2020

ADVANCED BUSINESS MATHEMATICS — HONOURS

Paper : DSE-5.1A

(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. 10×4=40

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

    (b) The total cost C of producing x items is given by $C = \begin{cases} 100 + 5x, 0 \le x \le 500 \\ 2000 + 4x, 500 < x \le 2000 \end{cases}$

    Show that C is discontinuous at $x = 500$. 5+5

2. (a) If $A - 2B = \begin{bmatrix} -7 & 7 \\ 4 & -8 \end{bmatrix}$ and $A - 3B = \begin{bmatrix} -11 & 9 \\ 4 & -13 \end{bmatrix}$, find the matrices A and B.

    (b) Prove that $\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ x^3 & y^3 & z^3 \end{vmatrix} = xyz(x-y)(y-z)(z-x)$. 5+5

3. (a) Evaluate : $\displaystyle\int \dfrac{(4x-3)^3}{x^2}\,dx$.

    (b) Find $\dfrac{d^2y}{dx^2}$, if $y^3 + 3ax^2 + x^3 = 0$. 5+5

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4. (a) If $y = \log\left(x + \sqrt{1 + x^2}\right)$, then show that $\left(1 + x^2\right)y_2 + xy_1 = 0$.

(b) A firm produces x tonnes of output at a total cost Rs. R where $R = \dfrac{1}{10}x^3 - 5x^2 + 10x + 5$.
Find at what level of output, average cost be minimum and what level will it be.   5+5

5. (a) Find the area included between $y^2 = 9x$ and $y = x$.

(b) The price p and quantity q of a commodity are related by $q = 32 - 4p - p^2$; find the marginal revenue when $p = 3$.   5+5

6. (a) Evaluate : $\displaystyle\int \dfrac{dx}{\sqrt{x+1} - \sqrt{x-1}}$.

(b) Evaluate : $\displaystyle\int \dfrac{5x + 2}{(x-2)(x-3)}dx.$ 5+5

7. (a) Solve by Cramer's Rule the following set of equations :
$2x + 3y - z = 9$; $x + y + z = 9$; $3x - y - z = -1$.

(b) Verify that the matrix $A = \dfrac{1}{3}\begin{bmatrix} -1 & 2 & -2 \\ -2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ is an orthogonal matrix.   5+5

8. Find the inverse of $\begin{bmatrix} 1 & 1 & -2 \\ -2 & 1 & -2 \\ 1 & 0 & 2 \end{bmatrix}$ and hence solve the following system of equations

$x + y - 2z = 4$; $-2x + y - 2z = 1$; $x + 2z = 3$.   10
8

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