By-Parts Formulae

(Please write your Exam Roll No.) **Exam Roll No.** 01121402014

END TERM EXAMINATION

FIRST SEMESTER [BCA] DEC.2014 – JAN.2015

Paper Code: BCA101	***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) If $A=\begin{bmatrix}9 & 1\\ 4 & 3\end{bmatrix}$, $B=\begin{bmatrix}1 & 5\\ 7 & 12\end{bmatrix}$ find the matrix X such that 3A+5B+2X=0. **(3)**

(b) Prove that if (verify by finding AA^{-1}) $A=\begin{bmatrix}2 & 3\\ 4 & 2\end{bmatrix}$ then $A^{-1}=\begin{bmatrix}-1/4 & 3/8\\ 1/2 & 1/4\end{bmatrix}$ **(3)**

(c) Show that $y=\frac{x^2-1}{x-1}$ is continuous except at x=1. What is the nature ? of the discontinuity? **(3)**

(d) Find $\lim_{x\to 0}\frac{\sqrt{x+1}-1}{x}$. $=\frac{1}{2}$ **(3)**

(e) Using Taylor's series, find the value of $f\left(\frac{21}{20}\right)$ if $f(x)=x^3-6x^2+7$. **(3)**

(f) Show that $\sin(x)(1+\cos x)$ is maximum when $x=\frac{\pi}{3}$. $\sqrt{5}/2$ **(3)**

(g) Evaluate $\int e^x\left(\frac{x-1}{x^2}\right)dx$. **(3)**

(h) Evaluate $\int e^x\cos^2 x\,dx$. **(4)**

UNIT-I

Q2 (a) Given $A=\begin{bmatrix}2 & 1 & 1\\ -1 & 2 & -1\\ 1 & -1 & 2\end{bmatrix}$, find A^{-1} and A^4 using Cayley-Hamilton Theorem. **(6)**

(b) If $A=\begin{bmatrix}1 & 3 & 0\\ -1 & 2 & 1\\ 0 & 0 & 2\end{bmatrix}$, $B=\begin{bmatrix}2 & 3 & 4\\ 1 & 2 & 3\\ -1 & 1 & 2\end{bmatrix}$ compute AB and BA and show that AB≠BA. **(6.5)**

Q3 (a) If the matrix $\begin{bmatrix}0 & 2b & c\\ a & b & -c\\ a & -b & c\end{bmatrix}$ is orthogonal, then find the values of a, b and c. **(6)**

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(b) Determine the rank of the following matrix using elementary row transformation:- **(6.5)**

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

UNIT-II

Q4 (a) For what value of x does $y = \frac{x+1}{(x+2)(x+3)}$ tends to infinity? Indicate the form of the graph of the function and describe its discontinuities. **(6)**

(b) Evaluate $\ln_{m \to \infty} P\left(1+\frac{i}{m}\right)^{mn}$. **(6.5)**

Q5 (a) A function f is defined as follows:- $f(x) = \begin{cases} \frac{9x}{x+2}, & if \quad x<1 \\ 3, & if \quad x=1 \\ \frac{x+3}{x}, & if \quad x>1 \end{cases}$. Examine the continuity of f in the interval (-3,3). **(6)**

(b) Find the value of a so that the function $f(x) = \begin{cases} ax+5 & if \quad x \le 2 \\ x-1 & if \quad x>2 \end{cases}$ is continuous at x=2. **(6.5)**

UNIT-III

Q6 (a) Find $\frac{dy}{dx}$ if-

(i) $y = \sin\sqrt{x}$ (ii) $x^y.y^x = K$ where K is a constant. (iii) $y = \sin^3 2x$. **(6)**

(b) Find all the asymptotes of the curve $y^2(x-2a) = x^3 - a^2$. **(6.5)**

Q7 (a) Find the nth derivative of $\log(2x+3)$. **(6)**

(b) Show that the function $f(x) = x^2 + \frac{250}{x}$ has a minimum value at x=5. **(6.5)**

UNIT-IV

Q8 (a) Find the following integrals:- **(6)**

(i) $\int xe^{-x}dx$ (ii) $\int x^n \log x dx$.

(b) Find out the Reduction Formulae for $\int_0^{\pi/4} \sin^n x dx$, n being a positive integer. **(6.5)**

Q9 (a) Prove that $\beta(m,n) = \beta(m+1,n) + \beta(m,n+1)$. **(6)**

(b) Evaluate $\int \frac{dx}{2x^2+3x+5}$. **(6.5)**

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