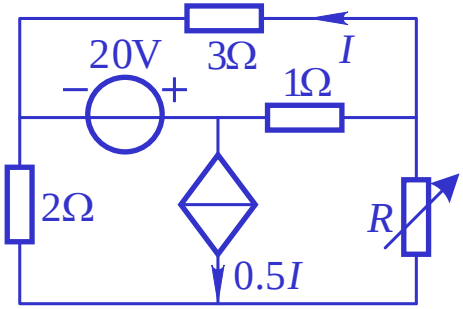
戴维南定理例题

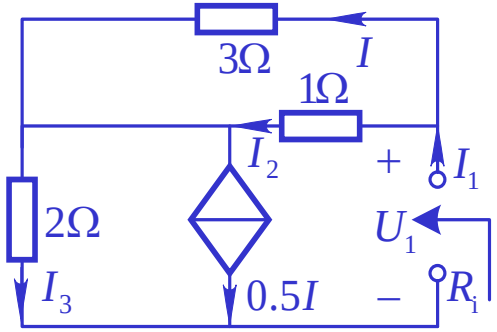
例3 图示的电阻R可调，试求R可获得的最大功率是多少？

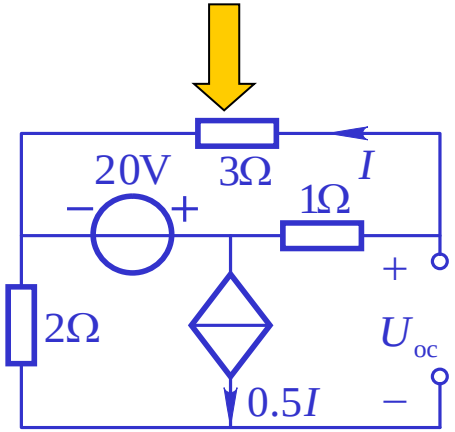


解：1)计算开路电压

$$I = 20\text{V}/(1\Omega+3\Omega) = 5\text{A}$$

$$U_{oc} = I\times 3\Omega - 0.5I\times 2\Omega = 10\text{V}$$





2)计算等效电阻

$$3\Omega\times I = 1\Omega\times I_2 \qquad I_3 = I + I_2 - 0.5I = 3.5I$$

$$R_i = \frac{U_1}{I_1} = \frac{1\Omega\times I_2 + 2\Omega\times I_3}{I + I_2} = \frac{1\Omega\times 3I + 2\Omega\times 3.5I}{I + 3I} = 2.5\Omega$$

3)求最大功率

$$\begin{cases} R = R_i = 2.5\Omega \\ P_{max} = U_{oc}^2 / 4R_i = 10\text{W} \end{cases}$$