**Roll No.** ☐☐☐☐☐☐☐☐☐☐☐☐                    **Total No. of Pages : 03**

**Total No. of Questions : 07**

**BCA (2010 Batch)     (Sem.–4)**
# MATHEMATICS – II
## (Computer Oriented)
**Subject Code : BC-301**
**Paper ID : [B0227]**

**Time : 3 Hrs.**                                              **Max. Marks : 60**

**INSTRUCTIONS TO CANDIDATES :**
1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains SIX questions carrying TEN marks each and students has to attempt any FOUR questions.**

### SECTION-A

1. **Write briefly :**

   (a) For what value of '$a$' the matrix A = $\begin{bmatrix} 1 & 4 \\ 2 & a \end{bmatrix}$ is a singular matrix.

   (b) Give an example of an upper triangular matrix.

   (c) What is Trapezoidal method for numerical integration?

   (d) What is the relation between Mean, Median, and Mode?

   (e) If $y = \left(9x^2 + 1\right)^2$, find $\dfrac{dy}{dx}$.

   (f) Evaluate $\displaystyle\int_0^1 x(1-x)^5\,dx$.

   (g) Find the local maximum and minimum values (if any) of the function

   $f(x) = 3x^2 - 2x + 1$.

(h) Evaluate $\int \dfrac{x^3}{1+x^4} dx$.

(i) Find the inverse of the matrix $\begin{bmatrix} 2 & 5 \\ -3 & 1 \end{bmatrix}$.

(j) If the sum of 20 observations is 300 and its sum of squares is 5000 and median is 15. Find its co-efficient of variation.

**SECTION-B**

2.  (a) If $A = \begin{bmatrix} 2 & 21 \\ 3 & 23 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 11 \\ -2 & -5 \end{bmatrix}$, find the matrix X, such that $3A + 2X = 4B$.

(b) Find the rank of the matrix $\begin{bmatrix} 1 & 3 & 4 & -2 \\ 2 & 6 & 8 & -4 \\ 3 & 0 & 3 & 3 \end{bmatrix}$.

3.  (a) Solve by using Gauss Elimination Method :

$2x - 3y + 5z = 11,$

$3x + 2y - 4z = -5,$

$x + y - 2z = -3.$

(b) Find inverse of the matrix $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ and also verify that $AA^{-1} = I$.

4.  (a) Find the Arithmetic Mean of the following data :

| Income | : | 20–30 | 30–40 | 40–50 | 50–60 | 60–70 | 70–80 | 80–90 |
|---|---|---|---|---|---|---|---|---|
| No. of Persons | : | 16 | 36 | 61 | 76 | 87 | 95 | 5 |

(b) For a group of 200 candidates the mean and standard deviation were found to be 40 and 15. Later on it was found that the score 43 was misread as 34. Find the correct mean and correct standard deviation.

5. (a) If $y = x + \dfrac{1}{x}$, show that $x^2 \dfrac{dy}{dx} - xy + 2 = 0$.

   (b) Divide 15 into two parts such that the square of one multiplied with the cube of the other is maximum.

6. (a) If $x^y = e^{x-y}$, prove that $\dfrac{dy}{dx} = \dfrac{\log x}{(1 + \log x)^2}$.

   (b) Evaluate $\displaystyle\int \dfrac{2x - 1}{(x-1)(x+2)(x-3)} dx$.

7. (a) Evaluate $\displaystyle\int_0^{\pi/4} e^x \sin x \, dx$.

   (b) A river is 80 ft. wide. The depth $d$ in $ft$. at a distance $x$ $ft$. from one bank is given by the following :

   | $x$ | : | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 |
   |---|---|---|---|---|---|---|---|---|---|---|
   | $y$ | : | 0 | 4 | 7 | 9 | 12 | 15 | 14 | 8 | 3 |

   Find approximately the area of the cross-section.