



$$i(0) = 0$$

$$L_1 \frac{di}{dt} + R_1 i = 120 \sin(60(\pi t)) \cdot u(t-4)$$

$$\frac{d^3 y}{dt^3} - 2 \frac{d^2 y}{dt^2} + 4 \frac{dy}{dt} - 6y = 2 \cos(3t) \quad \begin{matrix} y(0) = 2 \\ y'(0) = -2 \\ y''(0) = 4 \end{matrix}$$

LODE(3) c.c. NH.

$$\mathcal{L}\left\{\frac{d^3 y}{dt^3} - 2 \frac{d^2 y}{dt^2} + 4 \frac{dy}{dt} - 6y\right\} = \mathcal{L}\{2 \cos(3t)\}$$

$$\mathcal{L}\left\{\frac{d^3 y}{dt^3}\right\} - 2\mathcal{L}\left\{\frac{d^2 y}{dt^2}\right\} + 4\mathcal{L}\left\{\frac{dy}{dt}\right\} - 6\mathcal{L}\{y\} = 2\mathcal{L}\{\cos(3t)\}$$

$$\left[s^3 \mathcal{L}\{y\} - s^2 y(0) - s y'(0) - y''(0)\right] - 2\left[s^2 \mathcal{L}\{y\} - s y(0) - y'(0)\right] + 4\left[s \mathcal{L}\{y\} - y(0)\right] - 6 \mathcal{L}\{y\} = 2 \left[\frac{s}{s^2 + 9}\right]$$

$$(s^3 \mathcal{L}\{y\} - 2s^2 + 2s - 4) - 2(s^2 \mathcal{L}\{y\} - 2s + 2) + 4(s \mathcal{L}\{y\} - 2) - 6 \mathcal{L}\{y\} = \frac{2s}{s^2 + 9}$$

$$(s^3 - 2s^2 + 4s - 6) \mathcal{L}\{y\} - 2s^2 + (2-2)s + (-4+2-2) = \frac{2s}{s^2 + 9}$$

$$(s^3 - 2s^2 + 4s - 6) \mathcal{L}\{y\} = \frac{2s}{s^2 + 9} + 2s^2 + 4$$

$$(s^3 - 2s^2 + 4s - 6) \mathcal{L}\{y\} = \frac{2s + (2s^2 + 4)(s^2 + 9)}{s^2 + 9}$$

$$\mathcal{L}\{y\} = \frac{2s + (2s^2 + 4)(s^2 + 9)}{(s^2 + 9)(s^3 - 2s^2 + 4s - 6)}$$

$$\mathcal{L}\{y(t)\} = \frac{2s + (2s^2 + 4)(s^2 + 9)}{(s^2 + 9)(s^3 - 2s^2 + 4s - 6)}$$

$$= \frac{2s + 2s^4 + 22s^2 + 36}{(s^2 + 9)(s - 1.7113)(s - 0.1443 + 1.8669i)(s - 0.1443 - 1.8669i)}$$

$$= \frac{2s^4 + 22s^2 + 2s + 36}{(s^2 + 9)(s - 1.7113)((s - 0.1443)^2 + 1.8669^2)}$$

$$= \frac{As + B}{(s^2 + 9)} + \frac{C}{(s - 1.7113)} + \frac{Ds + E}{s^2 - 0.2886s + 3.4853}$$

$$2s^4 + 22s^2 + 2s + 36 = (As + B)(s^3 - 2s^2 + 4s - 6) + C(s^2 + 9)(s^2 - 0.2886s + 3.5061)$$

$$+ (Ds + E)(s^2 + 9)(s - 1.7113)$$

$$2s^4 + 22s^2 + 2s + 36 = (A + C + D)s^4 + (\quad)s^3 + (\quad)s^2 + (\quad)s + (\quad)$$

$$L\{y(t)\} = \frac{As+B}{s^2+9} + \frac{C}{s-1.7113} + \frac{Ds+E}{((s-0.1443)^2+1.8669^2)}$$

$$y(t) = A L^{-1}\left\{\frac{s}{s^2+9}\right\} + \frac{B}{3} L^{-1}\left\{\frac{3}{s^2+9}\right\} + C L^{-1}\left\{\frac{1}{s-1.7113}\right\}$$

$$+ D L^{-1}\left\{\frac{s + \frac{E}{D}}{((s-0.1443)^2+1.8669^2)}\right\}$$

$$= A \cos(3t) + \frac{B}{3} \sin(3t) + C e^{1.7113t} +$$

$$+ D L^{-1}\left\{\frac{(s-0.1443) + \left(\frac{E}{D} + 0.1443\right)}{((s-0.1443)^2+1.8669^2)}\right\}$$

$$= A \cos(3t) + \frac{B}{3} \sin(3t) + C e^{1.7113t} +$$

$$+ D L^{-1}\left\{\frac{(s-0.1443)}{(s-0.1443)^2+1.8669^2}\right\} +$$

$$+ \frac{\left(\frac{E}{D} + 0.1443\right)}{1.8669} L^{-1}\left\{\frac{1.8669}{(s-0.1443)^2+1.8669^2}\right\}$$

$$= A \cos(3t) + \frac{B}{3} \sin(3t) + C e^{1.7113t} +$$

$$+ D e^{0.1443t} \cos(1.8669t) +$$

$$+ \frac{\left(\frac{E}{D} + 0.1443\right)}{1.8669} e^{0.1443t} \sin(1.8669t)$$