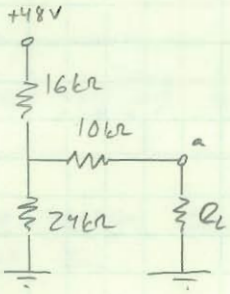
Chap 9 (19, 23, 40)

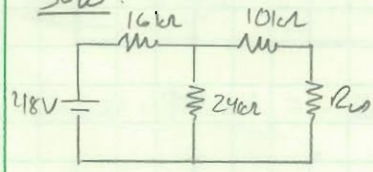
9.19

GIVEN

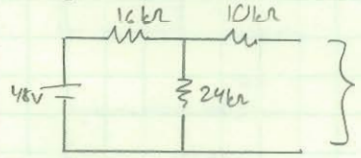


READ: FIND THEVENIN EQUIVILENT.
FIND I_{LO} w/ $R_{LO} = 0, 10k\Omega, 50k\Omega$

SOLN:



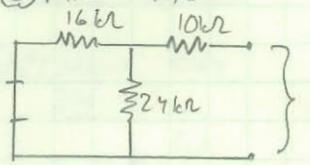
① FIND E_{TH}



VDR

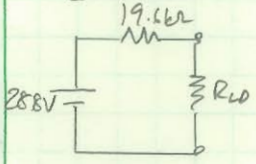
$$E_{TH} = 48V\left(\frac{24k\Omega}{16+24k\Omega}\right) = \boxed{28.8V = E_{TH}}$$

② FIND R_{TH}



$$R_{TH} = 10k\Omega + 16\,//\,24k\Omega = \boxed{19.6k\Omega = R_{TH}}$$

③ REDRAW CKT



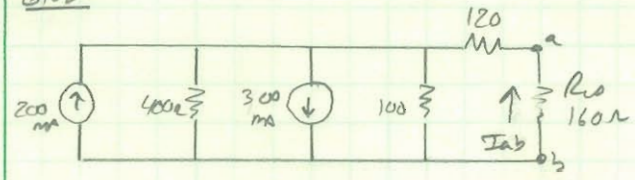
$R_{LO} = 0 \rightarrow$ $I_{LO} = \dfrac{E_{TH}}{R_{TH}+R_{LO}} = \dfrac{28.8V}{19600+0} = \boxed{1.47mA = I_{0\Omega}}$

$R_{LO} = 10k\Omega \rightarrow$ $I_{LO} = \dfrac{E_{TH}}{R_{TH}+R_{LO}} = \dfrac{28.8V}{19600+10000} = \boxed{973\mu A = I_{10k\Omega}}$

$R_{LO} = 50k\Omega \rightarrow$ $I_{LO} = \dfrac{E_{TH}}{R_{TH}+R_{LO}} = \dfrac{28.8V}{19600+50000} = \boxed{414\mu A = I_{50k\Omega}}$

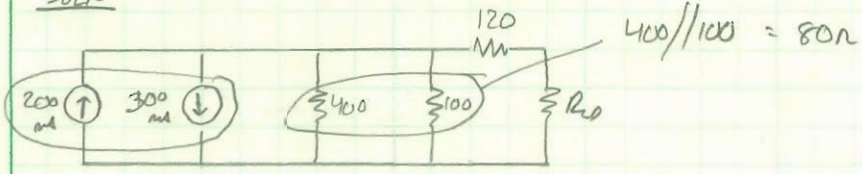
9-23

GIVEN

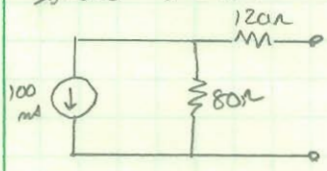


READ FIND THEVENIN EQUIVILENT
FIND Iab

SOLN

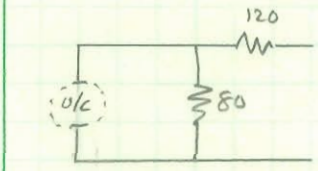


$I_s = 200 - 300\ mA = -100\ mA$



① FIND E_{TH}

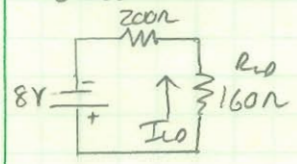
$E_{TH} = IR = (0.100\,A)\,80\Omega = \boxed{8V = E_{TH}}$



② FIND R_{TH}

$R_{TH} = 120 + 80 = \boxed{200\Omega = R_{TH}}$

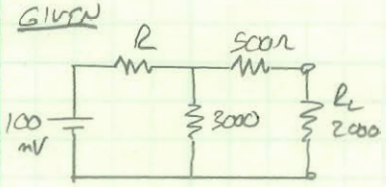
③ REDRAW CKT



$I_{L0} = \frac{E_{TH}}{R_{TH} + R_{L0}} = \frac{8V}{200 + 160} = \boxed{22.2\,mA = I_{L0}}$

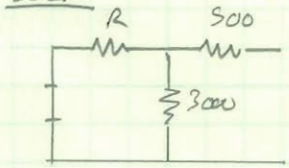
9-40

GIVEN



REQD: FIND R SO THAT $R_L = R_{TH}$
CALCULATE MAX PWR TX

SOLN



$$R_{TH} = 500 + 3000 // R = R_L = 2000$$

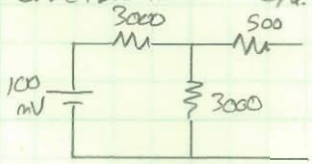
$$\left[\frac{1}{3000} + \frac{1}{R}\right]^{-1} = 2000 - 500 = 1500$$

$$\frac{1}{3000} + \frac{1}{R} = \frac{1}{1500}$$

$$\frac{1}{R} = \frac{1}{1500} - \frac{1}{3000} = \frac{2}{3000} - \frac{1}{3000} = \frac{1}{3000}$$

$$\boxed{R = 3000\,\Omega}$$

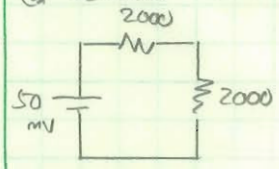
① DETERMINE E_{TH}.



VDR

$$E_{TH} = 100\,mV\left(\frac{3000}{3000+3000}\right) = \boxed{50\,mV = E_{TH}}$$

② REDRAW CKT



$$P_{MAX} = \frac{E_{TH}^2}{4R_{TH}} = \frac{(50\times10^{-3}\,V)^2}{4(2000)} = \boxed{313\,nW = P_{MAX}}$$