

**2024**

**ADVANCED BUSINESS MATHEMATICS — HONOURS**

**Paper : DSE-5.1 AH**

**(Module - II)**

**Full Marks : 40**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

Answer **any four** questions.

1. (a) If  $f(x) = \frac{x+|x|}{x-|x|}$ , find domain and range of the function  $f$ .

(b) Evaluate :  $\lim_{x \rightarrow 2} \frac{2x^2 - 7x + 6}{3x^2 - 7x + 2}$ . 5+5

2. (a) Express the following in a single matrix :  $\begin{bmatrix} 3 & -2 \\ 2 & 4 \\ 5 & -1 \end{bmatrix} \begin{bmatrix} -2 & 1 & 5 \\ 1 & -2 & 3 \end{bmatrix} - \begin{bmatrix} 8 & 2 & 3 \\ 5 & 3 & 7 \\ 9 & 11 & 2 \end{bmatrix}$ .

(b) Prove that  $\begin{vmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ b+c & c+a & a+b \end{vmatrix} = (a-b)(b-c)(c-a)(a+b+c)$ . 5+5

3. (a) Evaluate :  $\int \frac{dx}{(x-2)\sqrt{2x+1}}$ .

(b) If  $y = ae^{3x} + be^{-3x}$ , then prove that  $\frac{d^2y}{dx^2} = 9y$ . 5+5

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**(0579)**

4. (a) Evaluate :  $\int_0^2 \frac{x^2}{x^3+1} dx$ .

(b) Evaluate :  $\int \frac{dx}{\sqrt{x+1} + \sqrt{5x+1}}$ . 5+5

5. (a) Find the area above the  $x$ -axis bounded by  $x - 2y + 4 = 0$ ,  $x = 3$ ,  $x = 6$ .

(b) A firm produces  $x$  tonnes of output at a total cost ₹  $C$ , where  $C = \frac{1}{10}x^3 - 5x^2 + 10x + 5$ . At what level of output will the marginal cost attain the minimum value? 5+5

6. (a) If  $f(x) = \frac{ax-b}{bx-a}$ , show that  $f(a)f\left(\frac{1}{a}\right) - f(b)f\left(\frac{1}{b}\right) = 0$ .

(b) If  $y = 2x^3 + 6x^2 - 48x + 9$ , find the values of  $x$  for which  $\frac{dy}{dx} = 0$ . 5+5

7. (a) Solve by Cramer's Rule :

$$\begin{aligned} x + y + z &= 9 \\ 2x + 3y - z &= 9 \\ 3x - y - z &= -1 \end{aligned}$$

(b) If  $\begin{bmatrix} x-1 & x+1 \\ y+1 & y-1 \end{bmatrix} = \begin{bmatrix} 4 & 6 \\ 5 & 3 \end{bmatrix}$ , find  $x$  and  $y$ . 5+5

8. (a) Show that  $\begin{vmatrix} x & x^2 & x^3 \\ y & y^2 & y^3 \\ z & z^2 & z^3 \end{vmatrix} = xyz(x-y)(y-z)(z-x)$ .

(b) Find the matrices  $A$  and  $B$  for which  $3B - 2A = \begin{bmatrix} 10 & 1 \\ 3 & 5 \end{bmatrix}$  and  $2A + B = \begin{bmatrix} 2 & 3 \\ 5 & 1 \end{bmatrix}$ . 5+5