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ME 4203

ECE 425  
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ASSIGNMENT #1

LAPLACE TRANSFORM

1)  $\mathcal{L}(3 - e^{-3t} + 5\sin 2t) = F(t)$

$$\mathcal{L}(3) = 3/s$$

$$\mathcal{L}(e^{-3t}) = \frac{1}{s+3}$$

$$\mathcal{L}(5\sin 2t) = \frac{10}{s^2+4}$$
$$= \frac{3}{s} - \frac{1}{s+3} + \frac{10}{s^2+4}$$

2)  $\mathcal{L}(3 + 12t + 42t^3 - 3e^{2t}) = F(t)$

$$\mathcal{L}(3) = 3/s$$

$$\mathcal{L}(12t) = \frac{12}{s^2}$$

$$\mathcal{L}(42t^3) = \frac{252}{s^4}$$

$$\mathcal{L}(3e^{2t}) = \frac{3}{s-2}$$

$$= \frac{3}{s} + \frac{12}{s^2} + \frac{252}{s^4} - \frac{3}{s-2}$$

3)  $\mathcal{L}[(t+1)(t+2)] = F(t)$

$$\mathcal{L}(t^2 + 3t + 2)$$

$$\mathcal{L}(t^2) = \frac{2}{s^3}$$

$$\mathcal{L}(3t) = \frac{3}{s^2}$$

$$\mathcal{L}(2) = \frac{2}{s}$$

$$= \frac{2}{s^3} + \frac{3}{s^2} + \frac{2}{s}$$

INVERSE LAPLACE

1)  $\mathcal{L}^{-1}\left(\frac{8 - 3s + s^2}{s^3}\right)$

$$\mathcal{L}^{-1}\left(\frac{8}{s^3} - \frac{3s}{s^3} + \frac{s^2}{s^3}\right)$$

$$\mathcal{L}^{-1}\left(\frac{8}{s^3}\right) = 4t^2$$

$$\mathcal{L}^{-1}\left(\frac{3s}{s^3}\right) = 3t$$

$$\mathcal{L}^{-1}\left(\frac{s^2}{s^3}\right) = 1$$

$$= 4t^2 - 3t + 1$$

2)  $\mathcal{L}^{-1}\left(\frac{5}{s-2} - \frac{4s}{s^2-9}\right)$

$$\mathcal{L}^{-1}\left(\frac{5}{s-2}\right) = 5e^{2t}$$

$$\mathcal{L}^{-1}\left(\frac{4s}{s^2-9}\right) = 4\cos(3t)$$

$$= 5e^{2t} - 4\cos(3t)$$

3)  $\mathcal{L}^{-1}\left(\frac{7}{s^2+6}\right)$

$$\mathcal{L}^{-1}\left(\frac{7}{\sqrt{6}} \cdot \frac{\sqrt{6}}{s^2 + (\sqrt{6})^2}\right)$$

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