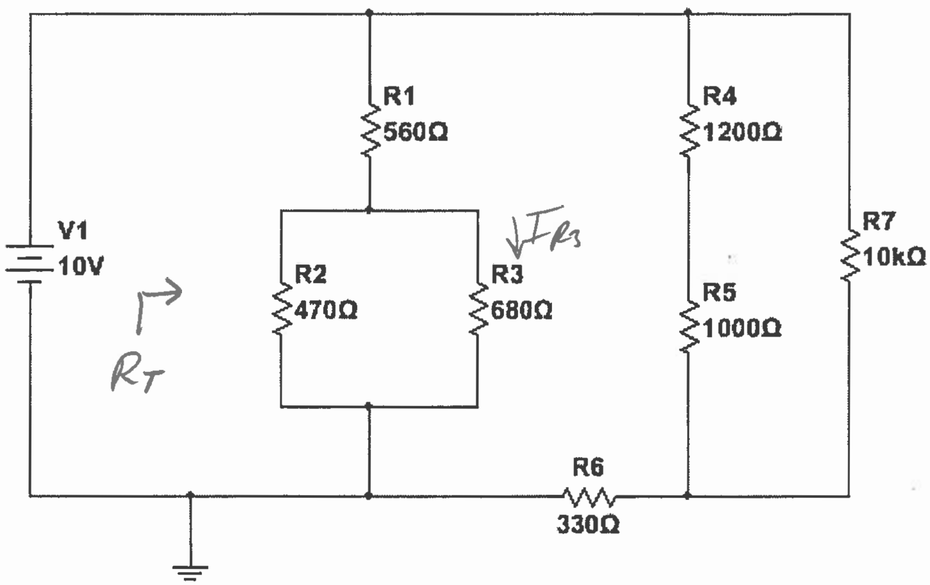


Find:

1) The total resistance seen by the source
2) The current through R3

(1) $R_T = [R_7 // (R_4 + R_5) + R_6] // (R_1 + R_2 // R_3)$

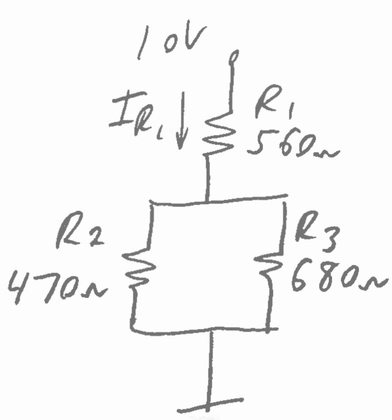
$= [(10k\Omega // 2200\Omega) + 330\Omega] // (560\Omega + 470\Omega // 680\Omega)$

$[1,803.3\Omega + 330\Omega] // (560\Omega + 277.9\Omega)$

$2,133.3\Omega // 837.9\Omega$

$\boxed{R_T = 601.6\Omega}$

(2)

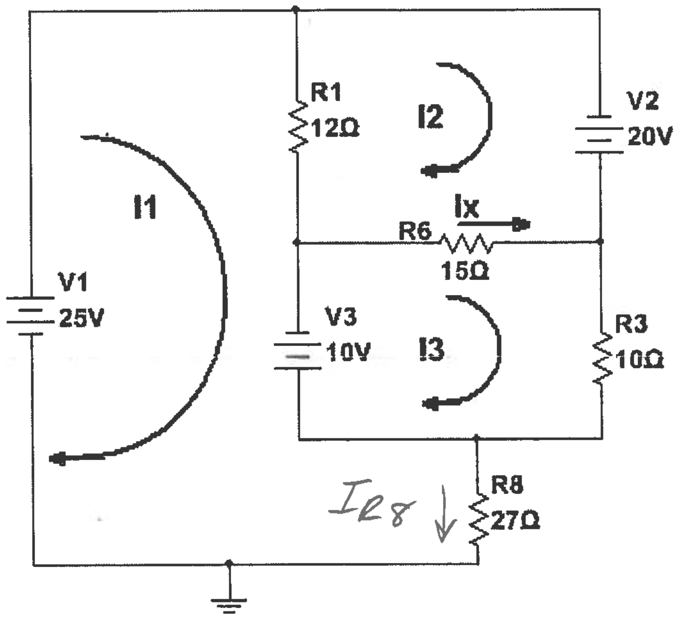


$I_{R_1} = \frac{10V}{R_1 + (R_2 // R_3)} = \frac{10V}{837.9\Omega} = \underline{11.934\ mA}$

$\therefore I_{R_3} = I_{R_1} \frac{R_2 // R_3}{R_3}$

$= 11.934\ mA \left(\frac{277.9\Omega}{680\Omega}\right)$

$\boxed{I_{R_3} = 4.88\ mA,\ \text{DOWNWARD}}$



Given that:

Loop1: $V_1 - R_1 I_1 + R_1 I_2 + V_3 - R_8 I_1 = 0$

$-39 I_1 + 12 I_2 + 0 I_3 = -35$ (EQ1)

I1 = 1.43 A

Loop2: $-I_2 R_1 + I_1 R_1 + V_2 - I_2 R_6 + R_6 I_3 = 0$

$12 I_1 - 27 I_2 + 15 I_3 = -20$ (EQ2)

I2 = 1.73 A

Loop 3: $-V_3 - I_3 R_6 + I_2 R_6 - I_3 R_3 = 0$

I3 = 0.639 A

$0 I_1 + 15 I_2 - 25 I_3 = 10$ (EQ3)

- You should calculate/verify these currents later, before Exam #3 to check your MESH analysis technique and equation solver prowess!

Find:

1) Ix, the current through R6 (direction as shown)
2) The power dissipated by R8
3) The power delivered by source V1
4) The voltage across R1 (value and polarity)

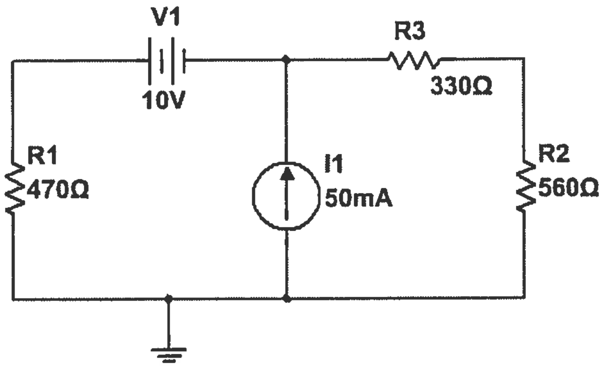
(1) $I_x = I_3 - I_2 = \boxed{-1.09A}$

(2) $P_{R8} = I_{R8}^2 R_8 = (I_1)^2 R_8 = \boxed{55.2W}$

(3) $P_{V1} = V_1 \cdot I_1 = \boxed{35.75W}$

(4) R_1 + V_{R1} − $V_{R1} = (I_1 - I_2) R_1 = \boxed{-3.6V}$

OR R_1 − V_{R1} + $V_{R1} = (I_2 - I_1) R_1 = \boxed{3.6V}$

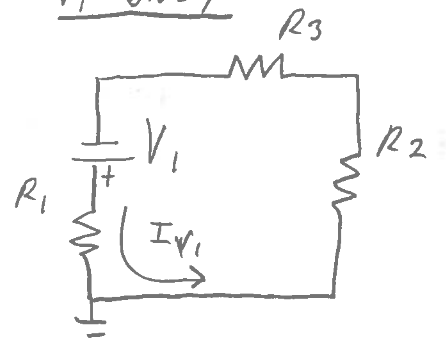


Find:

1) The current that flows through R3 due only to the 10V source and the direction of this current
2) The total current that flows through R3 and the direction of this current

(1)

V_1 ONLY



$I_{V_1} = V_1/R_T$

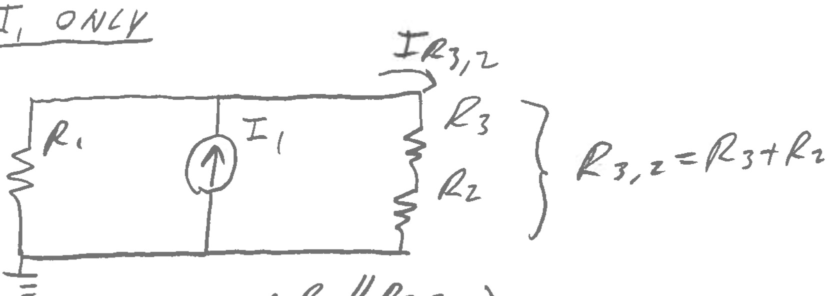
$R_T = R_1 + R_2 + R_3$

$\therefore I_{V_1} = \frac{10V}{1360\Omega}$

$I_{V_1} = 7.353\ mA$

$\therefore I'_{R_3} = 7.353\ mA$ RIGHT TO LEFT

I_1 ONLY



$R_{3,2} = R_3 + R_2$

$I_{R_{3,2}} = I_1\left(\frac{R_1 // R_{3,2}}{R_{3,2}}\right)$

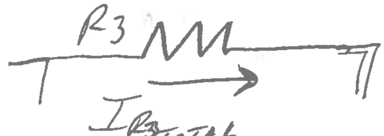
$= 50\ mA\left(\frac{307.6\Omega}{890\Omega}\right) = 17.279\ mA$

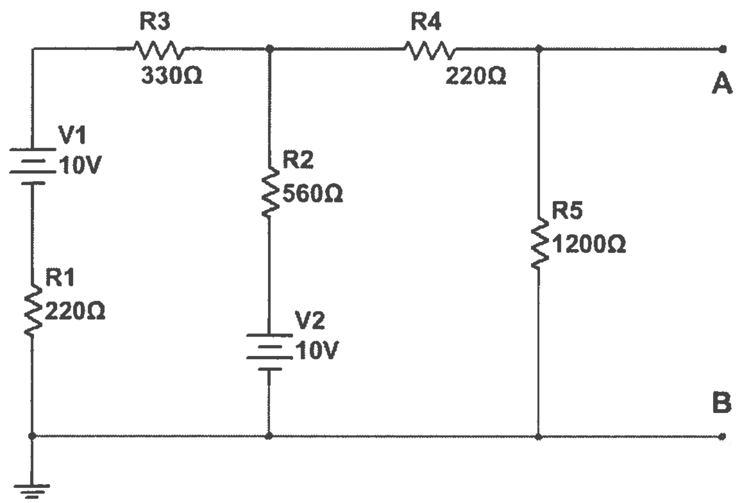
$I_{R_3}'' \Rightarrow$ LEFT TO RIGHT

$\therefore I_{R_3\ TOTAL} = (17.279\ mA - 7.353\ mA)$ LEFT TO RIGHT

OR

$I_{R_3\ TOTAL} = 9.93\ mA$

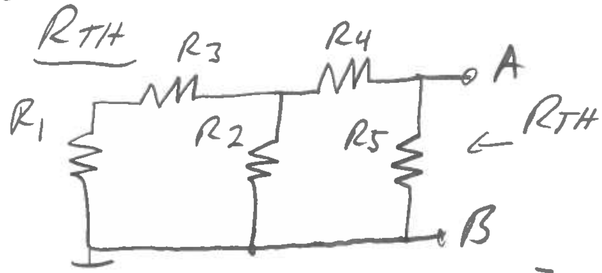




Find:

1) The Thevenin equivalent resistance (R_{TH}) looking back into the circuit from terminals A-B (the load has already been removed)
2) The Thevenin equivalent voltage (V_{TH}) looking back into the circuit from terminals A-B (the load has already been removed)
3) The power dissipated by a 100 Ohm resistor placed between terminals A-B

(1)
R_{TH}



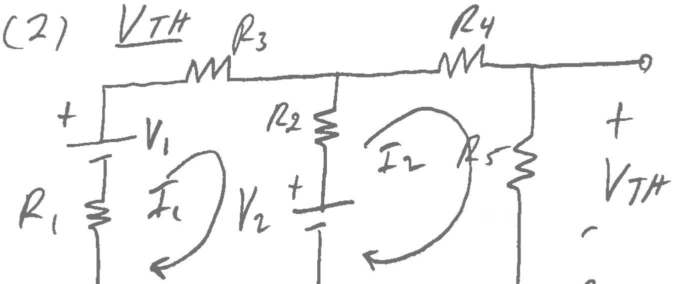
$$R_{TH} = \left[\left[(R_1+R_3)//R_2\right]+R_4\right]//R_5$$

$(550\Omega // 560\Omega + 220\Omega) // 1200\Omega$

$497.5\Omega // 1200\Omega$

$$\boxed{R_{TH} = 351.7\Omega}$$

(2) V_{TH}



Vth = I2*R5

Loop 1

$-I_1R_1 + V_1 - I_1R_3 - I_1R_2 + I_2R_2 - V_2 = 0$

$-1110I_1 + 560I_2 = 0$ (1)

Loop 2

$V_2 - I_2R_2 + I_1R_2 - I_2R_4 - I_2R_5 = 0$

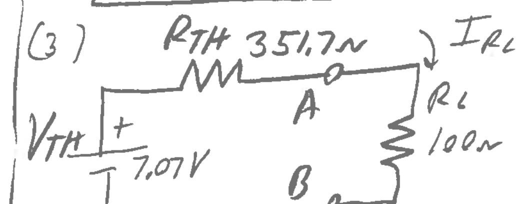
$560I_1 - 1980I_2 = -10$ (2)

Yields: $I_1 = 2.97\,mA$

$I_2 = 5.89\,mA$

∴ $\boxed{V_{TH} = 7.07V}$

(3)



$I_{RL} = \dfrac{V_{TH}}{R_{TH}+R_L} = 15.65\,mA$

∴ $P_{RL} = (I_{RL})^2 \cdot R_L = \boxed{24.5\,mW}$