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ME-4203

ASSIGNMENT 1

I. SOLVE FOR THE LAPLACE TRANSFORM OF THE FOLLOWING:

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

$\mathcal{L}\{3\} \rightarrow 3\mathcal{L}\{1\} = 3(1/s) = 3/s$

$\mathcal{L}\{e^{-3t}\} = 1/s+3 \; ; a = 3$

$\mathcal{L}\{5\sin 2t\} \rightarrow 5\mathcal{L}\{\sin 2t\} = 5(2/s^2+2^2) = 10/s^2+4 \; ; \omega = 2$

$\boxed{F(s) = 3/s - 1/s+3 + 10/s^2+4}$

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

$\mathcal{L}\{3\} \rightarrow 3\mathcal{L}\{1\} = 3(1/s) = 3/s$

$\mathcal{L}\{12t\} \rightarrow 12\mathcal{L}\{t\} = 12(1/s^2) = 12/s^2$

$\mathcal{L}\{42t^3\} \rightarrow 42\mathcal{L}\{t^3\} \; ; n = 3 = 42(3!/s^{3+1}) = 42(6/s^4) = 252/s^4$

$\mathcal{L}\{3e^{2t}\} \rightarrow 3\mathcal{L}\{e^{2t}\} = 3(1/s-2) = 3/s-2 \; ; a = 2$

$\boxed{F(s) = 3/s + 12/s^2 + 252/s^4 - 3/s-2}$

3. $\mathcal{L}\{(t+1)(t+2)\} = F(s)$

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

$\mathcal{L}\{t^2\} \; ; n = 2 \rightarrow 2!/s^{2+1} = 2/s^3$

$\mathcal{L}\{3t\} \rightarrow 3\mathcal{L}\{t\} = 3(1/s^2) = 3/s^2$

$\mathcal{L}\{2\} \rightarrow 2\mathcal{L}\{1\} = 2(1/s) = 2/s$

$\boxed{F(s) = 2/s^3 + 3/s^2 + 2/s}$

II. SOLVE FOR THE INVERSE LAPLACE TRANSFER OF THE FOLLOWING:

1. $\mathcal{L}^{-1}\{8-3s+s^2/s^3\} = f(t)$

$\mathcal{L}^{-1}\{8/s^3 - 3/s^2 + 1/s) = f(t)$

$\mathcal{L}^{-1}\{8/s^3\} \rightarrow 4\mathcal{L}^{-1}\{2/s^3\} = 4t^2$

$\mathcal{L}^{-1}\{3/s^2\} \rightarrow 3\mathcal{L}^{-1}\{1/s^2\} = 3t$

$\mathcal{L}^{-1}\{1/s\} = u(t)$ or 1

$\boxed{f(t) = (4t^2 - 3t + 1)}$

2. $\mathcal{L}^{-1}\{5/s-2 - 4s/s^2+9\} = f(t)$

$\mathcal{L}^{-1}\{5/s-2\} \rightarrow 5\mathcal{L}^{-1}\{1/s-2\} = 5e^{2t}$

$\mathcal{L}^{-1}\{4s/s^2+9\} \rightarrow 4\mathcal{L}^{-1}\{s/s^2+9\} = 4\cos 3t$

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

3. $\mathcal{L}^{-1}\{7/s^2+6\} = f(t)$

$7\mathcal{L}^{-1}\{1/s^2+6) = 7/\sqrt{6}\,\mathcal{L}^{-1}\{\sqrt{6}/s^2+6\} = [7/\sqrt{6}\,(\sin\sqrt{6})]\,\sqrt{6}/\sqrt{6}$

$\boxed{f(t) = 7\sqrt{6}/6 \, \sin\sqrt{6}}$