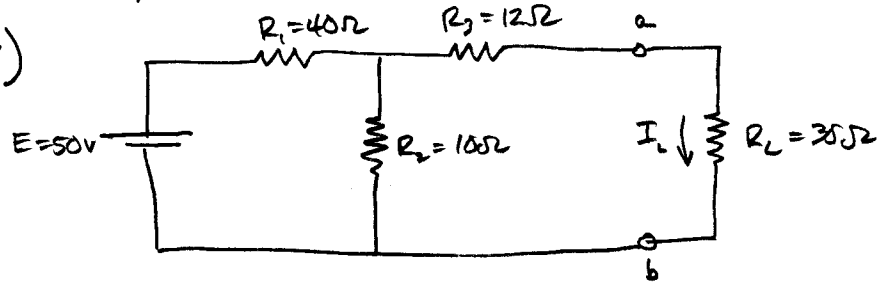
HW #13 Solutions

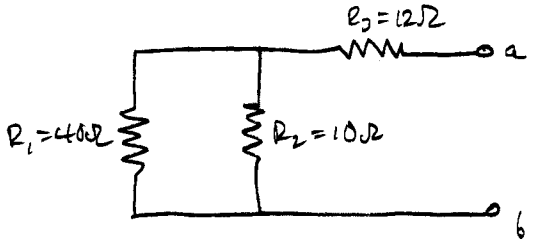
Ch. 9 # 7, 8, 15

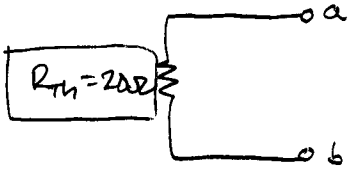
9.7)



Find R_{Th} and V_{ab}

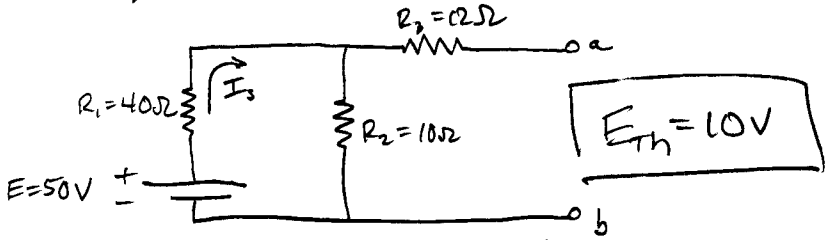
Replace 50V voltage source with short:





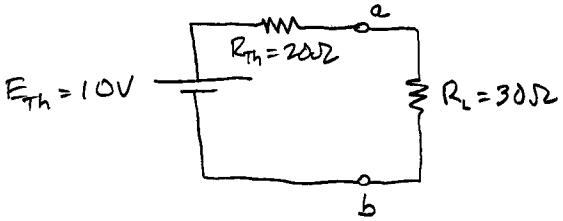
$$R_{Th} = R_3 + R_1 \| R_2 = 12\Omega + \frac{(40\Omega)(10\Omega)}{40\Omega + 10\Omega} = 20\Omega$$

Then, reinsert 50V source and find open circuit voltage of a-b.



$$E_{Th} = \frac{R_2}{R_1 + R_2} E = \frac{10\Omega}{40\Omega + 10\Omega}(50V) = 10V$$

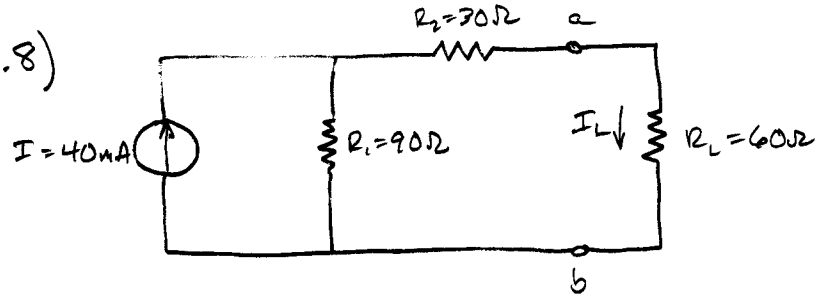
To find V_{ab}, use equivalent circuit with R_L.



$$V_{ab} = \frac{R_L}{R_{Th} + R_L} E_{Th} = \frac{30\Omega}{50\Omega}(10V)$$

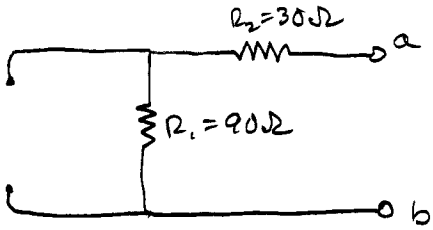
$$V_{ab} = 6V$$

9.8)



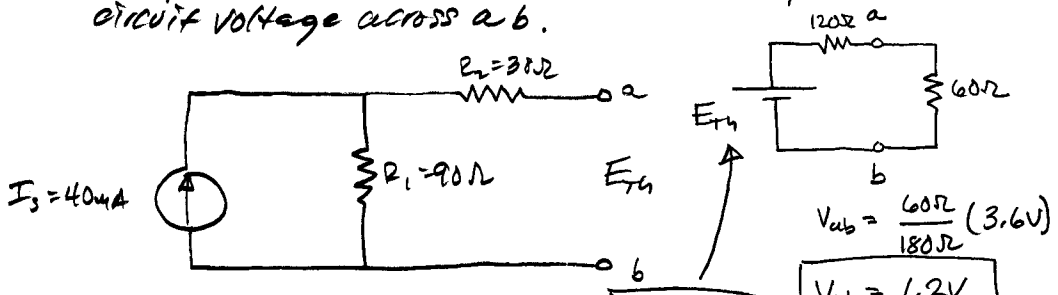
Find R_{Th} and V_{ab}

Replace current source with open circuit



$$R_{Th} = R_1 + R_2 = 90\Omega + 30\Omega = \boxed{120\Omega}$$

Then, reinsert current source and find open circuit voltage across a b.

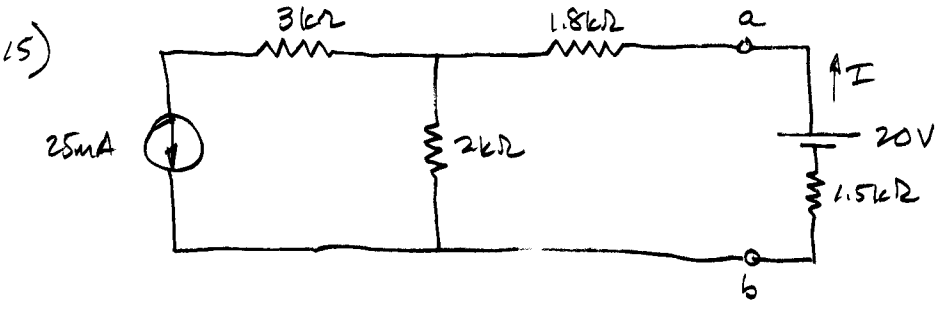


$$V_{ab} = \frac{60\Omega}{180\Omega}(3.6V)$$

$$\boxed{V_{ab} = 1.2V}$$

$$E_{Th} = I_s R_1 = (40mA)(90\Omega) = \boxed{3.6V}$$

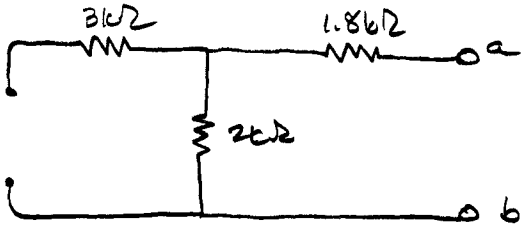
9.15)



a) Find R_{Th} and E_{Th}

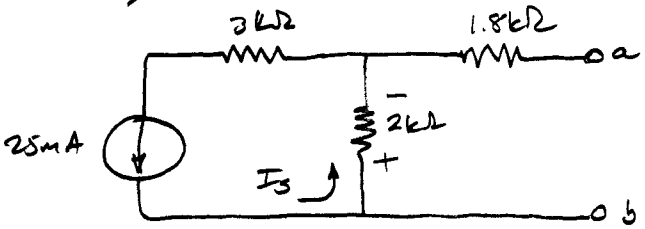
9.15) Continued

Replace current source with open circuit

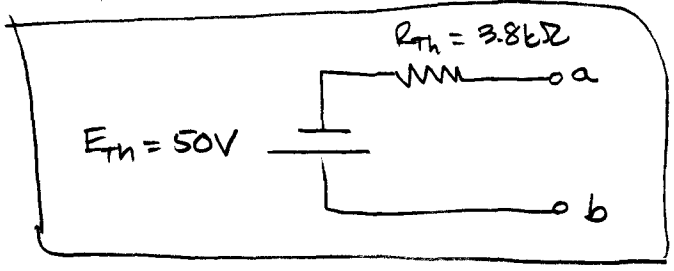


$$R_{Th} = 1.8k\Omega + 2k\Omega = \boxed{3.8k\Omega}$$

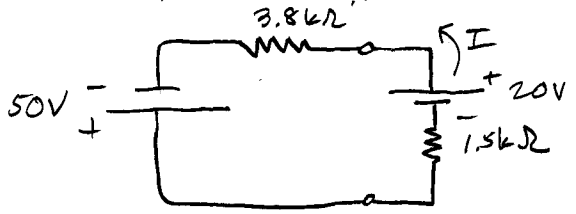
Re-insert current source and find open circuit voltage across a-b.



$$E_{Th} = V_{ab} = I_s R_{2k\Omega} = (25mA)(2k\Omega) = 50V$$



b) Find I in current branch.



$$I = \frac{E_T}{R_T} = \frac{20V + 50V}{1.5k\Omega + 3.8k\Omega} = \boxed{13.21mA}$$