

9. (a) Find the derivative of  $f(x) = \sqrt{x+1}$  by the first principle of derivatives. 5

(b) If  $f(x) = x^2 + 2, \quad x \geq 2$   
 $= x - 3 \quad x < 2$

Find the value of  $f(-3), f(5)$  and  $f(2)$ . 3

10. (a) State Lagrange's mean value theorem and give the geometrical interpretation. 2+2=4

(b) Find the derivative of the following : (any three) 4×3=12

(i)  $4e^x - 7x^{-3} + 2x$

(ii)  $e^{4x+3} - x^3 + 2$

(iii)  $(x^2 + 4x - 3)(x^2 + 5x - 2)$

(iv)  $\frac{4x^2 + 5e^x - 3}{4x - 3}$

(v)  $4\sqrt{x} + \frac{5}{x} + 2x$

(vi)  $\frac{4x^2 - 3x + 5}{5x^2 + 7x - 2}$

Total number of printed pages-4

44 (2) BCA-HC-2016

2024

**MATHEMATICS-II**

Paper : BCA-HC-2016

Full Marks : 80

Time : Three hours

**The figures in the margin indicate full marks for the questions.**

1. Answer the following : 1×7=7

(a) Define Transpose of a Matrix.

(b) Define Scalar matrix.

(c) What do you mean by Row matrix and Column matrix ?

(d) When a matrix is said to singular ?

(e) Find the value of  $a$  and  $b$  for

$$\begin{bmatrix} a+2 & 3 \\ 4 & b-3 \end{bmatrix} = \begin{bmatrix} 4-a & 3 \\ 4 & 7 \end{bmatrix}$$

(f) Form a  $2 \times 2$  matrix for

$$[a_{ij}] = \frac{(i+j)^2}{2}.$$

(g) Find the value of  $\begin{vmatrix} 4 & 2 \\ -3 & 5 \end{vmatrix}$ .

2. Ex. If  $A = \begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix}$  verify that  
 $A \cdot (\text{adj } A) = |A| I = (\text{adj } A) \cdot A$  5

3. If  $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$  and  $ad - bc \neq 0$   
 find  $A^{-1}$  (Inverse of  $A$ ) 5

4. Let  $A$  and  $B$  are two square matrices such that  $AB = B$  and  $BA = A$ . Prove that  $A^2 = A$  and  $B^2 = B$ . 5

5. (i) Give an example to show that the product of two non-zero matrices may be a zero matrix. 3

(ii) Show that the following matrix is non-singular  $A = \begin{bmatrix} 1 & 3 & 4 \\ 3 & -1 & 6 \\ -1 & 5 & 1 \end{bmatrix}$ . 3

6. If  $A$  and  $B$  are two  $n$  square matrices, show that

$$\text{adj}(AB) = (\text{adj } B) (\text{adj } A) \quad 5$$

7. (a) Express in the form  $A + iB$

$$\frac{7+5i}{3-4i} \quad 3$$

(b) Find the multiplicative inverse of the complex number  $3+4i$ . 3

(c) Find the modulus and arguments of  $z = 1 - \sqrt{3}i$ . 3

(d) Solve the equation  $x^2 + 3x + 9 = 0$  4

8. Evaluate :

(a)  $\lim_{x \rightarrow a} \frac{(x+5)^{3/2} - (a+5)^{3/2}}{x-a}$  4

(b)  $\lim_{x \rightarrow 0} \frac{\sqrt{2+5x} - \sqrt{2-5x}}{x}$  3

(c)  $\lim_{x \rightarrow 3} \frac{x^4 - 81}{x+3}$  3