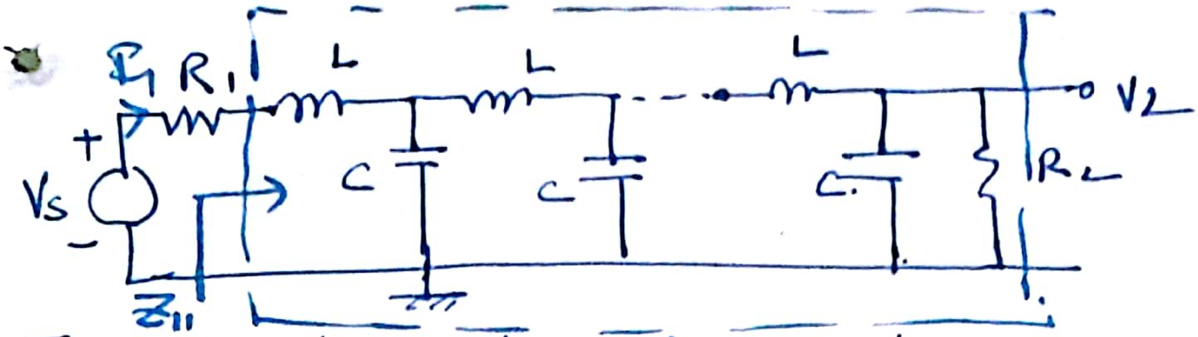

The generalized transfer function,

$$T(s) = \frac{V_2}{V_1} = \frac{K}{b_n s^n + b_{n-1} s^{n-1} + \cdots b_1 s + b_0} = \frac{K}{Q(s)}$$

$$\Rightarrow \frac{V_2}{V_1}(s = j\omega = 0) = \frac{K}{b_0} = \frac{R_2}{R_1 + R_2} \quad \text{[Scaling of the output].}$$

$$Z_{11} = R_{11} + jX_{11}$$

$$I_1 = \frac{V_s}{R_1 + Z_{11}}.$$

Power dissipated in Z_{11},

$$R_{11} |I_1(j\omega)|^2 = \frac{|V_2(j\omega)|^2}{R_2}.$$

$$\Rightarrow R_{11} \frac{|V_s|^2}{|R_1 + Z_{11}|^2} = \frac{|V_2(j\omega)|^2}{R_2}.$$

$$|T(j\omega)|^2 = \frac{|V_2(j\omega)|^2}{|V_s(j\omega)|^2} = \frac{R_2 R_{11}}{|R_1 + Z_{11}|^2}$$

Auxiliary Function,

$$|A(j\omega)|^2 = 1 - 4\frac{R_1}{R_2}|T(j\omega)|^2 = 1 - 4\frac{R_1}{\cancel{R_2}} \frac{\cancel{R_2} R_{11}}{|R_1 + Z_{11}|^2}$$

$$= \frac{|Z_{11} + R_1|^2 - 4R_1 R_{11}}{|Z_{11} + R_1|^2}$$

$$= \frac{|(R_{11} + R_1) + jX_{11}|^2 - 4R_1 R_{11}}{|Z_{11} + R_1|^2}$$

$$= \frac{(R_{11} + R_1)^2 + X_{11}^2 - 4R_1 R_{11}}{|Z_{11} + R_1|^2}$$

$$= \frac{(R_{11} - R_1)^2 + X_{11}^2}{|Z_{11} + R_1|^2} = \cancel{\frac{(R_1 - R_{11})^2 + X_{11}^2}{|Z_{11} + R_1|^2}}$$

$$= \frac{|Z_{11} - R_1|^2}{|Z_{11} + R_1|^2}$$

$$|A(j\omega)|^2 = \frac{|R_1 - Z_{11}|^2}{|R_1 + Z_{11}|^2}$$

Suppose, $A(s) = E(s) + O(s)$, where E are the even and O are the odd terms

$A(-s) = E(s) - O(s)$.

$\Rightarrow A(s)A(-s) = E^2 - O^2$

$\Rightarrow A(s)A(-s)|_{s=j\omega} = |E(j\omega)|^2 + |O(j\omega)|^2$

$= |A(j\omega)|^2$

$\Rightarrow |A(j\omega)|^2 = A(s)A(-s)|_{s=j\omega}$.

$$A(s)A(-s)|_{s=j\omega} = \frac{|R_1 - Z_{11}|^2}{|R_1 + Z_{11}|^2}$$

$\Rightarrow A(s) = \pm \left(\frac{R_1 - Z_{11}}{R_1 + Z_{11}}\right)$.

[I can choose
$A(s) = E(s) + O(s)$
or $A(s) = -[E(s) + O(s)]$
or $A(s) = E - O$
or $A(s) = O - E$]

$\Rightarrow Z_{11} = R_1 \frac{1-A}{1+A}$

or $Z_{11} = R_1 \left[\frac{1+A}{1-A}\right]$

Flow chart.

$T(j\omega) \rightarrow T(s) \rightarrow A(s) = 1 - 4\frac{R_1}{R_2}T(s) \rightarrow Z_{11}$

Please follow the book for rest of the discussion.