

Diketahui: $\sin t$

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Civil Engrg.

$$1) \frac{d^2x}{dt^2} + 5 \frac{dx}{dt} + 6x = \cos t$$

$$x = Ae^{kt}$$

$$\frac{dx}{dt} = Ake^{kt}$$

$$\frac{d^2x}{dt^2} = Ak^2e^{kt}$$

$$Ak^2e^{kt} + 5Ake^{kt} + 6Ae^{kt} = 0$$

$$Ae^{kt} (k^2 + 5k + 6) = 0$$

$$k^2 + 5k + 6 = 0$$

$$k_1 = -2$$

$$k_2 = -3$$

$$\Rightarrow Ae^{-2t} + Be^{-3t}$$

~~if~~ $\cos t$ $P(x) = \cos t$ $y = C \cos t + D \sin t$
 $\frac{dy}{dx} = -C \sin t + D \cos t$

$$-2 \cos t - 0 \sin t$$

$$-2 \cos t - 0 \sin t + 5(-C \cos t + 0 \sin t) + 6(C \cos t + 0 \sin t) = C \cos t + 0 \sin t$$

$$-2 + 5D + 6C = 1 \quad \dots (1)$$

$$-0 - 5C + 6D = 0 \quad \dots (2)$$

$$5D - 5C = 0$$

$$5D = 5C$$

$$D = C \quad \dots (3)$$

$$-2 + 5D + 6C = 1$$

$$5D + 5C = 3$$

$$5D + 5D = 3$$

$$10D = 3$$

$$D = \frac{3}{10}$$

Since $C = D$

$$C = \frac{3}{10}$$

$$y = \frac{3}{10} \cos t + \frac{3}{10} \sin t$$

$$x = Ae^{-2t} + Be^{-3t} + \frac{1}{10}(\cos t + \sin t)$$

When $t=0$, $x=0.1$, $\frac{dx}{dt} = 0.1$

$$x = Ae^{-2t} + Be^{-3t} + \frac{1}{10}(\cos t + \sin t)$$

$$\frac{dx}{dt} = -2Ae^{-2t} - 3Be^{-3t} + \frac{1}{10}(-\sin t + \cos t)$$

When $t=0$

$$x=0.1$$

$$0.1 = Ae^{-2(0)} + Be^{-3(0)} + \frac{1}{10}(\cos(0) + \sin(0))$$

$$0.1 = A + B + \frac{1}{10}$$

$$0.1 - \frac{1}{10} = A + B$$

$$A + B = 0 \quad \dots (1)$$

When $t=0$

$$\frac{dx}{dt} = 0$$

$$0 = -2Ae^{-2(0)} - 3Be^{-3(0)} + \frac{1}{10}(-\sin(0) + \cos(0))$$

$$0 = -2A - 3B + \frac{1}{10}(\cos(0) + \sin(0))$$

$$\cancel{2A+B} \quad 2A+3B = 0.1 \quad \dots (ii)$$

$$A+B = 0$$

$$2A+3B = 0.1$$

$$A = -0.1$$

$$B = 0.1$$

$$x = \Rightarrow -0.1e^{-2t} + 0.1e^{3t} + \frac{1}{10} (\cos t + \sin t)$$

$$x = \cancel{-0.1e^{-2t}}$$