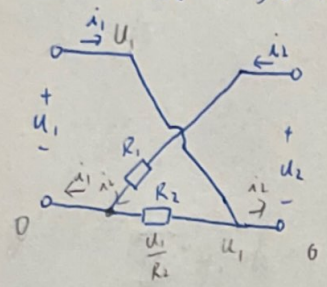
1. 求G参数和R参数.

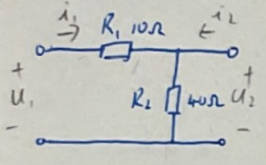


$$\begin{cases} i_2 + \frac{U_1}{R_2} = i_1 \\ R_1 i_2 - U_1 = U_2 \end{cases} \Rightarrow \begin{cases} U_1 = R_2 i_1 - R_2 i_2 \\ U_2 = -R_2 i_1 + (R_1+R_2) i_2 \end{cases}$$

$$R = \begin{bmatrix} R_2 & -R_2 \\ -R_2 & R_1+R_2 \end{bmatrix}$$

$$G = R^{-1} = \begin{bmatrix} \frac{1}{R_1}+\frac{1}{R_2} & \frac{1}{R_1} \\ \frac{1}{R_1} & \frac{1}{R_1} \end{bmatrix}$$ 高斯消元

2. 已知$R_1=10\Omega$, $R_2=40\Omega$, 求T参数.



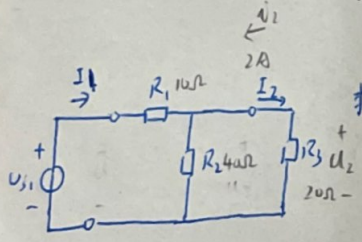
黑箱法：

$$T_{11} = \frac{U_1}{U_2}\Big|_{i_2=0} = \frac{R_1+R_2}{R_2} = \frac{10+40}{40} = \frac{5}{4} \qquad T_{12} = \frac{U_1}{-i_2}\Big|_{U_2=0} = \frac{i_1 R_1}{i_1} = R_1 = 10$$

（$i_1 = i_2$, $R_2 = 0$）

$$T_{21} = \frac{i_1}{U_2}\Big|_{i_2=0} = \frac{i_1}{i_1 R_2} = \frac{1}{R_2} = \frac{1}{40} \qquad T_{22} = \frac{i_1}{-i_2}\Big|_{U_2=0} = 1$$

$$T = \begin{bmatrix} \frac{5}{4} & 10 \\ \frac{1}{40} & 1 \end{bmatrix}$$



求U_{S1}及I

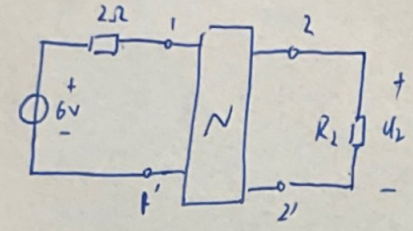
$$U_{S1} = T_{11} U_2 - T_{12} i_2 \qquad U_2 = I_2 R_3 = 2 \times 20 = 40V$$

$$I_1 = T_{21} U_2 - T_{22} i_2 \qquad i_2 = -I_2 = -2A.$$

$$U_{S1} = \frac{5}{4} \times 40 - 10 \times (-2) = 70V$$

$$I_1 = \frac{1}{40} \times 40 - 1 \times (-2) = 3A$$

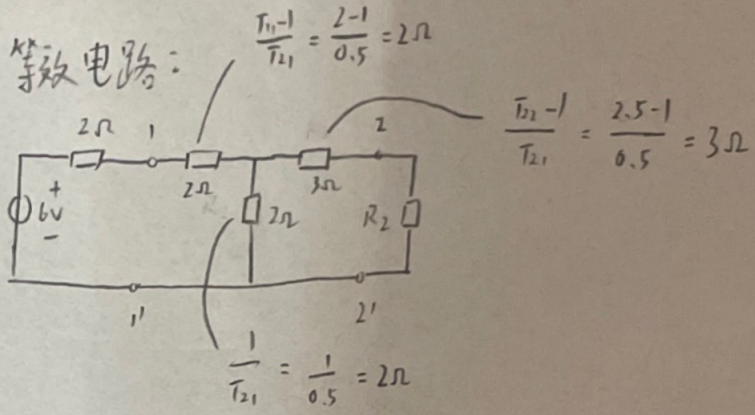
$T=\begin{bmatrix} 2 & 8\Omega \\ 0.5S & 2.5 \end{bmatrix}$，求等效电路，当$R_2$为何值时，$P_{max}$？



$T_{11}T_{22}+T_{12}T_{21}=2\times2.5+8\times0.5=0$

为互易二端口

等效电路：



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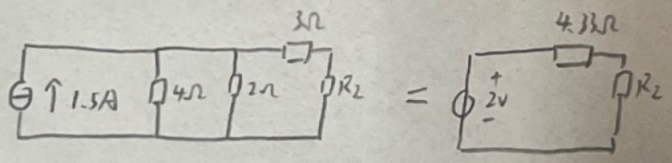

当$R_2=4.33\Omega$时，功率最大

$P_{max}=\frac{U_S^2}{4R_S}=\frac{2^2}{4\times4.33}=0.23W$.