$$F(s)=\frac{10s}{(s+1)(s+2)(s+3)}$$

$$F(s)=\frac{A}{(s+1)}+\frac{B}{(s+2)}+\frac{C}{(s+3)}$$

$$A=\frac{10(-1)}{(-1+2)(-1+3)}=\frac{-10}{(1)(2)}=-5,\quad B=\frac{10(-2)}{(-2+1)(-2+3)}=\frac{-20}{(-1)(1)}=20$$

$$C=\frac{10(-3)}{(-3+1)(-3+2)}=\frac{-30}{(-2)(-1)}=\frac{-30}{2}=-15$$

$$F(s)=-\frac{5}{(s+1)}+\frac{20}{(s+2)}-\frac{15}{(s+3)}\Rightarrow f(t)=u(t)\left[-5e^{-t}+20e^{-2t}-15e^{-3t}\right]$$

$$F(s)=\frac{2s^2+4s+1}{(s+1)(s+2)^3}=\frac{A}{s+1}+\frac{B}{(s+2)^3}+\frac{C}{(s+2)^2}+\frac{D}{(s+2)}$$

$$A=\frac{2-4+1}{(-1+2)^3}=\frac{-1}{1}=-1,\quad B\Rightarrow \overset{s=0}{\frac{1}{(1)(2)^3}}=\frac{1}{8}=-1+\frac{B}{8}+\frac{C}{4}+\frac{D}{2}$$

$$C\Rightarrow \overset{s=-3}{\frac{18-12+1}{(-2)(-1)^3}}=\frac{7}{2}=\frac{1}{2}+\frac{B}{-1}+\frac{C}{1}+\frac{D}{-1}\Rightarrow \frac{B}{8}+\frac{C}{4}+\frac{D}{2}=\frac{9}{8}$$

$$\Rightarrow -B+C-D=\frac{6}{2}$$

$$D\Rightarrow \overset{s=1}{\frac{2+4+1}{(3)(3)^3}}=\frac{7}{54}=-\frac{1}{2}+\frac{B}{27}+\frac{C}{9}+\frac{D}{3}\Rightarrow \frac{B}{27}+\frac{C}{9}+\frac{D}{3}=\frac{17}{27}$$

$$B=-1,\quad C=3,\quad D=1$$

$$F(s)=-\frac{1}{s+1}-\frac{1}{(s+2)^3}+\frac{3}{(s+2)^2}+\frac{1}{(s+2)}$$

$$\Rightarrow f(t)=u(t)\left[-e^{-t}-t^2e^{-2t}+3te^{-2t}+e^{-2t}\right]$$

$$F(s) = \frac{s+1}{(s+2)(s^2+2s+5)} \qquad \alpha = 1 \Rightarrow \alpha^2 = 1 \quad \omega^2 = 5-1 = 4 \Rightarrow \omega = 2$$
$$\beta^2 = 5$$

$$H(s) = \frac{A}{s+2} + \frac{k_1(s+1)}{(s+1)^2+4} + \frac{k_2\,2}{(s+1)^2+4} = -\frac{1}{5(s+2)} + \frac{k_1(s+1)}{(s+1)^2+4} + \frac{2k_2}{(s+1)^2+4}$$

$$A = \frac{-2+1}{(4-4+5)} = \frac{-1}{5} = -\frac{1}{5}$$

Con $s=0$

$$\frac{1}{(2)(5)} = \frac{1}{10} = -\frac{1}{5(2)} + \frac{k_1}{1+4} + \frac{2k_2}{1+4}$$

$$\frac{1}{10} = -\frac{1}{10} + \frac{k_1}{5} + \frac{2k_2}{5} \Rightarrow \frac{1}{5} = \frac{k_1}{5} + \frac{2k_2}{5} \Rightarrow \boxed{k_1 + 2k_2 = 1}$$

Con $s=-3$

$$\frac{-3+1}{(-3+2)(9-6+5)} = \frac{-2}{(-1)(8)} = \frac{1}{4} = -\frac{1}{5(-3+2)} + \frac{k_1(-3+1)}{(-3+1)^2+4} + \frac{2k_2}{(-3+1)^2+4}$$

$k_1 = 1/5 \quad k_2 = 2/5$

$$\frac{1}{4} = -\frac{1}{5(-1)} + \frac{k_1(-2)}{(-2)^2+4} + \frac{2k_2}{(-2)^2+4}$$

$$\frac{1}{4} = \frac{1}{5} - \frac{2}{8}k_1 + \frac{2}{8}k_2 \Rightarrow \boxed{\frac{k_1}{4} - \frac{k_2}{4} = -\frac{1}{20}}$$

$$H(s) = -\frac{1}{5(s+2)} + \frac{(s+1)}{5[(s+1)^2+4]} + \frac{2}{5}\frac{2}{(s+1)^2+4}$$

$$h(t) = u(t)\left[-\frac{1}{5}e^{-2t} + \frac{1}{5}e^{-t}\cos(2t) + \frac{2}{5}e^{-t}\operatorname{sen}(2t)\right]$$

$$F(s)=\frac{8(s+1)(s+3)}{s(s+2)(s+4)}=\frac{A}{s}+\frac{B}{s+2}+\frac{C}{s+4}$$

$$A=\frac{8(1)(3)}{(2)(4)}=\frac{24}{8}=3$$

$$B=\frac{8(-2+1)(-2+3)}{(-2)(-2+4)}=\frac{8(-1)(1)}{(-2)(2)}=\frac{-8}{-4}=2$$

$$C=\frac{8(-4+1)(-4+3)}{(-4)(-4+2)}=\frac{8(-3)(-1)}{(-4)(-2)}=3$$

$$F(s)=\frac{3}{s}+\frac{2}{s+2}+\frac{3}{s+4}\rightarrow f(t)=a(t)\left[3+2e^{-2t}+3e^{-4t}\right]$$

$$F(s)=\frac{s^2+2s+4}{(s+1)(s+2)^2}=\frac{A}{s+1}+\frac{B}{(s+2)^2}+\frac{C}{(s+2)}=\frac{A}{s+1}+\frac{B}{(s+2)^2}+\frac{C}{s+2}$$

$$A=\frac{1+2+4}{(-1+2)^2}=\frac{7}{1}=7$$

Con $s=0$

$$\frac{4}{(1)(2)^2}=\frac{4}{4}=1=\frac{7}{1}+\frac{B}{2^2}+\frac{C}{2}$$

$$1=7+\frac{1}{4}B+\frac{1}{2}C \Rightarrow \boxed{\frac{1}{4}B+\frac{1}{2}C=-6}$$

Con $s=-3$

$$\frac{9+6+4}{(-3+1)(-3+2)^2}=\frac{19}{(-2)(1)}=-\frac{19}{2}=\frac{7}{-3+1}+\frac{B}{(-3+2)^2}+\frac{C}{-3+2}$$

$$B=-12$$

$$C=-6$$

$$=-\frac{19}{2}=-\frac{7}{2}+\frac{B}{1}+\frac{C}{-1}$$

$$-6=B-C \Rightarrow \boxed{B-C=-6}$$

$$F(s)=\frac{7}{s+1}-\frac{12}{(s+2)^2}-\frac{6}{s+2}\rightarrow f(t)=a(t)\left[7e^{-t}-12te^{-2t}-6e^{-2t}\right]$$

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

$2a=4 \quad a=2$

$a^2=4$

$\beta^2=5$

$\omega^2=5-4=1 \quad \omega=1$

$$F(s)=\frac{A}{s+3}+\frac{A_1(s+2)}{(s+2)^2+1}+\frac{A_2}{(s+2)^2+1}=\frac{5}{s+3}+\frac{A_1(s+2)}{(s+2)^2+1}+\frac{A_2}{(s+2)^2+1}$$

$$A=\frac{9+1}{2}=\frac{10}{2}=5$$

Con $s=0$

$$\frac{1}{(3)(5)}=\frac{1}{15}=\frac{5}{3}+\frac{A_1(2)}{(2)^2+1}+\frac{A_2}{2^2+1}$$

$$\frac{1}{15}=\frac{5}{3}+\frac{2}{5}A_1+\frac{1}{5}A_2 \Rightarrow \boxed{\frac{2}{5}A_1+\frac{1}{5}A_2=-\frac{8}{5}}$$

Con $s=-2$

$$\frac{4+1}{(-2+3)(4-8+5)}=\frac{5}{(1)(1)}=5=\frac{5}{(-2+3)}+\frac{A_2}{1} \Rightarrow \boxed{A_2=0}$$

$$\boxed{A_1=-4}$$

$$F(s)=\frac{5}{s+3}-4\frac{(s+2)}{(s+2)^2+1} \Rightarrow f(t)=u(t)\left[5e^{-3t}-4e^{-2t}\cos(t)\right]$$