

$$\frac{d^2 i}{dt^2} + 3 \frac{di}{dt} + 2i = 5e^{-3t}$$

$$t=0, \quad i=0 \quad \& \quad \frac{di}{dt} = 0.$$

Soln:

$$m^2 + 3m + 2 = 0$$

$$(m+2)(m+1) = 0$$

$$m_1 = -2, \quad m_2 = -1$$

$$i_c = Ae^{-2t} + Be^{-t}$$

Trial function

$$I = Ce^{-3t}$$

$$\frac{dI}{dt} = -3Ce^{-3t}$$

$$\frac{d^2 I}{dt^2} = 9Ce^{-3t}$$

$$\underbrace{9Ce^{-3t} + 3(-3C)e^{-3t}}_{=0} + 2Ce^{-3t} = 5e^{-3t}$$

$$2C = 5$$

$$C = \frac{5}{2}$$

$$i = i_c + I$$

$$i = Ae^{-2t} + Be^{-t} + \frac{5}{2}e^{-3t}$$

When  $t=0, i=0$

(2)

$$0 = A e^0 + B e^0 + \frac{5}{2} e^0$$

$$A + B = -\frac{5}{2} \quad \text{--- (1)}$$

$t=0, \frac{di}{dt} = 0$

$$i = A e^{-2t} + B e^{-t} + \frac{5}{2} e^{-3t}$$

$$\frac{di}{dt} = -2A e^{-2t} - B e^{-t} - \frac{15}{2} e^{-3t}$$

$$0 = -2A - B - \frac{15}{2}$$

$$\rightarrow 2A + B = -\frac{15}{2} \quad \text{--- (2)}$$

$$A = -5 \quad \& \quad B = \frac{5}{2}$$

$$i = -5e^{-2t} + \frac{5}{2}e^{-t} + \frac{5}{2}e^{-3t}$$

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