NETWORK ANALYSIS AND SYNTHESIS

Two Port Networks

Y parameters:

$$y_{11} = \frac{I_1}{V_1}\Bigg|_{V_2=0}$$

y_{11} is the admittance seen looking into port 1 when port 2 is shorted.

$$y_{12} = \frac{I_1}{V_2}\Bigg|_{V_1=0}$$

y_{12} is a transfer admittance. It is the ratio of the current at port 1 to the voltage at port 2 when port 1 is shorted.

$$y_{21} = \frac{I_2}{V_1}\Bigg|_{V_2=0}$$

y_{21} is a transfer impedance. It is the ratio of the current at port 2 to the voltage at port 1 when port 2 is shorted.

$$y_{22} = \frac{I_2}{V_2}\Bigg|_{V_1=0}$$

y_{22} is the admittance seen looking into port 2 when port 1 is shorted.

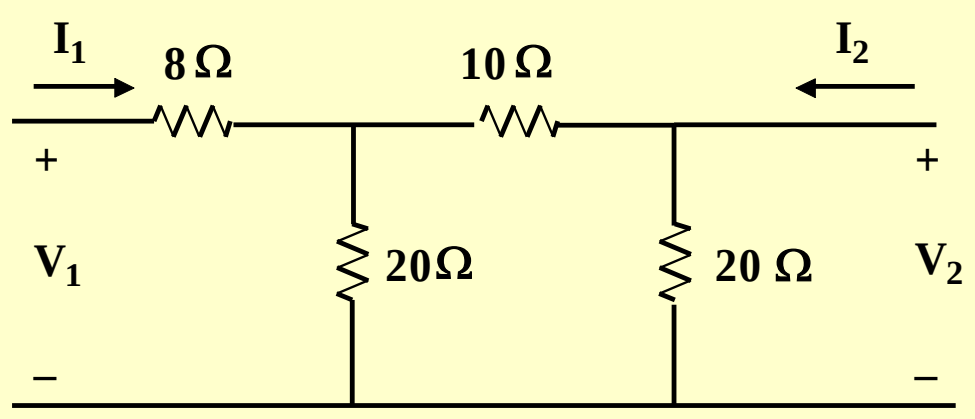
* notes

Two Port Networks

Z parameters:

Example 1

Given the following circuit. Determine the Z parameters.



Find the Z parameters for the above network.

Two Port Networks

Z parameters:

Example 1 (cont 1)

For z_{11}:

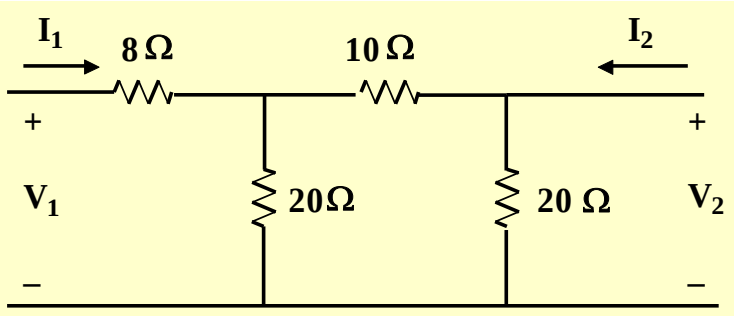
$Z_{11} = 8 + 20||30 = 20\ \Omega$

For z_{22}:

$Z_{22} = 20||30 = 12\ \Omega$

For z_{12}:

$$z_{12} = \frac{V_1}{I_2} \Big|_{I_1=0}$$



$$V_1 = \frac{20 x I_2 x 20}{20 + 30} = 8 x I_2$$

Therefore:

$$z_{12} = \frac{8 x I_2}{I_2} = 8\ \Omega = z_{21}$$

Two Port Networks

Z parameters:

Example 1 (cont 2)

The Z parameter equations can be expressed in matrix form as follows.

$$\begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} z_{11} & z_{12} \\ z_{21} & z_{22} \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix}$$

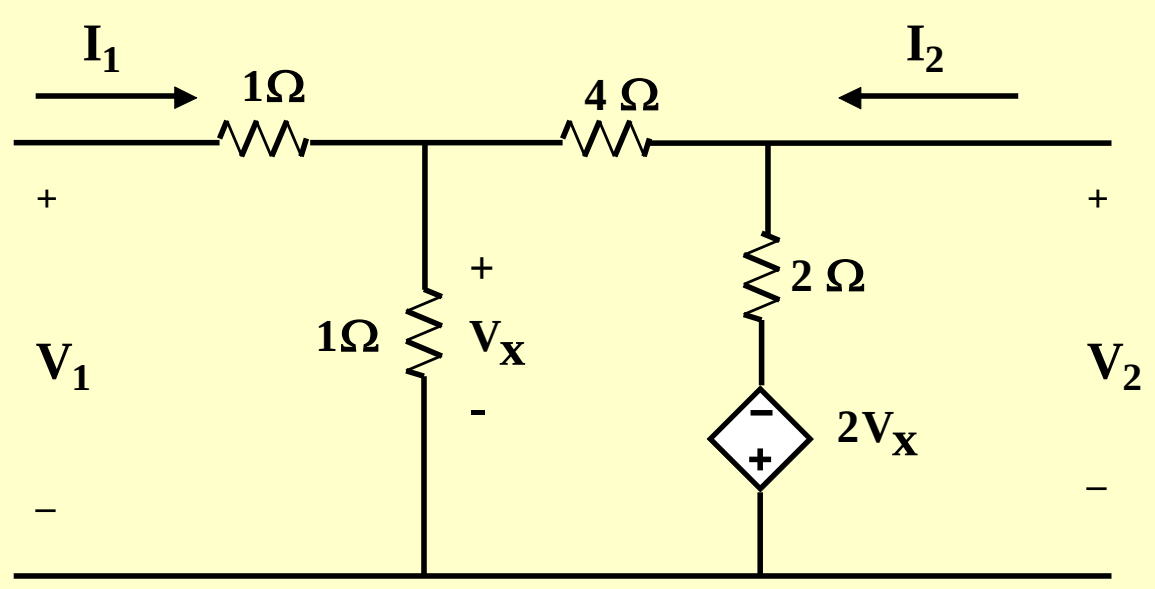
$$\begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} 20 & 8 \\ 8 & 12 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix}$$

Two Port Networks

Z parameters:

Example 2 (problem 18.7 Alexander & Sadiku)

You are given the following circuit. Find the Z parameters.



THANKS….

Queries Please…