2022

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) Evaluate : $\log_{x \to 0} \dfrac{\sqrt{1+2x} - \sqrt{1-2x}}{x}$

   (b) The function $f(x) = \dfrac{2x^2 - 8}{x - 2}$ is undefined at $x = 2$. What value must be assigned to $f(2)$, if $f(x)$ is to be continuous at $x = 2$? 5+5

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

   (b) Prove that : $\begin{vmatrix} x^2 + y^2 + 1 & x^2 + 2y^2 + 3 & x^2 + 3y^2 + 4 \\ y^2 + 2 & 2y^2 + 6 & 3y^2 + 8 \\ y^2 + 1 & 2y^2 + 3 & 3y^2 + 4 \end{vmatrix} = x^2 y^2$. 5+5

3. (a) Evaluate : $\displaystyle\int \dfrac{(x+2)}{\sqrt{x-2}}\, dx$

   (b) Evaluate : $\displaystyle\int_{2}^{5} \dfrac{dx}{(x+3)(x+5)}$ 5+5

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4. (a) Evaluate :· $\displaystyle\int \frac{xdx}{\sqrt{2x+3}+\sqrt{5+2x}}$

   (b) If $y = ae^{Mx} + be^{-Mx}$, show that $\dfrac{d^2 y}{dx^2} - M^2 y = 0$.

   5+5

5. (a) The demand function of a firm is $3p + x = 48$, where p is the price per unit and x is the number of units demanded. Find the level of output where total revenue is maximised.

   (b) Find the area bounded by the straight lines $3x + 4y = 12$, $x = 1$ and x-axis.

   5+5

6. (a) If $f(x) = \dfrac{1-x}{1+x}$, find $f\left\{f\left(\dfrac{1}{x}\right)\right\}, (x \ne 0)$.

   (b) Find $\dfrac{dy}{dx}$ when $y = x^x + x^2$.

   5+5

7. (a) Solve by Cramer's Rule : $\dfrac{1}{x} + \dfrac{1}{y} + \dfrac{1}{z} = 1, \dfrac{2}{x} + \dfrac{5}{y} + \dfrac{3}{z} = 0, \dfrac{1}{x} + \dfrac{2}{y} + \dfrac{4}{z} = 3$.

   (b) If $A = \begin{bmatrix} 1 & 2 & 1 \\ 1 & -4 & 1 \\ 3 & 0 & -3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 & 1 \\ 1 & -1 & 0 \\ 2 & 1 & -1 \end{bmatrix}$, show that $AB = 6I_3 (I_3$ is the identity matrix of order 3).

   Utilise this result to solve $2x + y + z = 5$, $x - y = 0$ and $2x + y - z = 1$.

   5+5

8. (a) Solve for x, y, z and t if $\begin{bmatrix} x-z & -x-z \\ 7-t & 6+z \end{bmatrix} = \begin{bmatrix} 3-t & 5-t \\ t+5 & x-y \end{bmatrix}$.

   (b) Find the value of x, when $\begin{vmatrix} x-1 & 1 & 1 \\ 1 & x+1 & -1 \\ -1 & 1 & x+1 \end{vmatrix} = 0$.

   5+5

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