(Please write your Exam Roll No.) Exam Roll No. 04921402015

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

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

e) Use Taylor's theorem to prove that -

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

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

g) Evaluate $\int\dfrac{dx}{\sqrt{x+a}+\sqrt{x}}$. (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)**

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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)**

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