

**2025**

**ADVANCED BUSINESS MATHEMATICS — HONOURS**

**Paper : DSE-5.1AH**

**(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  $f(x) = x^2 - x$ , then show that  $f(h + 1) = f(-h)$ .

(b) Evaluate :  $\lim_{x \rightarrow 1} \frac{x^2 + x - 2}{x^2 - 3x + 2}$ . 5+5

2. (a) If  $A = \begin{bmatrix} 9 & 1 \\ 1 & 3 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 5 \\ 7 & 12 \end{bmatrix}$ , find the matrix  $X$  such that  $5A + 3B + 2X = 0$  [ $X$  is the square matrix of order  $2 \times 2$  and  $0$  is the null matrix of order  $2 \times 2$ ].

(b) Solve :  $\begin{vmatrix} x & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{vmatrix} = 0$ . 5+5

3. (a) Show that the maximum value of the function  $x + \frac{1}{x}$  is less than its minimum value.

(b) If  $y = Ae^{2x} + Be^{-2x}$ , where  $A$  and  $B$  are constants, then show that  $\frac{d^2y}{dx^2} - 4y = 0$ . 5+5

4. (a) Evaluate :  $\int \frac{2x - 3}{\sqrt{2x^2 - 6x + 1}} dx$ .

(b) Evaluate :  $\int \frac{dx}{(x - 1)(x - 2)}$ . 5+5

**Please Turn Over**

**(4027)**

5. (a) Find the area of the region bounded by  $y = 4x^2$ ,  $y = 0$ ,  $x = 1$  and  $x = 3$ .
- (b) A firm produces  $x$  units of output at a total cost ₹  $\left(300x - 10x^2 + \frac{1}{3}x^3\right)$ . Find the output at which average cost is equal to marginal cost. 5+5

6. (a) If  $f(x) = \frac{x-1}{x+1}$ , show that  $\frac{f(x) - f(y)}{1 + f(x)f(y)} = \frac{x-y}{1+xy}$ .
- (b) The MR (marginal revenue) of a product is given by  $MR = 20 + 8x - x^2$ ,  $x$  being the output. Find the price of the product when  $x = 6$ . 5+5

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

$$\begin{aligned}x + y + z &= 6 \\2x - y + 3z &= 9 \\x + 3y - 2z &= 1\end{aligned}$$

- (b) If  $A = \begin{bmatrix} 4 & 5 \\ 5 & 6 \end{bmatrix}$ , prove that  $A^2 - 10A - I = 0$ , where  $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ . 5+5

8. (a) Without expanding, show that,

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-a).$$

- (b) If  $A = \begin{bmatrix} 2 & -3 \\ 0 & 1 \\ -1 & 4 \end{bmatrix}$ ,  $B = \begin{bmatrix} -1 & 5 \\ 2 & -3 \\ 0 & 1 \end{bmatrix}$  and  $C = \begin{bmatrix} 4 & -2 \\ 0 & -1 \\ 3 & 5 \end{bmatrix}$ , find  $A + 4B - 3C$ . 5+5