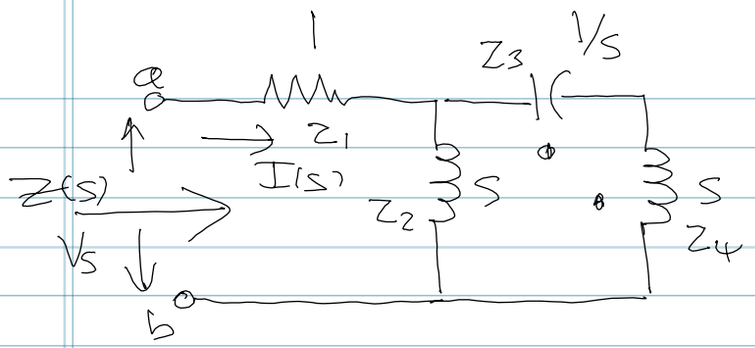
Example 4 Using series + ||el combination



$$Z(s) = \left[(Z_3 + Z_4) \| Z_2 \right] + Z_1$$

$Z(s)$ $\left(\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} \right)$

$$\frac{1}{Z_a} = \frac{1}{Z_3 + Z_4} + \frac{1}{Z_2} = \frac{Z_2 + Z_3 + Z_4}{Z_2(Z_3 + Z_4)}$$

$$Z_a = \frac{Z_2(Z_3 + Z_4)}{Z_2 + Z_3 + Z_4}$$

$$Z(s) = \frac{Z_2(Z_3 + Z_4)}{Z_2 + Z_3 + Z_4} + Z_1$$

$$= \frac{Z_2(Z_3 + Z_4) + Z_1(Z_2 + Z_3 + Z_4)}{Z_2 + Z_3 + Z_4}$$

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

$$= \frac{s^3 + 2s^2 + s + 1}{2s^2 + 1}$$