

PART C

5. (a) Solve $\frac{d^2y}{dx^2} + 4y = x^2 + \cos 2x + 2^{-x}$ (7 Marks)
- (b) Solve $\frac{d^2y}{dx^2} - y = x \sin x + (1 + x^2)e^x$ (7 Marks)
- (c) Using the method of variation of parameters solve

$$\frac{d^2y}{dx^2} + 4y = \tan 2x \quad (6 \text{ Marks})$$

6. (a) Using the method of undetermined coefficients, solve

$$\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 4y = 2x^2 + 3e^{-x} \quad (7 \text{ Marks})$$

$$(b) \text{ Solve } x^3 \frac{dy^3}{dx^3} + 3x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + 8y = 65 \cos(\log x) \quad (7 \text{ Marks})$$

- (c) Solve the initial value problem

$$\frac{d^2y}{dx^2} + 4 \frac{dy}{dx} + 5y + 2 \cosh x = 0$$

$$\text{given } y = 0, \frac{dy}{dx} = 1 \text{ at } x = 0 \quad (6 \text{ Marks})$$

PART D

7. (a) Find the Laplace Transforms of

i) $t^2 e^{-3t} \sin 2t$

ii) $\frac{\cos 2t - \cos 3t}{t}$

(7 Marks)

- (b) Find the Laplace Transform of the full-wave rectifier

$$f(t) = E \sin \omega t, \quad 0 < t < \frac{\pi}{\omega}$$

having period $\frac{\pi}{\omega}$

(7 Marks)

- (c) Find

i) $L[e^{-t} u(t-2)]$

ii) $L[t^2 u(t-3)]$

(6 Marks)

8. (a) Find the inverse Laplace Transform of

i) $\frac{1}{s^2(s+1)}$

ii) $\cot^{-1}\left(\frac{s}{a}\right)$

(7 Marks)

(b) Evaluate: $L^{-1}\left\{\frac{s}{(s^2+a^2)^2}\right\}$ using convolution theorem. (7 Marks)

- (c) Using Laplace Transforms solve

$$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - 3y = \sin t$$

$$\text{given } y = 0, \frac{dy}{dt} = 0 \text{ when } t = 0$$

(6 Marks)

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(c) Evaluate $\int_0^\infty e^{-st} \sin t dt$ (d) Given that $y = \frac{1}{2} \sin 2t + \frac{1}{2} \cos 2t$ (e) Out of the spheres $x_1^2 + x_2^2 + x_3^2 = 9$ (f) If $\int_{-\infty}^{\infty} e^{-st} f(t) dt = F(s)$ (g) If $\int_{-\infty}^{\infty} e^{-st} f(t) dt = F(s)$ (h) If $\int_{-\infty}^{\infty} e^{-st} f(t) dt = F(s)$ (i) If $\int_{-\infty}^{\infty} e^{-st} f(t) dt = F(s)$ (j) If $\int_{-\infty}^{\infty} e^{-st} f(t) dt = F(s)$