

Ques

$$\frac{d^2x}{dt^2} - 3x - 4y = 0 \quad \text{--- (1)}$$

$$\frac{d^2y}{dt^2} + x + y = 0 \quad \text{--- (2)}$$

$$\Rightarrow \frac{d^2x}{dt^2} - 3x - 4y = 0 \Rightarrow (D^2 - 3)x - 4y = 0 \quad \text{--- (3)}$$

$$\frac{d^2y}{dt^2} + y + x = 0 \Rightarrow x + (D^2 + 1)y = 0 \quad \text{--- (4)}$$

$$\Rightarrow (D^2 - 3)x - 4y = 0$$

$$(D^2 - 3)x + (D^2 - 3)(D^2 + 1)y = 0$$

$$-(D^2 - 3)(D^2 + 1)y - 4y = 0$$

$$\Rightarrow (D^2 + 1)(D^2 - 3)y + 4y = 0$$

$$(D^4 - 3D^2 + D^2 - 3 + 4)y = 0$$

$$\Rightarrow (D^4 - 2D^2 + 1)y = 0$$

$$\Rightarrow (D^2 - 1)^2 y = 0$$

Auxiliary equation $(m^2 - 1)^2 = 0$

$$\Rightarrow m^2 - 1 = 0 \quad ; \quad m^2 - 1 = 0$$

$$\Rightarrow m = \pm 1 \quad ; \quad m = \pm 1$$

$$y(t) = (c_1 + c_2 t)e^t + (c_3 + c_4 t)e^{-t}$$

$$y(t) = (c_1 + c_2 t)e^t + (c_3 + c_4 t)e^{-t} \quad \text{--- (B)}$$

by A Equation (4) we get

$$x = -(D^2 + 1)y \quad \text{--- (B)}$$

$$y(t) = (c_1 + c_2 t)e^t + (c_3 + c_4 t)e^{-t}$$

$$\frac{dy}{dt} = (c_1 + c_2 t)e^t + (c_3 + c_4 t)e^{-t}(-1) + c_2 e^t + c_4 e^{-t}$$

$$\frac{dy}{dt} = (c_1 + c_2 + c_2 t)e^t + (c_4 - c_3 + c_4 t)e^{-t}$$

$$\text{let } A = c_1 + c_2 \quad ; \quad B = c_4 - c_3$$

$$\frac{dy}{dt} = (A + c_2 t)e^t + (B - c_4 t)e^{-t}$$

$$\frac{d^2 y}{dt^2} = (A + c_2 t)e^t + c_2 + (B - c_4 t)e^{-t}(-1) + (-c_4)e^{-t}$$

$$\frac{d^2 y}{dt^2} = (c_1 + 2c_2 + c_2 t)e^t + (c_4 + c_3 - c_4 - c_4 t)e^{-t} \quad \text{--- (7)}$$

putting equation (5) and (7) in equation (6) we get

$$x(t) = - \frac{d^2 y}{dt^2} - y(t)$$

$$x(t) = - \left[(C_1 + 2C_2 + C_2 t) e^t + (C_3 - 2C_4 - C_4 t) e^{-t} + (C_1 + C_2 t) e^t + (C_3 + C_4 t) e^{-t} \right]$$