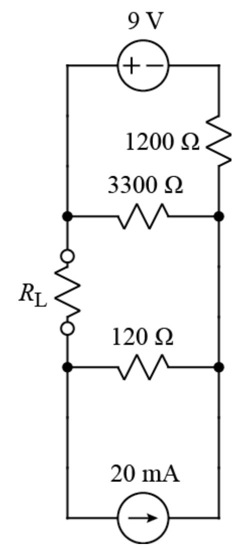
Ex:

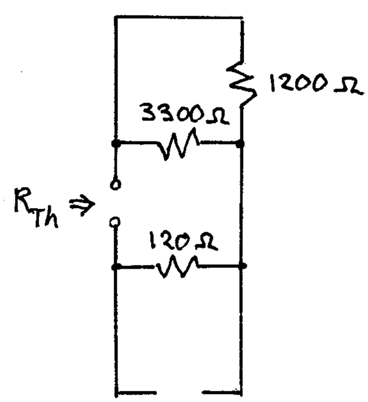


a) Calculate the value of R_L that would absorb maximum power.

b) Calculate that value of maximum power R_L could absorb.

sol'n: a) $R_L = R_{Th}$ for max pwr transfer.

We remove R_L, turn off the independent sources, and look in from the terminals for R_L to find R_{Th}.



$$R_{Th} = 120\,\Omega + 3300\,\Omega \| 1200\,\Omega$$

We have $3300 \| 1200\,\Omega = 100 \cdot 33 \| 12\,\Omega$

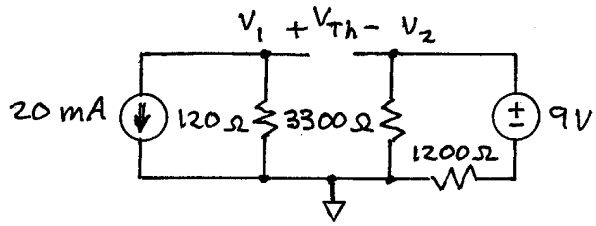
$$= \cancel{100}^{20} \cdot \frac{\cancel{396}^{44}}{\cancel{45}\,\cancel{9}}\,\Omega$$

$$= 880\,\Omega$$

So $\boxed{R_L = R_{Th} = 120\,\Omega + 880\,\Omega = 1\,k\Omega}$.

b) $$P_{max} = \frac{V_{Th}^2}{4 R_{Th}}$$

We find V_{Th} at the terminals where R_L is connected but without R_L. Since V_{Th} is squared, we may measure V_{Th} in either direction.



No current flows in the bottom wire, since otherwise charge would accumulate on one side. So the two sides act as separate circuits.

$V_1 = -20\,mA \cdot 120\,\Omega = -2.4\,V$ (ohm's law)

$V_2 = 9\,V \cdot \frac{3300\,\Omega}{3300 + 1200\,\Omega} = 6.6\,V$ (v-divider)

$V_{Th} = V_1 - V_2 = -2.4\,V - 6.6\,V = -9\,V$

$$\boxed{P_{max} = \frac{(-9\,V)^2}{4.1\,k\Omega} = 20.25\,mW}$$