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BT-3/D-21 **43195**

MATHEMATICS FOR BIG DATA AND OPTIMIZATION

Paper : BS-CS-AIDS-201A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt any *five* questions in all selecting at least *one* auestion from each unit. All questions carry equal marks.

UNIT–I

1. (a) Find the fourier series expansion of

$$f(x) = 2x - x^3 \text{ in } (0,\ 2\pi)\,. \qquad (7.5)$$

(b) Express the function in Q1(a) as half range Sine series in the interval (0,3). (7.5)

2. (a) Using Parseval's identity for Fourier Transform, evaluate

$$\int_0^{\infty} \frac{dt}{(9+t^2)\,(25+t^2)}\,. \qquad (7.5)$$

(b) Find the Fourier sine transform of $\dfrac{e^{-ax}}{x}$. (7.5)

UNIT–II

3. (a) Solve the differential equation :

$$(3x^2 + 6xy^2)\,dx + (6x^2y + 4y^3)\,dy = 0\,. \qquad (7.5)$$

(b) By variation of parameter, find the solution of

$$\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = \sin x \cdot \qquad (7.5)$$

4. Solve the equation :

$$(D^2 + a^2)y = \cos ax + e^{-2x} . \qquad (15)$$

UNIT–III

5. (a) Find the root of the equation $x \log_{10} x - 1$, correct to four decimal places, by Regula Falsi method. (7.5)

(b) Estimate the missing term from the following table :

x	0	1	2	3	4
$F(x)$	1	3	9	–	81

(7.5)

6. (a) Find the maximum and minimum value of $y(x)$ from the function tabulated below :

x	–2	–1	0	1	2	3	4
$y(x)$	2	–0.25	0	–0.25	2	15.75	56

(7.5)

(b) Given that $\frac{dy}{dx} = x^2 + y$, and $y = 1, x = 0$.

Find an approximate value of y at $x = 0.5$ by modified Euler's method. (7.5)

UNIT–IV

7. Using Kuhn Tucker method,

Minimize $f = x_1^2 + x_2^2 + 60x_1$,

subject to $x_1 - 80 \geq 0, x_1 + x_2 - 120 \geq 0$. (15)

8. Determine the extreme points as well as evaluate the following function $f(x)$:

where $f(x) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6.$ (15)