$$H_{(s)} = \frac{1}{(s+a)(s+b)^n \left((s+c)^2 + d^2\right)\left((s+e)^2 + g^2\right)^2}$$

$$\rightarrow H_{(s)} = \frac{k_1}{(s+a)} + \frac{k_{22}}{(s+b)} + \frac{k_{22}}{(s+b)^2} + \cdots + \frac{k_{2n}}{(s+b)^n}$$

$$+ \frac{k_3}{(s+c)+jd} + \frac{\overline{k_3}}{s+c-jd} + \frac{k_{41}}{(s+e)+jg} + \frac{\overline{k_{41}}}{(s+e)-jg}$$

$$+ \frac{k_{42}}{\left((s+e)+jg\right)^2} + \frac{\overline{k_{42}}}{\left((s+e)-jg\right)^2}$$

مثال : $H_{(s)} = \dfrac{s^2 + 3s + 3}{(s+1)^3}$

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

$$x\,(s+1)^3 \rightarrow \qquad = s^2 + 3s + 3 = A(s+1)^2 + B(s+1) + C$$

$$\underset{\longleftrightarrow}{s = -1} \qquad C = 1$$

مُشتَق $\rightarrow$ نسبت به S $\dfrac{d}{dS}$ $\rightarrow$ $2A(S+1) + B = 2S + 3$

$\underrightarrow{S = -1}$ $B = 1$ دوباره مُشتَق $\underrightarrow{}$ $2A = 2 \rightarrow A = 1$

حالت کلی $\rightarrow$ درجه‌ی کمتر از n :

$$\dfrac{}{(S+b)^n} = \dfrac{k_1}{(S+b)} + \dfrac{k_2}{(S+b)^2} + \cdots + \dfrac{k_n}{(S+b)^n}$$

$$\Rightarrow k_{n-i} = \left[\dfrac{1}{i!} \dfrac{d^i}{dS^i} \left[(S+b)^n H_{(S)} \right] \right]_{S = -b}$$

مثلاً : $k_1 = \dfrac{1}{(n-1)!} \left[\dfrac{d^{n-1}}{dS^{n-1}} \left[(S+b)^n H_{(S)} \right] \right]_{S = -b}$

$\vdots$

مثال : $H_{(S)} = \dfrac{12(S+30)}{S(S+5)(S+3)^2}$

$\rightarrow H_{(S)} = \dfrac{A}{S} + \dfrac{B}{S+5} + \dfrac{C}{(S+3)} + \dfrac{D}{(S+3)^2}$

$\rightarrow A = \left(H_{(S)} \cdot S \right)_{S=0} = \dfrac{12 \times 30}{5 \times 9} = 8$

$\rightarrow B = \left[H_{(S)} \cdot (S+5) \right]_{S=-5} = \dfrac{12(25)}{(-5)(4)} = -15$

$\rightarrow D = \left[H_{(S)} \cdot (S+3)^2 \right]_{S=-3} = \dfrac{12(27)}{(-3)(2)} = -54$

$\rightarrow$

مثال: $H_{(s)} = \dfrac{100(S+3)}{(S+6)(\underbrace{S^2+6S+25}_{(S+3)^2+4^2})}$

$\rightarrow H_{(s)} = \dfrac{A}{S+6} + \dfrac{B}{(S+3)+4j} + \dfrac{\bar{B}}{S+3-4j}$

$\rightarrow A = \left[H_{(s)}(S+6)\right]_{S=-6} = \dfrac{100(-3)}{(36-36+25)} = -12$

$\rightarrow B = H_{(s)}(S+3+4j)$

$\rightarrow B = \dfrac{100(S+3)}{(S+6)(S+3-4j)}\Big|_{S=-3-4j} = \dfrac{100(-4j)}{(3-4j)(-8j)}$

$\rightarrow B = \dfrac{50}{3-4j} = \dfrac{50}{5\angle-53°} = \dfrac{10}{\angle-53°}$

$3-4j \Rightarrow 5\angle tg^{-1}\dfrac{-4}{3}$ ← پاسخ زاویه ای

$\Rightarrow B = 10\angle 53°$ $\rightarrow \bar{B} = 10\angle-53°$

$\rightarrow H_{(s)} = \underbrace{\dfrac{-12}{S+6}} + \underbrace{\dfrac{10\angle 53°}{(S+3)+4j}} + \underbrace{\dfrac{10\angle-53°}{(S+3)-4j}}$

$-12e^{-6t}u_{(t)}$ $10\angle53° e^{(-3-4j)t}u_{(t)}$ $10\angle-53° e^{(-3+4j)t}u_{(t)}$

اگر جواب به این صورت باشد ←

$$\frac{K_2}{S+C+jd} + \frac{\overline{K_2}}{S+C-jd}$$

5   لاپلاس معکوس ← : $2|K_2| e^{-Ct} \cos(dt + \angle K_2)\, U_{(t)}$

برای مثال قبل : $\dfrac{10 \angle 53°}{(S+3)+4j}$ لاپلاس معکوس ← $2 \times 10 \times e^{-3t} \cos(4t + \angle 53°)$
$$\times U_{(t)}$$

10

15

20

25