

PART - C

5. (a) Solve the differential equation

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 25y = e^{2x} + \sin x + x. \quad (7 \text{ Marks})$$

(b) Solve :

$$\frac{d^3x}{dt^3} - 3\frac{d^2x}{dt^2} + 4x = 2 \cosh 2t \quad (7 \text{ Marks})$$

(c) Using the method of variation of parameters find the solution of

$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = \frac{e^x}{x} \quad (6 \text{ Marks})$$

6. (a) Solve the differential equation

$$\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = e^{2x} + \sin x$$

by the method of undetermined coefficients. (7 Marks)

(b) Find the solution of the differential equation

$$(2x - 1)^2 \frac{d^2y}{dx^2} + (2x - 1) \frac{dy}{dx} - 2y = 8x^2 - 2x + 3 \quad (7 \text{ Marks})$$

(c) Solve the initial-value problem

$$\frac{d^2x}{dt^2} + 4\frac{dx}{dt} + 29x = 0, \text{ given } x(0) = 0, \frac{dx}{dt}(0) = 15. \quad (6 \text{ Marks})$$

PART - D

7. (a) Find the Laplace transform of

i) $e^{2t} \cos 2t$ ii) $\frac{1 - \cos 3t}{t}$ (7 Marks)

(b) Find the Laplace transform of the function $f(t) = E \sin \frac{\pi t}{\omega}$, $0 < t < \omega$, given that $f(t + \omega) = f(t)$. (7 Marks)

(c) Express the function

$$f(t) = \begin{cases} \pi - t, & 0 < t \leq \pi \\ \sin t, & t > \pi \end{cases}$$

in terms of unit step function and hence find its Laplace transform. (6 Marks)

8. (a) Find the inverse Laplace transform of

i) $\frac{2s-1}{s^2+2s+17}$ ii) $\frac{e^{-2s}}{(s-3)^2}$ (7 Marks)

(b) Using convolution theorem find the inverse Laplace transform of $\frac{1}{s(s^2+9)}$ (7 Marks)

(c) Solve, using Laplace transform, the differential equation

$$\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 1 - e^{2x}$$

given that $y(0) = 1$ and $\frac{dy}{dx} = 1$ at $x = 0$. (6 Marks)

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