Rengo Prass - 11921ECP004

1) a) $\frac{1}{s}$ b) $\frac{1}{s^2}$ c) $\frac{w}{s^2+w^2}$ d) $\frac{s}{s^2+w^2}$

2) a) $\frac{w}{(s+a)^2+w^2}$ b) $\frac{(s+a)}{(s+a)+w^2}$ c) $\frac{6}{s^4}$

6) a) $\frac{8 \cdot 2^{\frac{1}{2}}(s+3)(s^2-12s+9)}{(s^2+9)^3}$

b) $\frac{12s + 6 \cdot 3^{\frac{1}{2}} s - 18 \cdot 3^{\frac{1}{2}} + \frac{9 \cdot 3^{\frac{1}{2}} s^2}{2} + 24}{(s^2+4s+20)^2}$

7) a) $\frac{(s+5)(s^2+3s+10)}{(s+3)(s+4)(s^2+2s+100)} = G(s)$

$G(t) = \frac{20e^{-3t}}{103} - \frac{7e^{-4t}}{64} + 5263e^{-t}\left(\frac{\cos(3 \cdot 11^{\frac{1}{2}} t) - 11^{\frac{1}{2}} \sin(3 \cdot 11^{\frac{1}{2}} t)}{57233}\right)$

$\frac{119e^{-4t}\left(\cos(1 \cdot 3^{\frac{1}{2}} t) - \frac{4262 \cdot 13^{\frac{1}{2}} \sin(13^{\frac{1}{2}} t)}{15587}\right)}{417}$

$-65e^{-\frac{5t}{2}}\left(\cos\left(\frac{3^{\frac{1}{2}} t}{2}\right) + \frac{137 - 3^{\frac{1}{2}} \sin(3^{\frac{1}{2}} t)}{15}\right) - \frac{266e^{-3t}}{9 \cdot 2}$

8) $(s^3+3s^2+5s+7)Y(s) = (s^3+4s^2+6s+8)X(s)$

$\frac{Y(s)}{X(s)} = \frac{s^3+4s+6s+8}{s^3+3s^2+5s+7}$

9) a) $\frac{d^2x}{dt^2} + 5\frac{dx}{dt} + 10x = 7f$

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b) $\frac{d^2x}{dt^2} + 21\frac{dx}{dt} + 110x = 15f$

c) $\frac{d^3x}{dt^3} + 11\frac{d^2x}{dt^2} + 12\frac{dx}{dt} + 18x = \frac{df}{dt} + 3f$

10) $\frac{d^6c}{dt^6} + 7\frac{d^5c}{dt^5} + 3\frac{d^4}{dt^4} + 2\frac{d^3c}{dt^3} + \frac{d^2c}{dt^2} + 5c = \frac{d^5r}{dt^6}$

$+ 2\frac{d^4r}{dt^4} \Rightarrow 4\frac{d^3r}{dt^3} + \frac{d^2r}{dt^2} + 4r$

11) $\frac{d^5c}{dt^5} + 3\frac{d^4c}{dt^4} + 2\frac{d^3c}{dt^3} + 4\frac{d^2c}{dt^2} + 5\frac{dc}{dt} + 2c = \frac{d^4r}{dt^4}$

$\Rightarrow 2\frac{d^2r}{dt^2} + \frac{dr}{dt} + r$

para $r(t) = t^3$

$\frac{d^5c}{dt^5} + 3\frac{d^4c}{dt^4} + 2\frac{d^3c}{dt^3} + 4\frac{d^2c}{dt^2} + 5\frac{dc}{dt} + 2c = 18\delta(t)$
$\Rightarrow (36 + 90t + 9t^2 + 3t^3)\,U(t)$

12) $[s^2x(s) - s + 1] + 4[sx(s) - 1] + 5x(s) = R(s)$

$x(s) = \frac{R(s)}{s^2+4s+5} + \frac{s+1}{s^2+4s+5}$

$R(s) \rightarrow \otimes \rightarrow \frac{1}{s^2+4s+5} \rightarrow x(s)$

13) a) $\frac{5(s+15)(s+26)(s+72)}{s(s+55)(s+24,97)(s^2+0,87)(s^2+5s+30)}$

b) $\frac{5s^3+565s^2+16710s+140400}{s^6+87s^5+1977s^4+13010s^3+60410s^2+16000s}$

14) a) $\frac{s^4+25s^3+20s^2+15s+42}{s^5+13s^4+9s^3+37s^2+35s+50}$

b) $\frac{(s+24,2)(s+1,35)(s^2-0,5462s+1,286)}{(s+12,5)(s^2+1,463s+1,493)(s^2-0,964s+2,679)}$

15) $\frac{10^4(s+70)(s+5)}{s(s+55)(s+45)(s^2+6s+95)(s^2+7s+110)}$

Franklin – cap 3

3,2) b) $\frac{3}{s}+\frac{7}{s^2}+\frac{2!}{s}+1=\frac{s^3+3s^2+7s+2}{s^3}$

d) $f(t)=(t+1)=t^2+2t+1$

$\mathcal{L}\{f(t)\}=\frac{2!}{s^3}+\frac{2}{s^2}+\frac{1}{s}=\frac{s^2+2s+2}{s^3}$

e) $f(t)\ \mathrm{senh}(t)=\frac{e^t-e^{-t}}{2}$

$=\frac{1}{2}\left(\frac{1}{s-1}\right)-\frac{1}{2}\left(\frac{1}{s+1}\right)=\frac{1}{s^2-1}$

3,3) a) $\frac{3s}{s^2+36}$ b) $\frac{2}{s^2+4}+\frac{2s}{s^2+4}+\frac{2}{(s+1)^2+4}$

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c) $\frac{2!}{s^3} + \frac{3}{(s+2)+4}$

3.5. a) $f(t) - \frac{1}{2}\cos 2t - \frac{1}{2}\cos(4t)$
$\mathcal{L}(f(t)) = \frac{6s^2}{(s^2+4)(s^2+16)}$

b) $f(t) = \frac{1-\cos 2t}{2} + 3\left(\frac{1+\cos 2t}{2}\right) = 2 + \cos 2t$
$\mathcal{L}\{f(t)\} = \frac{2}{s} + \frac{s}{s^2+4}$
c) $\frac{\pi}{2} - \tan^{-1}(s)$

3.7. a) $f(t) = 1(t) - e^{-2t}\,1(t)$

d) $F(s) = \frac{c_1}{s+1} + \frac{c\,e\,s + c_2}{s^2+5s+1)}$
$f(t) = \frac{2}{5}e^{-t} - \frac{2}{5}\cos 2t + \frac{6}{5}\operatorname{sen} 2t$

i) $\cos(t)\operatorname{senh}(t) + \operatorname{sen}(t)\left\{\frac{-e^{-t}+e^{t}}{2}\right\}$
j) $f(t) = (t-1)(t-1)$
3.9) a) $f(t) = \frac{d}{d\theta}\left[e^{t}\operatorname{sen}\sqrt{3}t\right] =$
$\frac{1}{\sqrt{3}}e^{t}\operatorname{sen}\sqrt{3}t + e^{t}\cos\sqrt{3}t$
e) $y(t) = \frac{3}{2} + \frac{1}{3}e^{-t} - \frac{5}{6}e^{-2t}$

f) $y(t) = t + \cos t - 2\operatorname{sen} t$