Homework 4

Sunday, October 18, 2020 3:13 PM

"I pledge my honor I have abided by the Stevens Honor system."

-Alex Gaskins

*P2.80. Find the Thévenin and Norton equivalent circuits for the two-terminal circuit shown in Figure P2.80.

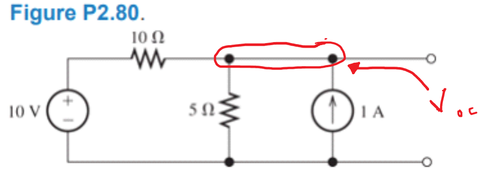


Figure P2.80

$$\frac{V_{oc} - 10}{10} + \frac{V_{oc}}{5} - 1 = 0$$

$$\frac{V_{oc}}{10} + \frac{V_{oc}}{5} = 2$$

$$\frac{3V_{oc}}{10} = 2; \quad V_{oc} = \frac{20}{3} \text{ V.}$$

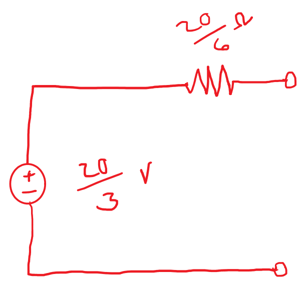
$$I_{sc} = \frac{10}{10} + 1$$

$$I_{sc} = 2 \text{ A.}$$

$$R_{th} = \frac{(20/3)}{2}$$

$$R_{th} = \frac{20}{6}\ \Omega$$

Thévenin:



Norton:

P2.88. Find the Thévenin and Norton equivalent circuits for the circuit shown in Figure P2.88.

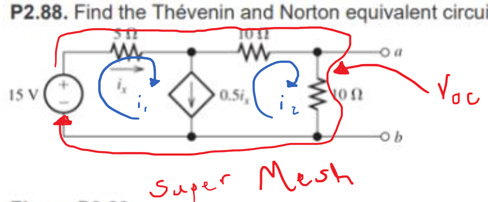
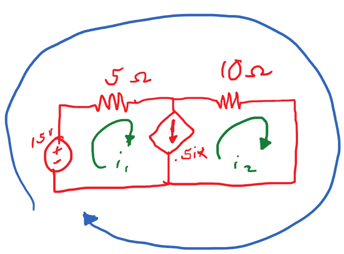


Figure P2.88

$$5i_1 + 10i_2 + 10i_2 = 15; \quad i_1 = i_x$$

$$.5i_x = i_x - i_2$$

$$i_2 = .5i_x$$



$$5i_x + 5i_x + 5i_x = 15$$

$$i_x = 1 \text{ A.}$$

$$5i_1 + 10i_2 = 15; \quad i_1 = i_x$$

$$.5i_x = i_x - i_2$$

$$i_2 = .5i_x$$

$$V = iR$$

$$V = \frac{1}{2}(10)$$

$$V_{oc} = 5 \text{ V.}$$

$$5i_x + 5i_x = 15$$

$$i_x = \frac{3}{2}\ A.$$

$$R_T = \frac{V_{oc}}{i_{sc}}$$

$$i_2 = .5\left(\frac{3}{2}\right)$$

$$i_2 = \frac{3}{4}\ A.$$

$$R_T = \frac{5}{\left(\frac{3}{2}\right)}$$

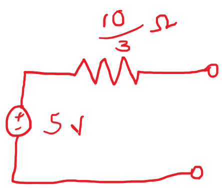
$$R_T = \frac{10}{3}\ \Omega$$

$$i_{sc} = i_2 + .5i_x$$

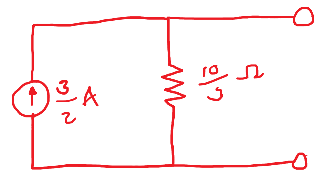
$$i_{sc} = \frac{3}{4} + \frac{3}{4}$$

$$i_{sc} = \frac{3}{2}\ A.$$

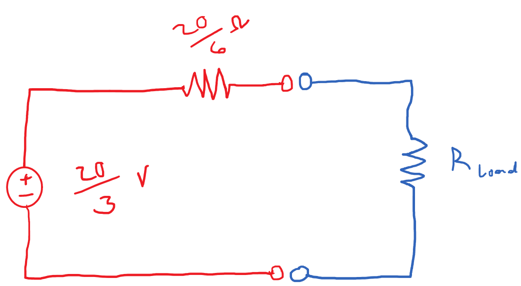
Thévenin:



Norton:



P2.89. Find the maximum power that can be delivered to a resistive load by the circuit shown in Figure P2.80. For what value of load resistance is the power maximum?



For maximum power, $R_T = R_{Load}$.

$$R_{Load} = \frac{20}{6}\ \Omega$$

$$P = \frac{V^2}{R} \quad ; \quad P = \frac{\left(\frac{20}{3}\right)^2}{\frac{20}{6} + \frac{20}{6}}$$

$$P = \frac{400}{9}\left(\frac{6}{40}\right)$$

$$P = \frac{60}{9} = \frac{20}{3}\ \text{Watts}$$

$P = \frac{60}{9} = \frac{20}{3}$ Watts