二端口网络

习题讲解

1. 求题图所示二端网络的Z参数。

$$Z_{11} = \left.\frac{\dot{U}_1}{\dot{I}_1}\right|_{\dot{I}_2=0} = (1+2)//(1+2) = \frac{3}{2}\Omega$$

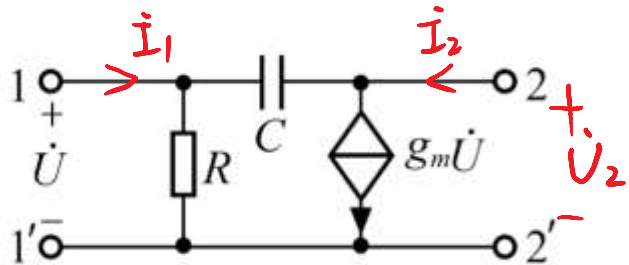$$Z_{12} = \left.\frac{\dot{U}_1}{\dot{I}_2}\right|_{\dot{I}_1=0} = \frac{\dfrac{\dot{I}_2}{2}\times 2 - \dfrac{\dot{I}_2}{2}\times 1}{\dot{I}_2} = \frac{1}{2}\Omega$$
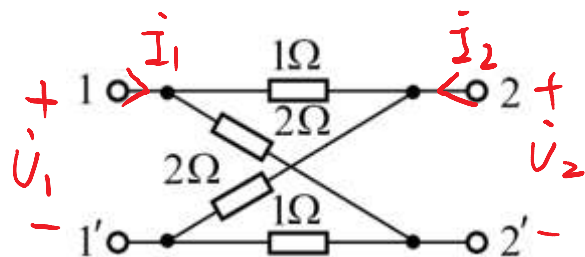
$$Z = \begin{bmatrix} \dfrac{3}{2} & \dfrac{1}{2} \\ \dfrac{1}{2} & \dfrac{3}{2} \end{bmatrix}\Omega$$

$$Z_{21} = Z_{12} = \frac{1}{2}\Omega$$

$$Z_{22} = \left.\frac{\dot{U}_2}{\dot{I}_2}\right|_{\dot{I}_1=0} = \frac{3}{2}\Omega$$

2. 求题图所示二端网络的Y参数。

$$\dot{I}_1 = \frac{\dot{U}}{R} + (\dot{U} - \dot{U}_2)\mathrm{j}\omega C$$

$$\dot{I}_2 = g_\mathrm{m}\dot{U} + (\dot{U}_2 - \dot{U})\mathrm{j}\omega C$$

$$\dot{I}_1 = (\frac{1}{R} + \mathrm{j}\omega C)\dot{U} + (-\mathrm{j}\omega C)\dot{U}_2$$

$$\dot{I}_2 = (g_\mathrm{m} - \mathrm{j}\omega C)\dot{U} + \mathrm{j}\omega C\dot{U}_2$$

$$Y = \begin{bmatrix} \dfrac{1}{R} + \mathrm{j}\omega C & -\mathrm{j}\omega C \\[2mm] g_m - \mathrm{j}\omega C & \mathrm{j}\omega C \end{bmatrix} \mathrm{S}$$

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