

**UNIT-3**  
**(Lecture-2)**

**Network Synthesis**

## Methods to synthesize

$$G(s) = \frac{b_N s^N + b_{N-1} s^{N-1} + \dots + b_1 s + b_0}{s^D + a_{D-1} s^{D-1} + \dots + a_1 s + a_0}$$

$$D \leq N+1$$

- Partial Fraction

$$G(s) = K_1 s + K_2 + \frac{K_3}{s-p_1} + \frac{K_4}{s-p_2} + \dots + \frac{K_D}{s-p_D}$$

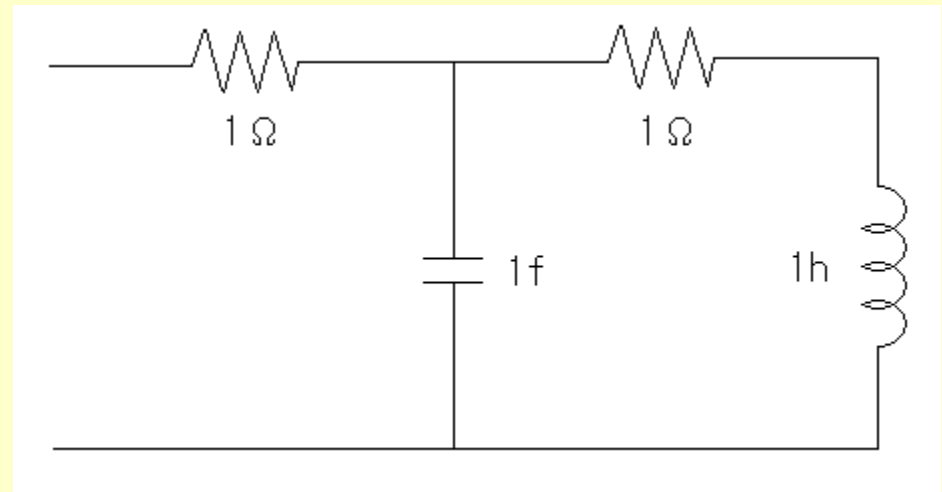
- Continued Fraction

$$G(s) = q_1 s + q_2 + \frac{1}{q_3 s + \frac{1}{q_4 s + \frac{1}{q_5 s + \dots}}}$$

## Continued Fraction Expansion

$$Z(s) = \frac{s^2 + 2s + 2}{s^2 + s + 1}$$

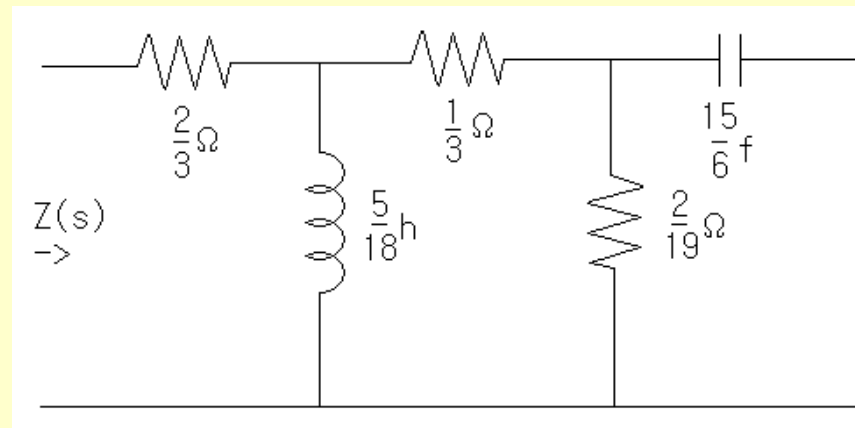
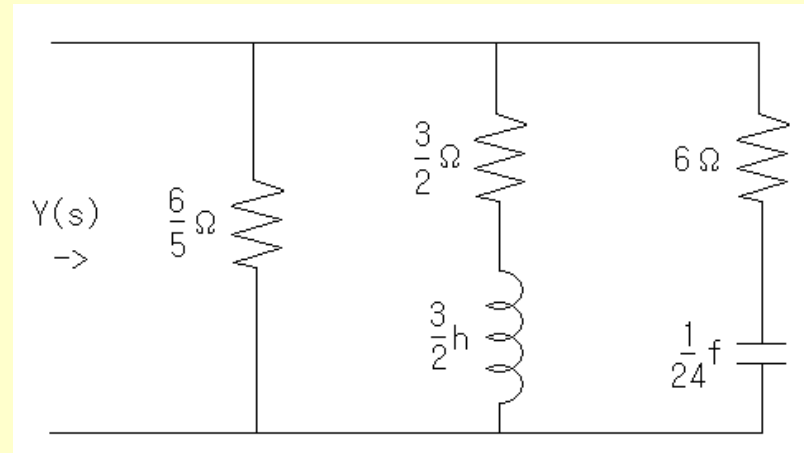
$$Z(s) = 1 + \frac{1}{s + \frac{1}{s + 1}}$$



# Partial Fraction Expansion

$$Y(s) = \frac{(s+2)(s+3)}{(s+1)(s+4)}$$

$$Y(s) = \frac{5}{6} + \frac{\frac{2}{3}}{s+1} + \frac{\frac{1}{6}s}{s+4}$$



## Practice Problem

- Synthesize following impedance function

$$Z(s) = \frac{(s+2)(s+4)}{(s+1)(s+5)}$$

