

20-01759

PART II

$$3. \quad L^{-1} \left[\frac{7}{s^2 + 6} \right] = f(t) = 7 \left(\frac{1}{\sqrt{6}} \right) L^{-1} \left[\frac{7(\sqrt{6})}{s^2 + \sqrt{6}^2} \right]$$

$$= \frac{\omega}{s^2 + \omega^2} \quad \omega = \sqrt{6}$$

$$f(t) = \frac{7}{\sqrt{6}} \sin(\sqrt{6}t)$$

PART III

$$3. \quad F(s) = \frac{s^4 + 2s^3 + 3s^2 + 4s + 5}{s(s+1)}$$

$$L^{-1} \left[\frac{s^4 + 2s^3 + 3s^2 + 4s + 5}{s(s+1)} \right]$$

$$\begin{array}{r} s^2 + s + 2 \\ s^2 + s \sqrt{s^4 + 2s^3 + 3s^2 + 4s + 5} \\ \hline s^4 + s^3 \\ s^3 + 3s^2 + 4s + 5 \\ s^3 + s^2 \\ \hline 2s^2 + 4s + 5 \\ 2s^2 + 2s \\ \hline 2s + 5 \end{array}$$

$$L^{-1} \left[s^2 + s + 2 + \frac{2s+5}{s^2+s} \right]$$

$$L^{-1} \left(\frac{2s+5}{s^2+s} \right) = \frac{A}{s} + \frac{B}{s+1} = \frac{5}{s} + \frac{-3}{s+1} = 5\delta t - 3e^{-t}$$

$$2s+5 = s+1(A) + s(B)$$

$$\text{let } s=0; \quad 2(0)+5 = 0+1(A) + 0(B) \quad A=5$$

$$\text{let } s=-1; \quad 2(-1)+5 = -1+1(A) + (-1)(B) \quad B=-3$$

$$f(t) = \frac{d^2f}{dt^2} + \frac{df}{dt} + 2\delta t + 5\delta t - 3e^{-t}$$

$$f(t) = \frac{d^2f}{dt^2} + \frac{df}{dt} + 7\delta t - 3e^{-t}$$