Assignment 1

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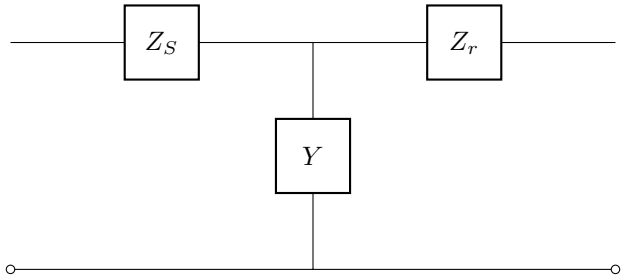
1 Problem 1: Find the ABCD parameters of the network below



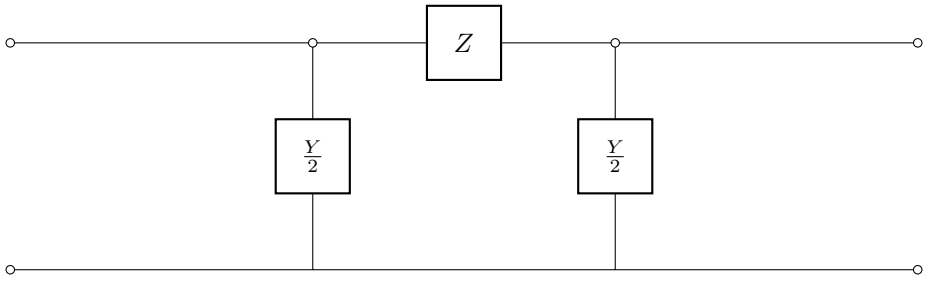
$$V_i = AV_o + BI_o$$
$$I_i = CV_o + DI_o$$

The receiving end is open-circuited meaning the receiving end current $I_o = 0$.

$$V_i = I_s(Z_s + Y)$$
$$V_o = I_S\left(\frac{Y}{Y + Z_s}\right) \; by\ voltage\ division$$
$$\frac{V_i}{V_o} = Y$$
$$V_i = YV_o$$
$$A = Y, B = 0$$

2 Problem 2: Find the y parameters and ABCD parameters of the network below

2.1 y parameters



$$Y_{Y11} = \frac{1}{Z_{Y11}}, \quad Y_{Y12} = -\frac{1}{Z_{Y12}}, \quad Y_{Y21} = -\frac{1}{Z_{Y21}}, \quad Y_{Y22} = \frac{1}{Z_{Y22}}$$

$$Y_{Zr11} = \frac{1}{Z_{Zr11}}, \quad Y_{Zr12} = -\frac{1}{Z_{Zr12}}, \quad Y_{Zr21} = -\frac{1}{Z_{Zr21}}, \quad Y_{Zr22} = \frac{1}{Z_{Zr22}}$$

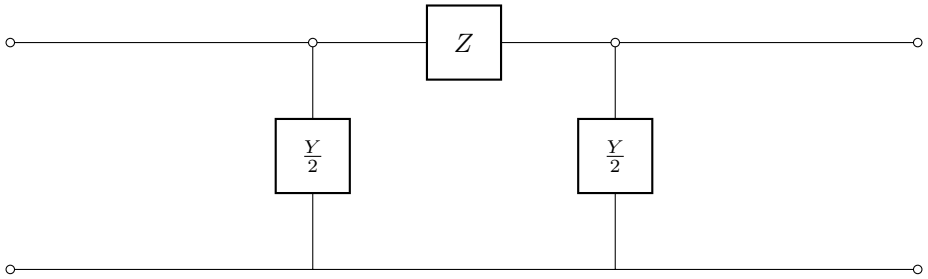
$$Y_{\text{net11}} = Y_{Y11} + Y_{Y12} + Y_{Zr11} + Y_{Zr22}$$

$$Y_{\text{net12}} = Y_{Y12} + Y_{Zr12}$$

$$Y_{\text{net21}} = Y_{Y21} + Y_{Zr21}$$

$$Y_{\text{net22}} = Y_{Y22} + Y_{Y21} + Y_{Zr11} + Y_{Zr22}$$

2.2 ABCD parameters



$$A_{\text{net}} = A_Y + \frac{B_Y}{Z_{Zr11}} C_Y$$

$$B_{\text{net}} = B_Y + \frac{B_Y}{Z_{Zr11}} D_Y C_Y$$

$$C_{\text{net}} = C_Y + D_Y C_Y$$

$$D_{\text{net}} = D_Y + \frac{C_Y}{Z_{Zr11}} D_Y C_Y$$