☺ Friday, October 18, 2024 ☹

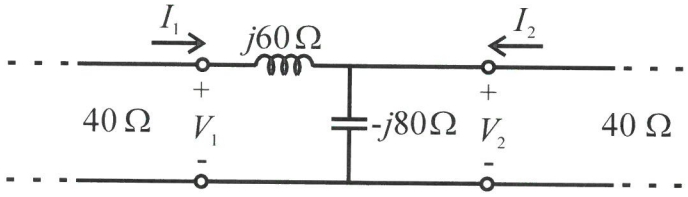
A/B

EE 481/581 Microwave Engineering Quiz #6 (Fall 2024)

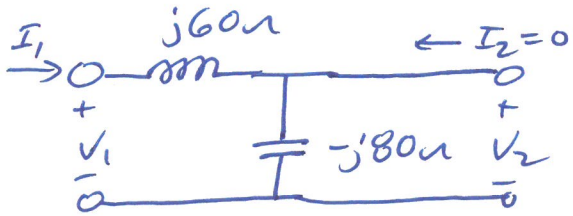
Name Key A + B

Instructions: Open notes & text. Place answers in indicated spaces. **Show** & **clearly label** all work for partial credit.

Find the [*Z*]-matrix for the two-port *L*-section shown below.



Z_{11} & Z_{21} → set $I_2 = 0$



By KVL and Ohm's Law

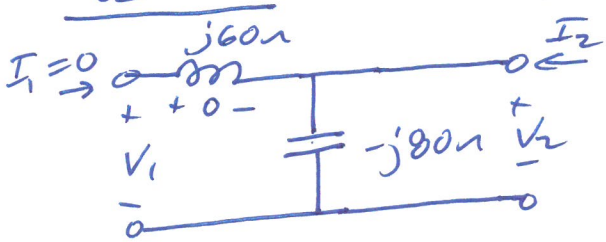
$V_1 = I_1(j60 - j80) = -j20 I_1$

$V_2 = I_1(-j80) = -j80 I_1$

$$Z_{11} = \left.\frac{V_1}{I_1}\right|_{I_2=0} = \frac{-j20 I_1}{I_1} = -j20\,\Omega$$

$$Z_{21} = \left.\frac{V_2}{I_1}\right|_{I_2=0} = \frac{-j80 I_1}{I_1} = -j80\,\Omega$$

Z_{22} & Z_{12} → set $I_1 = 0$



By KVL and Ohm's Law

$V_1 = V_2 = -j80\, I_2$

$$Z_{22} = \left.\frac{V_2}{I_2}\right|_{I_1=0} = \frac{-j80 I_2}{I_2} = -j80\,\Omega$$

$$Z_{12} = \left.\frac{V_1}{I_2}\right|_{I_1=0} = \frac{-j80 I_2}{I_2} = -j80\,\Omega$$

$$[Z] = \begin{bmatrix} -j20\,\Omega & -j80\,\Omega \\ -j80\,\Omega & -j80\,\Omega \end{bmatrix}$$