$\frac{V_0}{10} + \frac{20V_0}{10} = -26$ $\quad \frac{-260}{21}$

$\frac{21V_0}{10} = -26$

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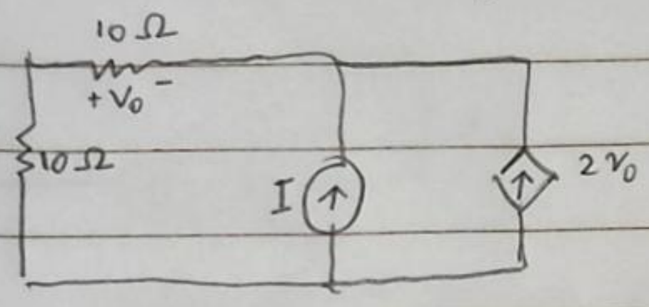
Engr 065

Homework 03

1) Given $I = 21A$, and figure below find V_0 and power absorb



i) ↳ Consider Ohm's Law ⇒ $\frac{V_0}{10} + 21 + 2V_0 = 0$

↳ $\frac{V_0}{10} + 2V_0 = -21 \Rightarrow \frac{21V_0}{10} = -21 \Rightarrow -210/21 ; V_0 = -10V$ ✓

ii) To Calc the power absorbed

i) ↳ Consider $i = 2V_0$; $V_0 = -10V$

i through ↳ Thereby, $-10V \cdot 2 = -20$ Ampere ✓

source

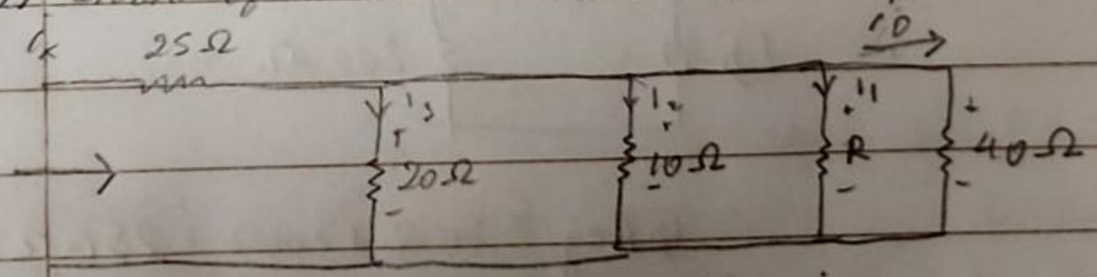
ii) ↳ Across source: $V = (10+10) i_0$; $i_0 = V_0/10$

↳ $20 \cdot \frac{-10}{10} = 20(-1) = -20V$

iii) Thereby, power absorbed ⇒ $P_{ab} = I \cdot V$

↳ $-20V \cdot -10V = 200W$

2) Given $i_0 = 5$ and $R = 8\Omega$ Calculate i_x



A. i) ↳ Consider $V = R \cdot I$; $i_0 = 5$; $R = 40\Omega$ ⇒ $V = 200V$ ✓

ii) Voltage going through each resistor ⇒ $I_1 = 200/8 = 25A$ ✓

$I_2 = 200/10 = 20A$ ✓

$I_3 = 200/20 = 10A$ ✓

iii) ↳ Thus, recall $i_x = i_1 + i_2 + i_3 + i_0$

↳ $25A + 20A + 10A + 5A = 60A$ ✓

↳ Voltage for I_x ⇒ $R = 25\Omega$; $60 \cdot 25 = 1500V$ ✓

b. Calculate P_{eq} ⇒ Consider Σ of Each voltage through every resistor

↳ $P_{40\Omega} = 40(25^2) = 1000W$

$P_{8\Omega} = 25^2(8) = 5000W$

$P_{10\Omega} = 20^2(10) = 4000W$

$P_{20\Omega} = 10^2(20) = 2000W$

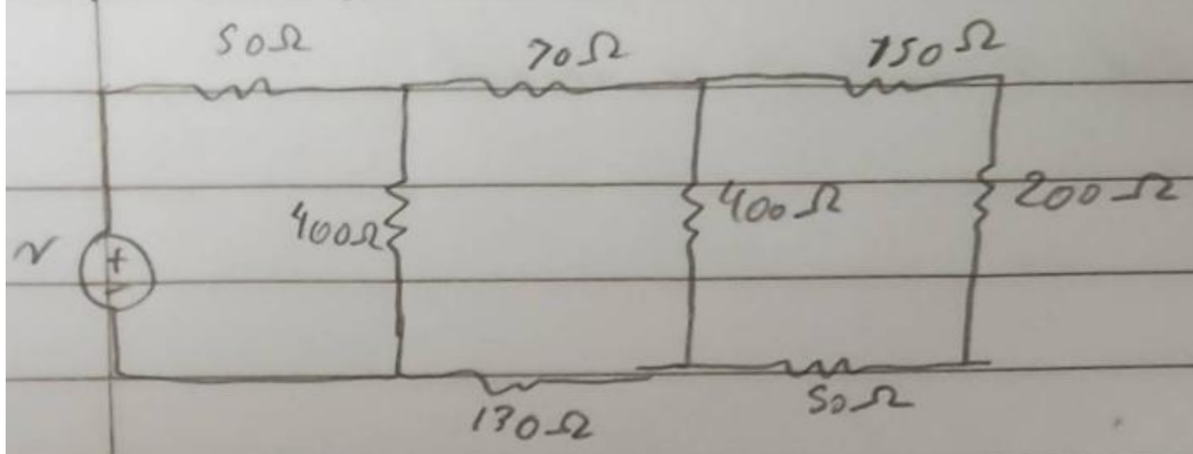
$P_{25\Omega} = 60^2(25) = 90000W$

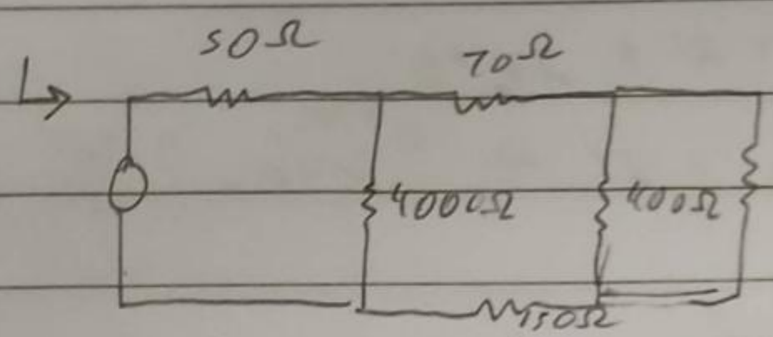
Thus, $1000 + 5000 + 4000 + 2000 + 90,000$

↳ $102,000W$ ✓

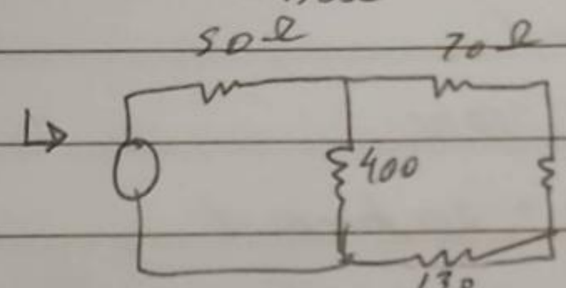
3. Use series and parallel simplification, find the equivalent resistance and the overall absorbed power by the resistor network; given

a. $V = 680\ V$

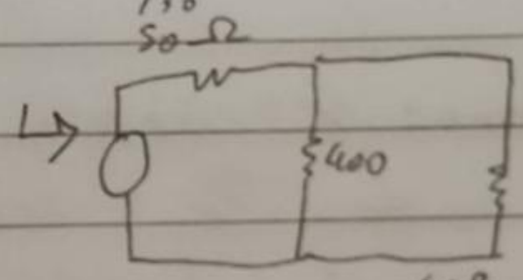




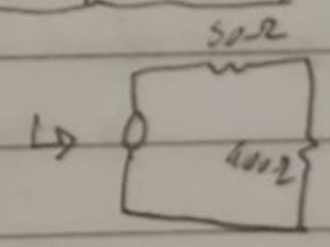
$R_1 = 150 + 200 + 50 = 400\ \Omega$



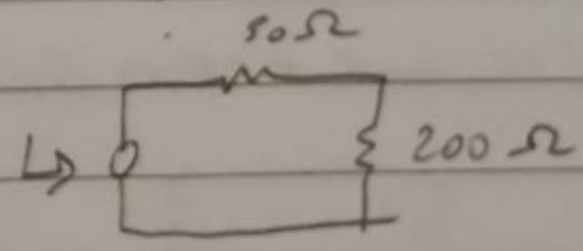
$400 /\!/ 400 = \frac{400^2}{800} = 200\ \Omega = R_2$



$R_3 = 70 + 200 + 130 = 400\ \Omega$



$R_4 = \frac{400^2}{800} = 200\ \Omega$



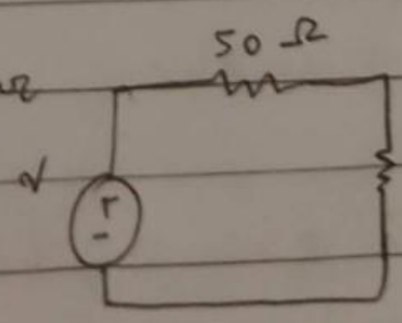
↳ $R_{eq} = 50\Omega + 200\Omega = 250\Omega$ ✓

- Overall power absorbed by Resistor Network

↳ Consider $P_R = V_s^2 / R_{eq}$

↳ Thus, $P_R = 680^2 / 250 = 1,849.6\ W$ ✓

B. Consider



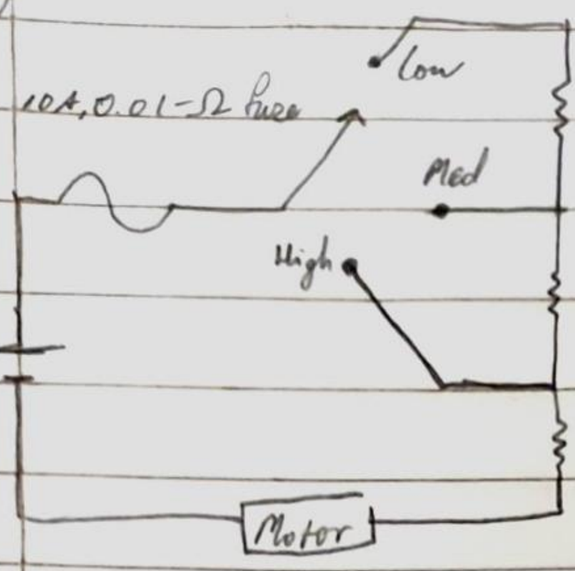
- Compute voltage across 50 Ω resistor

i) ↳ Recall Voltage across a R $\Rightarrow V_1 = \frac{V R_1}{R_1 + R_2}$

ii) ↳ Thus, $V = 680, R_1 = 50, R_2 = 200$

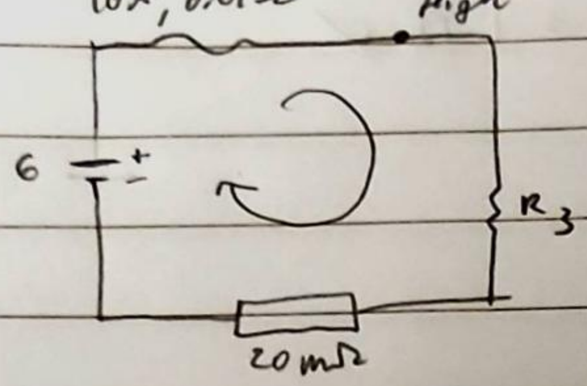
↳ $\frac{680(5)}{250} = 136\ V$

4)



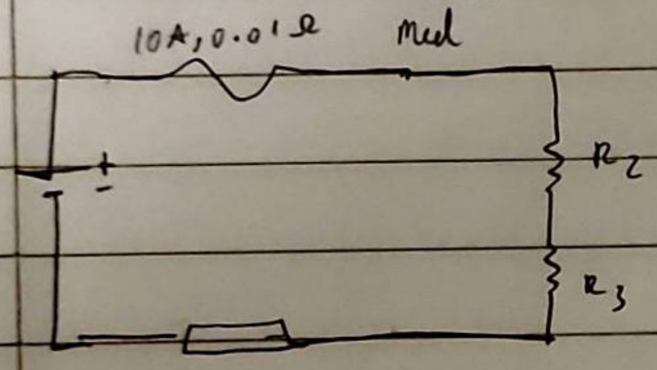
- Given $i_{high} = 6A$, $i_{mid} = 3A$ $i_{low} = 2A$
  load resistance = 20mΩ fuse resistance = 0.01Ω

I) Consider 3 scenario $i_{high} = 6A$



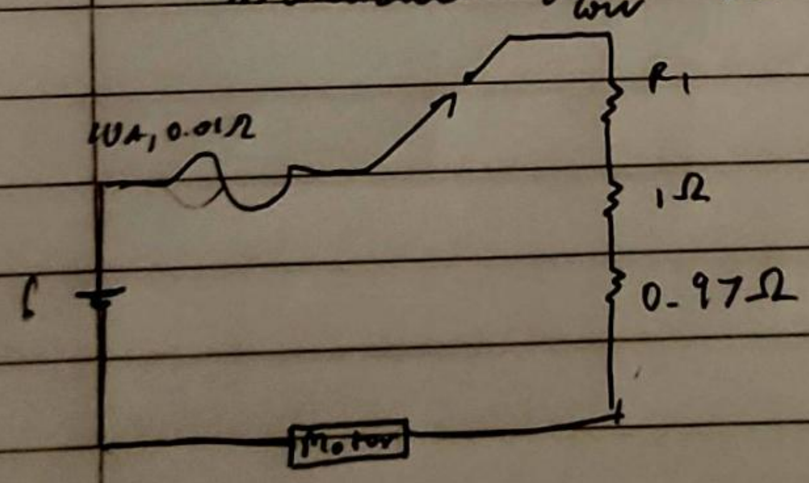
- Apply kvl $= -6 + (10A + R_3 + (20 \cdot 10^{-3}) i_{high} = 0$
  $(.01A + R_3 + .02)6 = 6$
  $.03A + R_3 = 1$
  $R_3 = 0.97\Omega$ ✓

II) Consider $i_{mid} = 3A$



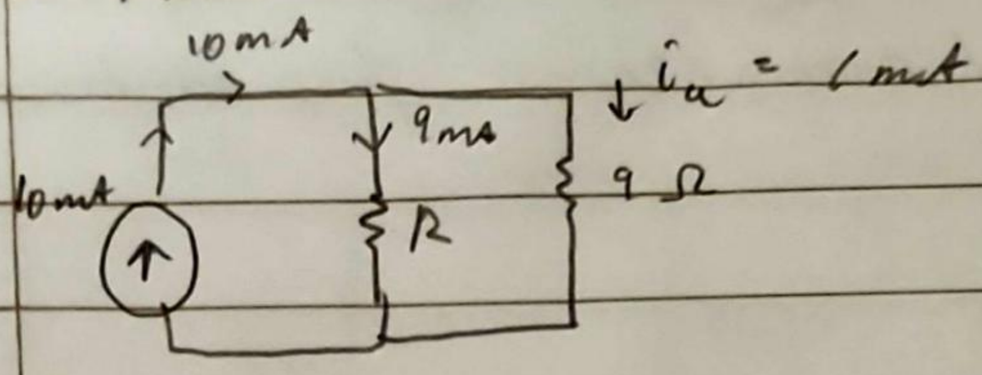
- Apply kvl $= -6 + (0.01 + 0.97\Omega + R_2 + (20 \cdot 10^{-3}))(3) = 0$
  ↳ $(0.01 + 0.97\Omega + R_2 + 0.02)3 = 6$
  ↳ $0.01 + 0.97 + 0.02 + R_2 = 2$
  ↳ $1 + R_2 = 2$
  ↳ $R_2 = 1\Omega$ ✓

III) Consider $i_{low} = 2A$



- Apply kvl $= -6 + (0.01\Omega + R_1 + 1\Omega + 0.97\Omega + (20 \cdot 10^{-3})(2) = 0$
  ↳ $(0.01 + 1 + 0.97 + 0.02 + R_1)2 = 6$
  ↳ $0.01 + 1 + 0.97 + 0.02 + R_1 = 3$
  ↳ $2 + R_1 = 3$
  ↳ $R_1 = 1$ ✓

5) Compute value of R flowing in the 9 Ω resistor is equal to 1 mA



i) ↳ Consider V across 9 Ω

↳ 9 (1 mA) = 9 mV

ii) Compute R, $R = V/I$; $I = 9mV / 9mA = 1\ \Omega$ ✓