.5)**

i) $(1-x^2)y_2 - xy_1 = 0$.

ii) $(1-x^2)y_{n+2} - (2n+1)\, xy_{n+1} - n^2y_n = 0$.

b) Examine the given function for maxima/minima $f(x)=\frac{(x-1)(x-6)}{(x-10)}, x\neq 10.$ **(6)**

Unit-IV

Q8. a) Evaluate **(6)**

i) $\int \log(1+x)dx$ (ii) $\int_0^2 \frac{5x}{x^2+1}dx$.

b) Obtain the reduction formula for $\int \tan^n x\, dx.$ Also evaluate $\int_0^{\pi/4} \tan^n x\ dx.$ **(6.5)**

Q9. a) Show that

$$\int_0^{\pi/2} \sin^p\theta\cos^q\theta\ d\theta = \frac{\Gamma\left(\frac{p+1}{2}\right)\Gamma\left(\frac{q+1}{2}\right)}{2\,\Gamma\left(\frac{p+q+2}{2}\right)},\ p,q>-1.$$ **(6.5)**

b) Evaluate $\int_0^1 \frac{xe^x}{(x+1)^2}dx.$ **(6)**

****

BCA-101

P2/2