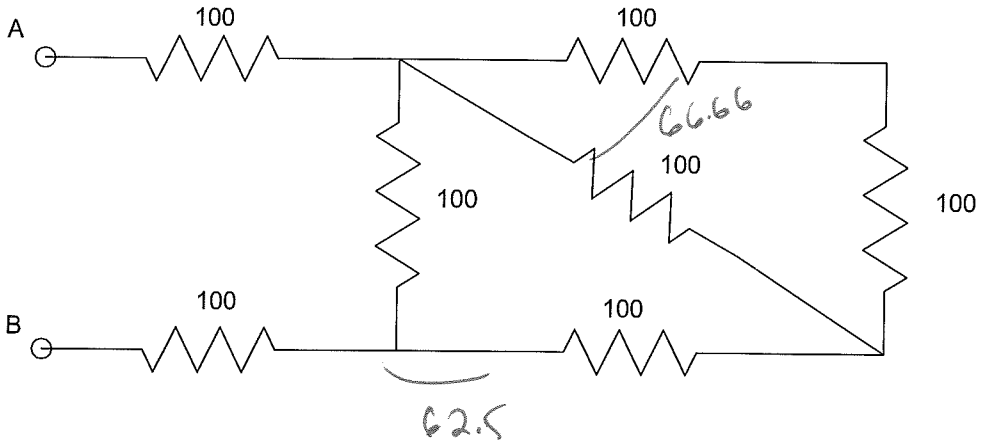
ECE 320: Quiz #1 Name _____ 9:00 / 11:00

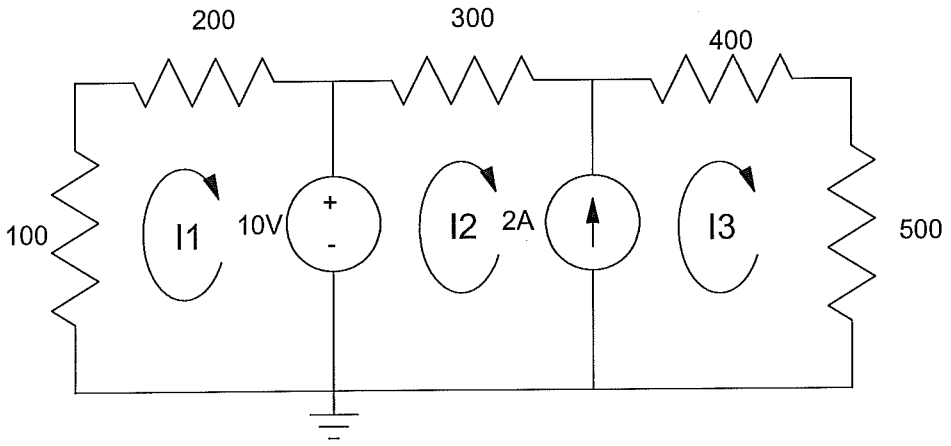
Circuits I Review - January 19, 2016

1) Find the resistance between A and B

R = 262.5



2) Write 3 current loop equations that allow you to solve for I1, I2, and I3. You don't need to solve - just give the 3 equations.

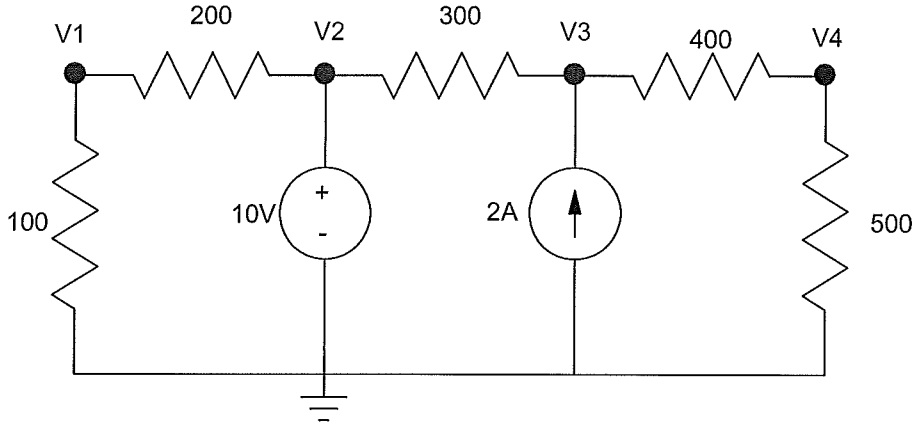


$100I_1 + 200I_1 + 10 = 0$

$I_3 - I_2 = 2$

$100I_1 + 200I_1 + 300I_2 + 400I_3 + 500I_3 = 0$

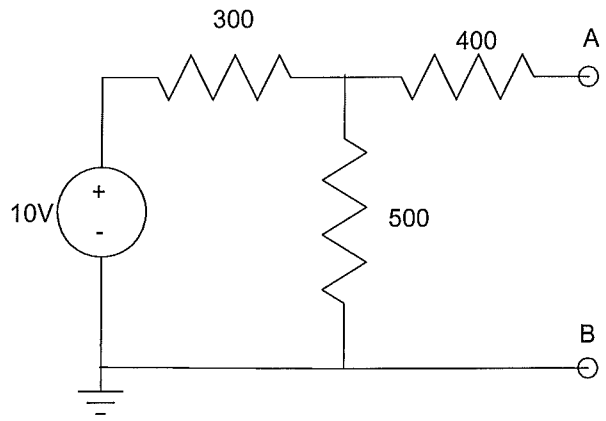
3) Write 4 current loop equations that allow you to solve for V1, V2, V3, and V4. You don't need to solve - just give the 4 equations.

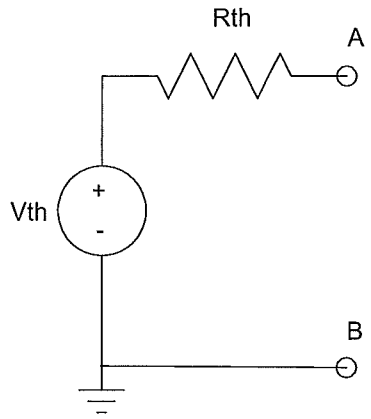


$\frac{V_1}{100} + \frac{V_1 - V_2}{200} = 0$
$V_2 = 10$
$\frac{V_3 - V_2}{300} + \frac{V_3 - V_4}{400} - 2 = 0$
$\frac{V_4 - V_3}{400} + \frac{V_4}{500} = 0$

4) Find the Thevenin equivalent for the following circuit:

Vth	Rth
6.25V	587.5



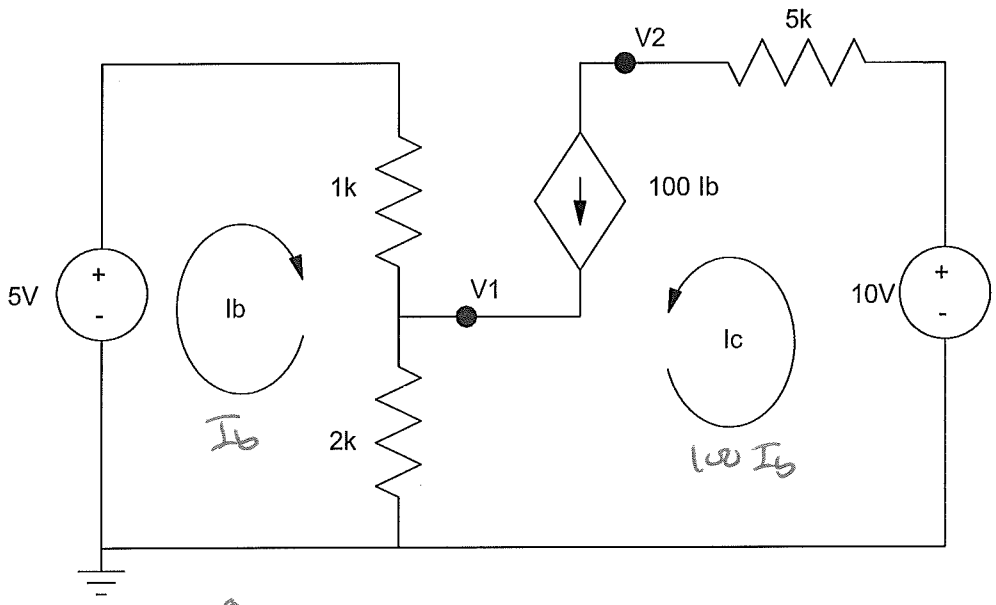


$V_{th} = \left(\frac{5}{8}\right) 10 = 6.25V$

$R_{th} = 400 + 500 \parallel 300 = 587.5$

5) Determine Ib, Ic, V1, and V2

Ib	Ic	V1	V2
24.6μA	2.46mA	4.975V	-2.315V



Loop ↑

$$-5 + 1k \cdot I_b + 2k(I_b + 100 I_b) = 0$$

$$I_b = \frac{5}{1k + 2k(101)} = 24.6\mu A$$

$$V_1 = (I_b + I_c)2k$$

$$V_2 = 10 - 5k \cdot I_c = -2.315V$$

Bonus! Assume

- A typical cell phone uses 1 Watt-hour of energy per day (it has a 3V 1000mAh battery and it needs recharging every 3 days).
- There are 300 million people in the U.S., and
- It takes one pound of coal to produce 1kWh of electricity.

How many pounds of coal does it take to power the cell phones in the U.S. assuming every person has one?

$\frac{1kw}{1000w}$ $1 \cdot 365 \frac{d}{y} \cdot 300 \text{ million} = 109 \cdot 10^6$ lb coal/year

= 300,000 lb coal/day