

$$(2 \times 10^3) \ddot{x} + (18 \times 10^3) x + (5 \times 10^3) = 0$$

$t=0, x=0$ & $\dot{x}=0.$

Soln:

$$(2 \times 10^3) \ddot{x} + (18 \times 10^3) x = -(5 \times 10^3)$$

$$\underline{2\ddot{x} + 18x = -5}$$

$$2\ddot{x} + 18x = 0$$

$$2m^2 + 18 = 0$$

$$m^2 = -9$$

$$m = \pm j3 = 0 \pm j3$$

$$x_c = \underline{A \cos(3t) + B \sin(3t)}$$

$$X = C$$

$$\dot{X} = \dot{X} = 0$$

$$2(0) + 18C = -5$$

$$C = -\frac{5}{18}$$

$$x = x_c + X$$

$$= A \cos(3t) + B \sin(3t) - \frac{5}{18}$$

$$t=0, x=0$$

$$0 = A \underbrace{\cos(0)}_{=1} + B \underbrace{\sin(0)}_{=0} - \frac{5}{18}$$

$$0 = A - \frac{5}{18} \Rightarrow A = \frac{5}{18}$$

$$t=0, \dot{x}=0$$

$$x = A \cos(3t) + B \sin(3t) - \frac{5}{18}$$

$$\dot{x} = -3A \sin(3t) + 3B \cos(3t)$$

$$0 = -3A \underbrace{\sin(0)}_{=0} + 3B \underbrace{\cos(0)}_{=1}$$

$$0 = 3B \Rightarrow B = 0$$

$$x = \frac{5}{18} \cos(3t) + 0 - \frac{5}{18}$$

$$x = \frac{5}{18} [\cos(3t) - 1]$$

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