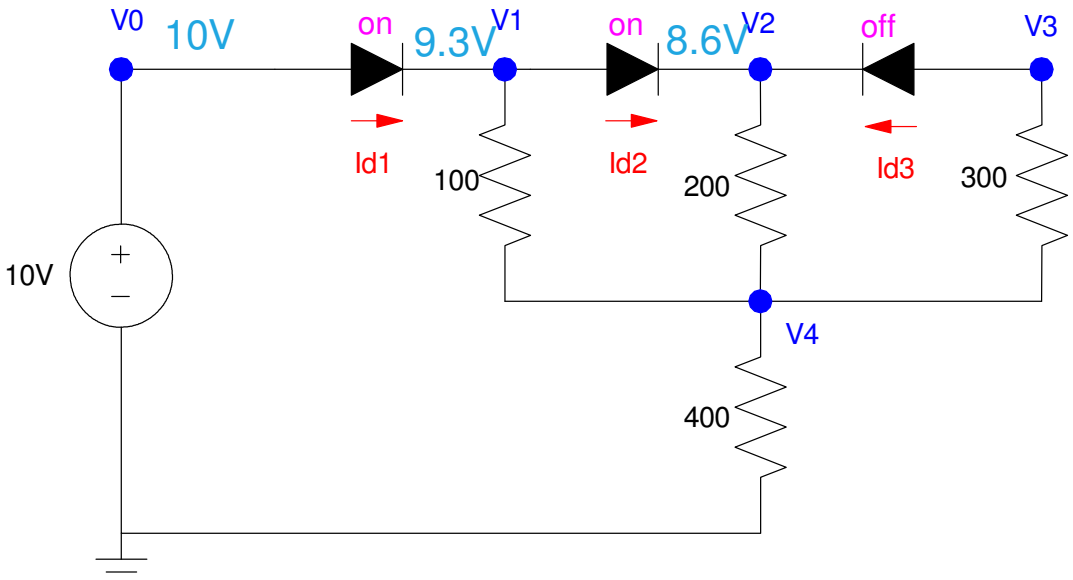
ECE 320 - Quiz #3 - Name _____

Ideal Diodes, LEDs, AC to DC Converters - Spring 2023

1) Determine the voltages for the following circuit.

- Assume ideal silicon doides (Vd = 0.7V when on)

V1	V2	V3	V4
9.3V	**8.6V**	**7.771V**	**7.771V**



To solve for V4

$$\left(\frac{V_4-9.3V}{100}\right)+\left(\frac{V_4-8.6V}{200}\right)+\left(\frac{V_4}{400}\right)=0$$

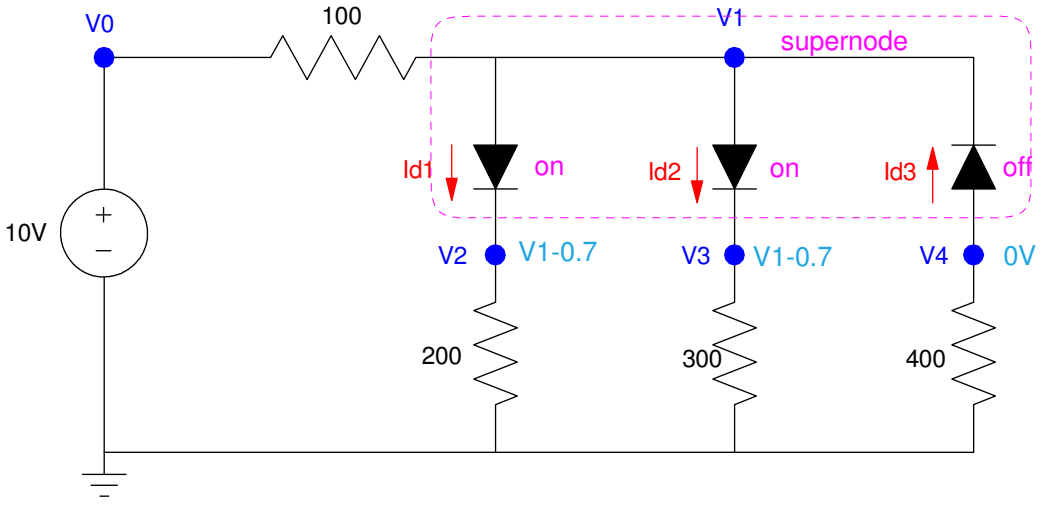
$$\left(\frac{1}{100}+\frac{1}{200}+\frac{1}{400}\right)V_4=\left(\frac{9.3V}{100}\right)+\left(\frac{8.6V}{200}\right)$$

$$V_4=7.771V$$

2) Determine the voltages for the following circuit. Assume

- Assume ideal silicon doides (Vd = 0.7V when on)

V1	V2	V3	V4
5.773V	**5.073V**	**5.073V**	**0V**



Writing the supernode equation

$$\left(\frac{V_1-10}{100}\right)+\left(\frac{V_1-0.7}{200}\right)+\left(\frac{V_1-0.7}{300}\right)=0$$

$$\left(\frac{1}{100}+\frac{1}{200}+\frac{1}{300}\right)V_1=\left(\frac{10}{100}\right)+\left(\frac{0.7}{200}\right)+\left(\frac{0.7}{300}\right)$$

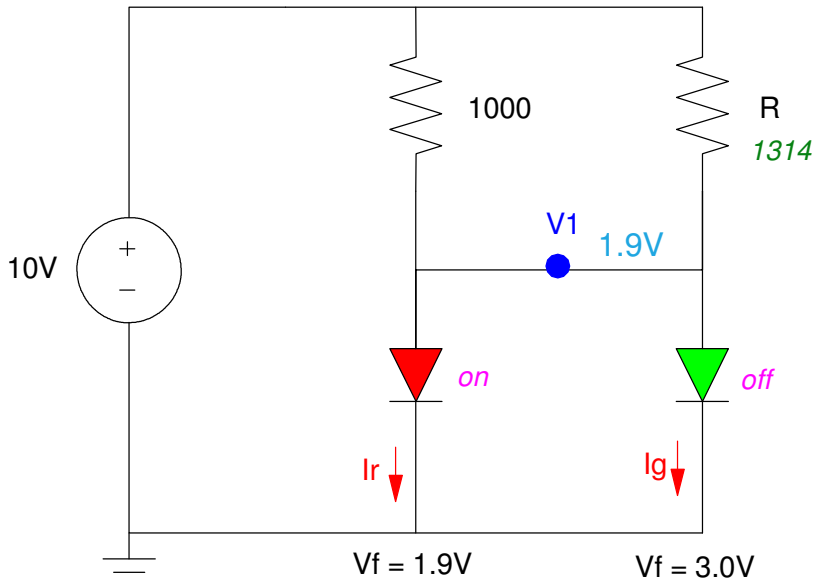
$$V_1=5.733V$$

$$V_2=V_1-0.7=5.0733V$$

3) A red and green are connected to a 10V source. Determine the current and brighness of each LED. Assume

- R is 800 + 100*(your birth month) + (your birthday).
- Red LED: Vf = 1.9V @ 100mA 5000 mcd @ 100mA
- Green LED Vf = 3.0V @ 100mA 5000 mcd @ 100mA

R 800 + 100*mo + day	V1 Volts	Red LED		Green	
		Ir	mcd	Ig	mcd
1314	**1.9V**	**14.26mA**	**713.2 mcd**	**0**	**0**



R || 1000 = 567.84 Ohms

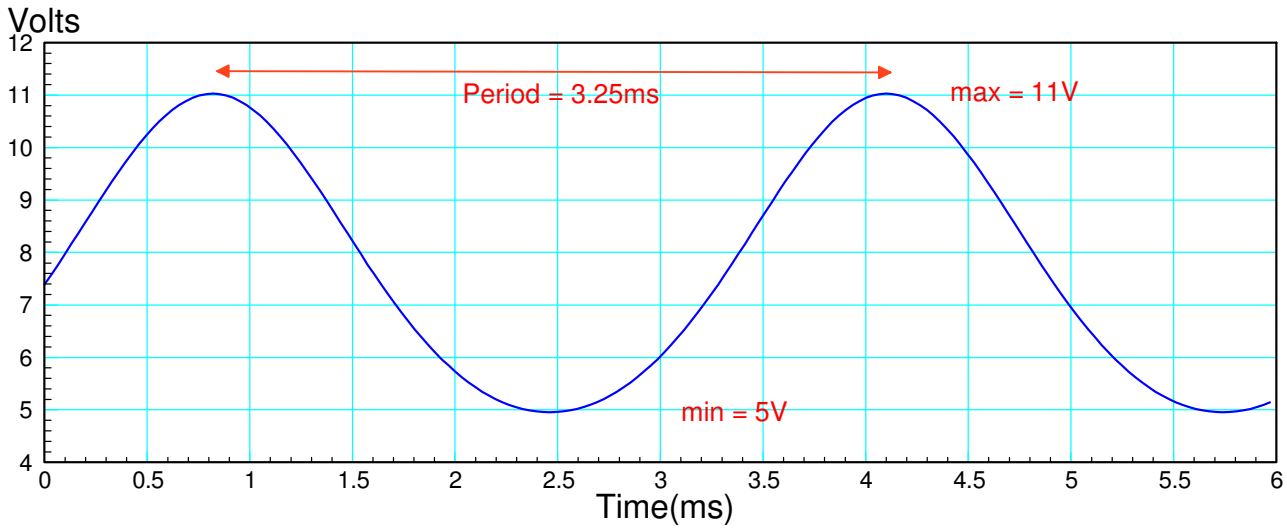
$$I_r = \left(\frac{10V - 1.9V}{567.84\Omega}\right) = 14.264mA$$

mcd

$$\left(\frac{14.264mA}{100mA}\right) 5000mcd = 713.2mcd$$

4) The following waveform is found using CircuitLab for an AC to DC converter. Determine the following

Frequency (Hz)	Voltage	
	DC (average)	AC (Vpp)
307 Hz	**8.0V**	**6.0Vpp**



$$frequency = \frac{1}{period} = \frac{1}{0.00325s} = 307Hz$$

$$DC \approx \left(\frac{\max+\min}{2}\right) = 8.0V$$

$$AC \approx (\max - \min) = 6.0V_{pp}$$