

### Question 1

For the circuit shown in Fig. 1,

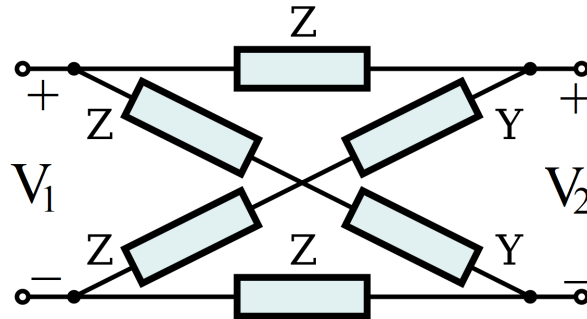


Figure 1: Lattice network.

(a) Find the transfer function  $H(s) = \frac{V_2(s)}{V_1(s)}$ , where  $Z(s)$  and  $Y(s)$  denote impedance and admittance of two single-port passive network.

(b) Let  $Z = s + \frac{1}{s}$  and  $Y = s + \frac{1}{s}$  be a series and a parallel LC network, respectively. Find the simplified transfer function  $H(s) = \frac{V_2(s)}{V_1(s)}$  and the corresponding frequency response  $H(j\omega) = \frac{V_2(j\omega)}{V_1(j\omega)}$ .

(c) Draw the zero-pole diagram of  $H(s)$  calculated in part (b).

(d) Draw the approximated amplitude and phase response of  $H(j\omega)$  calculated in part (b).