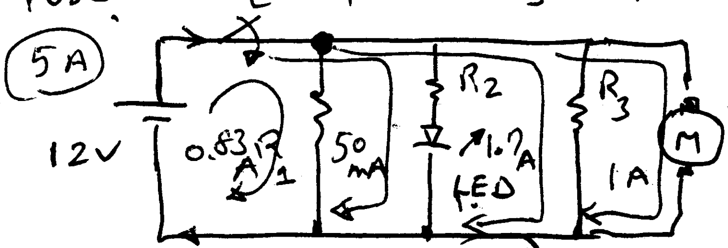
2012/2/22 ①

Chapter 6 Parallel circuits

$\sum I = 0$

$I_t = I_1 + I_2 + I_3 + I_m = 0.83 + 0.05 + 1.7 + 1$
$= 3.58 Amp$

Fuse



DC Motor 12W $P = E \cdot I$

$12W = 12V \cdot I \Rightarrow 1A$

10 Watt (50mA)

I_t

Defrost window

Heater (car seats) 20Watt

* $\boxed{R_1 = ? = 13.5\Omega}$

$I^2 \cdot R_1 = P = I \cdot E$ (10W, 12V)

$I \doteq 0.83A$ ~~0.89~~ $= \frac{10W}{12V}$

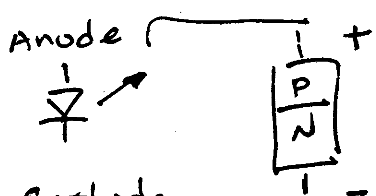
$R_1 = \frac{V}{I} = \frac{12V}{I} = \frac{12V}{0.83A} \approx 13.5\Omega$

* $\boxed{R_3 = 7.2\Omega}$ $P = I^2 \cdot R$ $R = \frac{P}{I^2}$

$I_3 = \frac{12V}{R_3} = \frac{12}{7.2} = \frac{E^2}{R}$ $R = \frac{E^2}{P} = \frac{144}{20W} = 7.2\Omega$

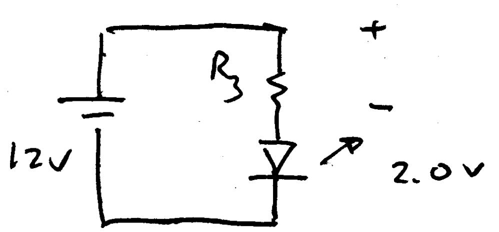
$= 1.7A$

* LED



$V_D \approx 2.0V \sim 2.2V$

Green, Red, Yellow



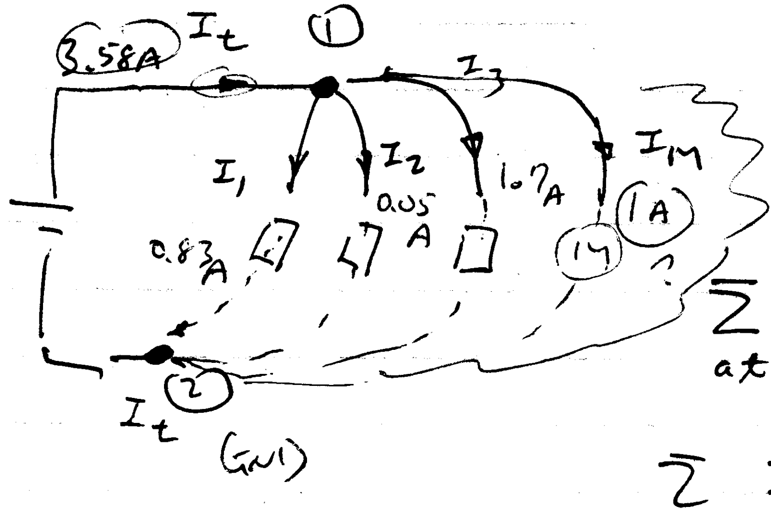
KVL

$12 = V_{R3} + V_D$
$= V_{R3} + 2.0V$
$V_{R3} = 10V$

OHM's Law $R_3 = \frac{E}{I}$

$= \frac{V_{R3}}{50mA} = \frac{10V}{50mA} = 0.2 K\Omega = 200\Omega$

$\approx 300\Omega$



Dust (oil)

KCL. Leakage current.

$\sum I = 0$ at node 1

$\sum I = 0$ at GND

Incoming current (Source) I_t (positive)

$\sum$ out going current $I_1 + I_2 - - + I_m$ (Negative)

Ex

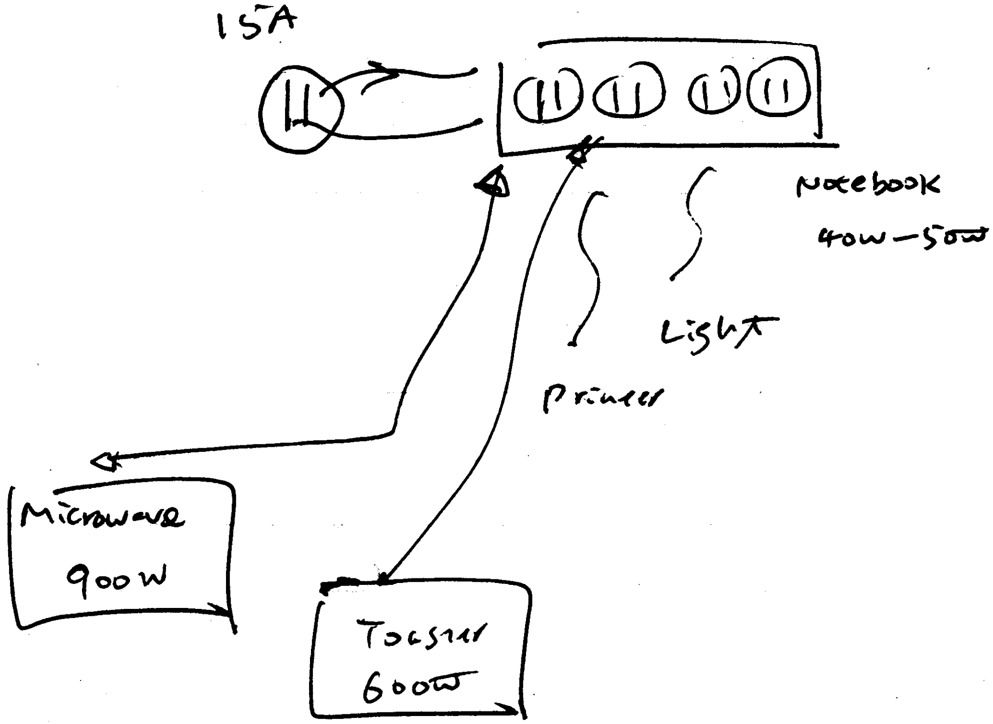
IF I_m = ____ ? unknown

$I_t = 3.58A$ $I_1 = 0.83A$, $I_2 = 0.05A$

$I_3 = 1.7A$

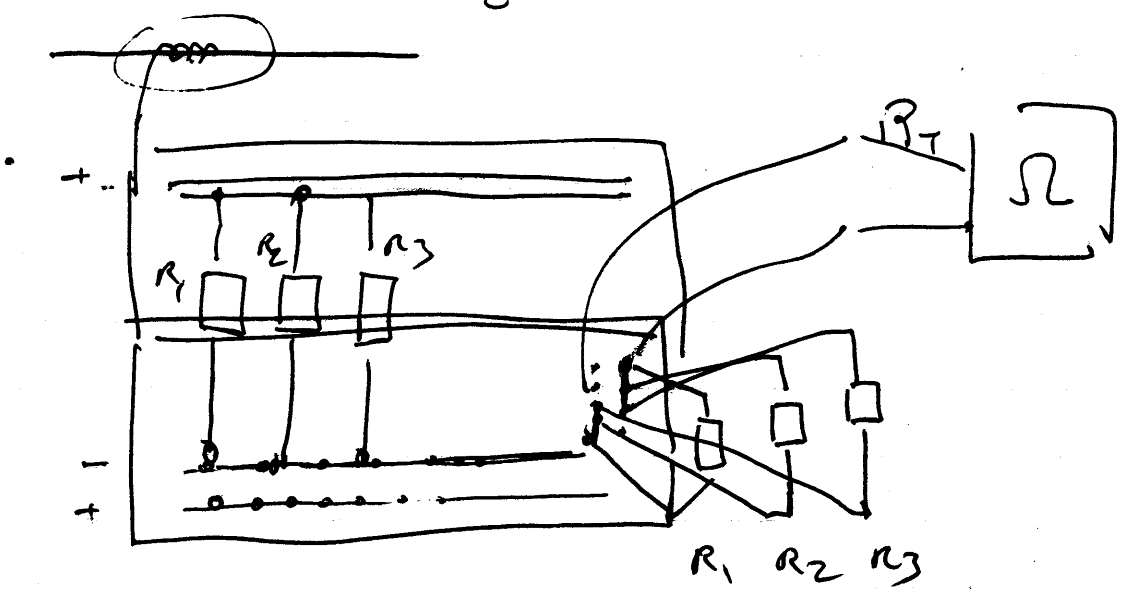
Find I_m = ____

From KCL $I_t - I_1 - I_2 - I_3 \Rightarrow I_m$



1.5KW Starting current (Surge)

5 turns Soldering it



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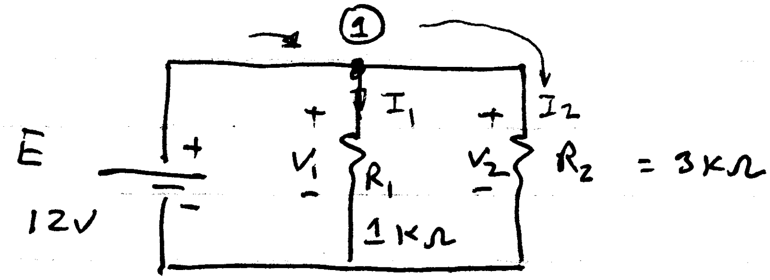
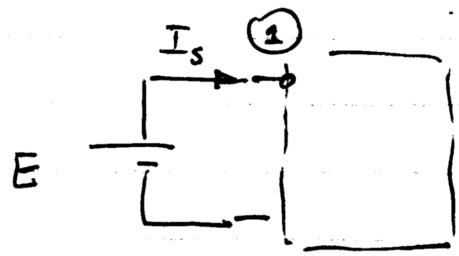


$$R_T = \frac{1K \cdot 3K}{1K + 3K} = \frac{3K}{4} = 0.75K = 750\Omega$$

$E = 12v = V_1 = V_2$



Equivalent Resistance

OHM's Law.

$$R_T = \frac{E}{I_s} = \frac{E}{I_1 + I_2}$$

$$= \frac{\cancel{E}}{\cancel{V_1}/R_1 + \cancel{V_2}/R_2} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}}$$

$$= \frac{1}{\frac{R_1 + R_2}{R_1 \cdot R_2}} = \frac{R_1 \cdot R_2}{R_1 + R_2}$$ Product / Sum

$$\frac{1}{R_1} + \frac{1}{R_2} = \frac{R_1 + R_2}{R_1 \cdot R_2} \Rightarrow \frac{\cancel{R_1}}{\cancel{R_1} \cdot R_2} + \frac{\cancel{R_2}}{R_1 \cdot \cancel{R_2}}$$