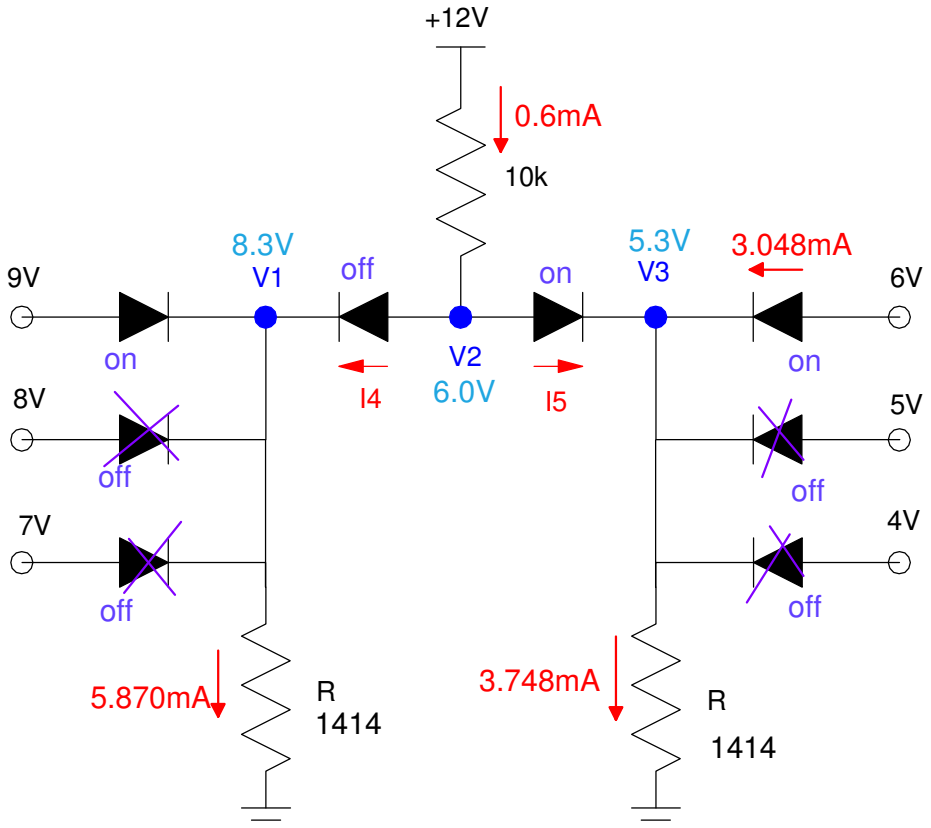
ECE 320 - Quiz #4 - Name _____

Max/Min, Clipper, Transistors. Spring 2022

1) Max/Min: Determine the voltages and currnets for the following min/max circuit.

- Assume ideal silicon diodes (Vf = 0.7V)
- R = 900 + 100 * Birth Month + Birth Day. May 14th for example gives R = 1414 Ohms

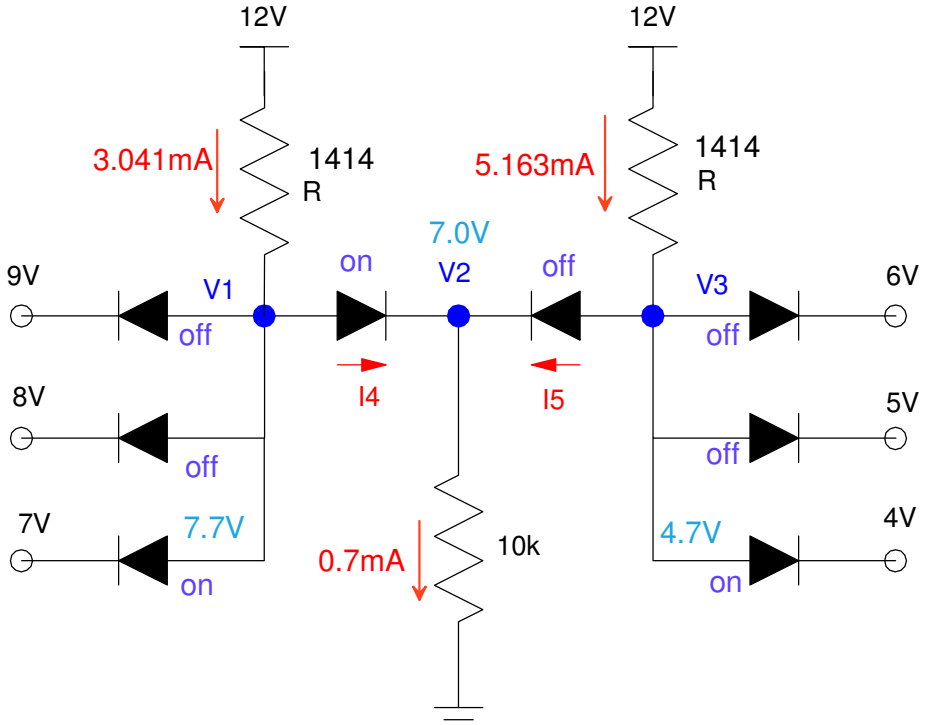
R 900 + 100*Mo + Day	V1	V2	V3	I4	I5
1414	8.30 V	6.00V	5.30V	0	0.6mA



2) Max/Min: Determine the voltages and currnets for the following min/max circuit.

- Assume ideal silicon diodes (Vf = 0.7V)
- R = 900 + 100 * Birth Month + Birth Day.

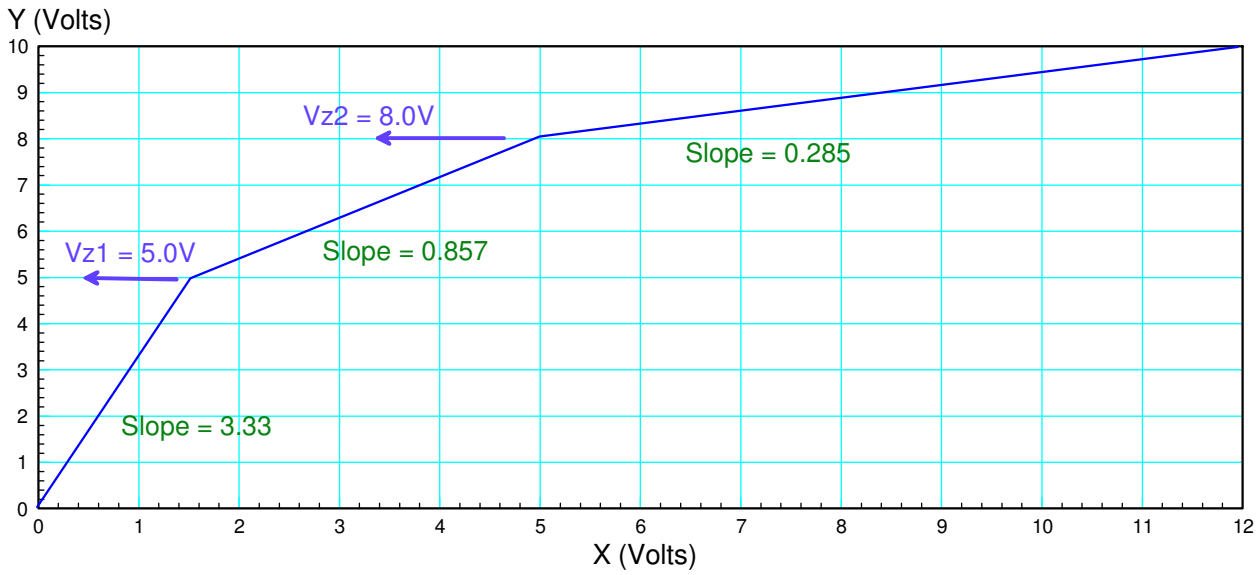
R 900 + 100*Mo + Day	V1	V2	V3	I4	I5
1414	7.70 V	7.00 V	4.70 V	0.7 mA	0

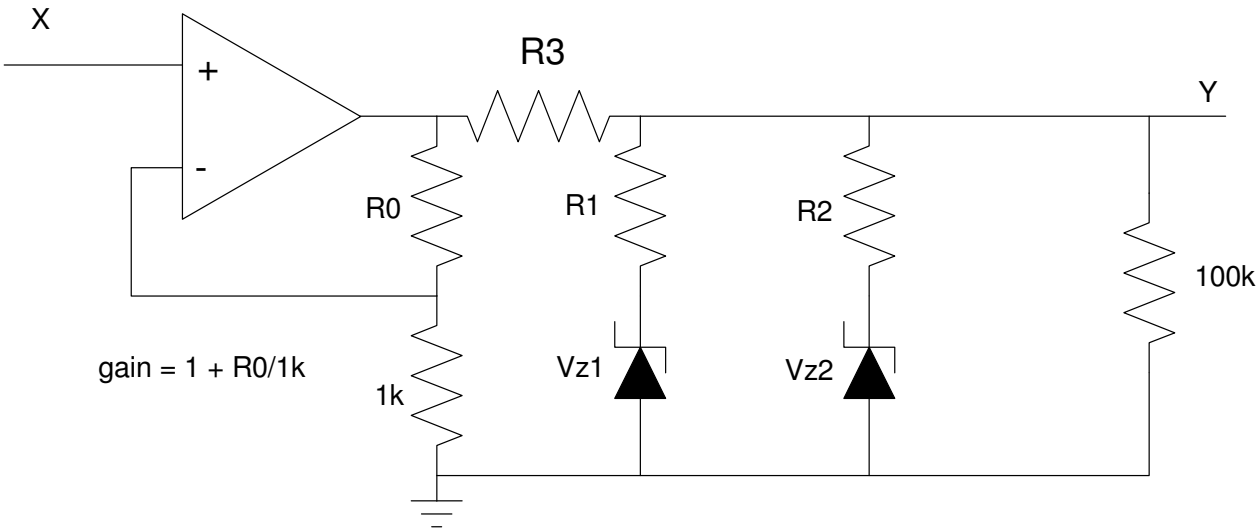


3) Clipper: Determine {R0, R1, R2, Vz1, Vz2} to implement the following function.

- Let R3 be 900 + 100 * your birth month + your birth day.

R3 900 + 100*Mo + Day	R0	Vz1	R1	Vz2	R2
1414	2.33k	5.0V	490	8.0V	181





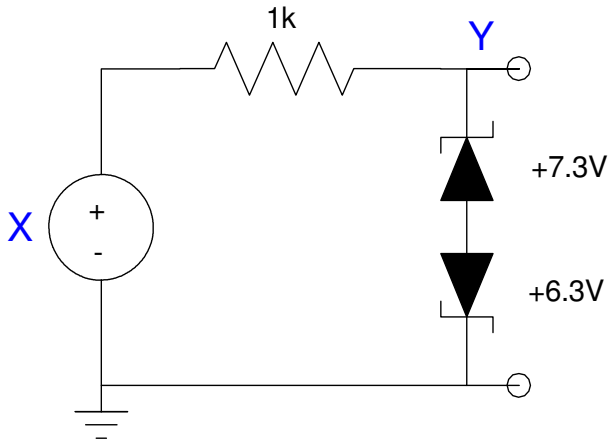
$$0.857 = \left(\frac{R_1}{R_1+R_3}\right)3.333 \qquad \Rightarrow R_1 = 490\Omega$$

$$0.285 = \left(\frac{R_{12}}{R_{12}+R_3}\right)3.33 \qquad \Rightarrow R_{12} = R_1 \| R_2 = 132.3\Omega$$

$$\Rightarrow R_2 = 181\Omega$$

4) Clipper: Design a circuit to clip the voltage at +8V and -7V

$$y = \begin{cases} +8V & x > 8V \\ x & -7V < x < 8V \\ -7V & x < -7V \end{cases}$$



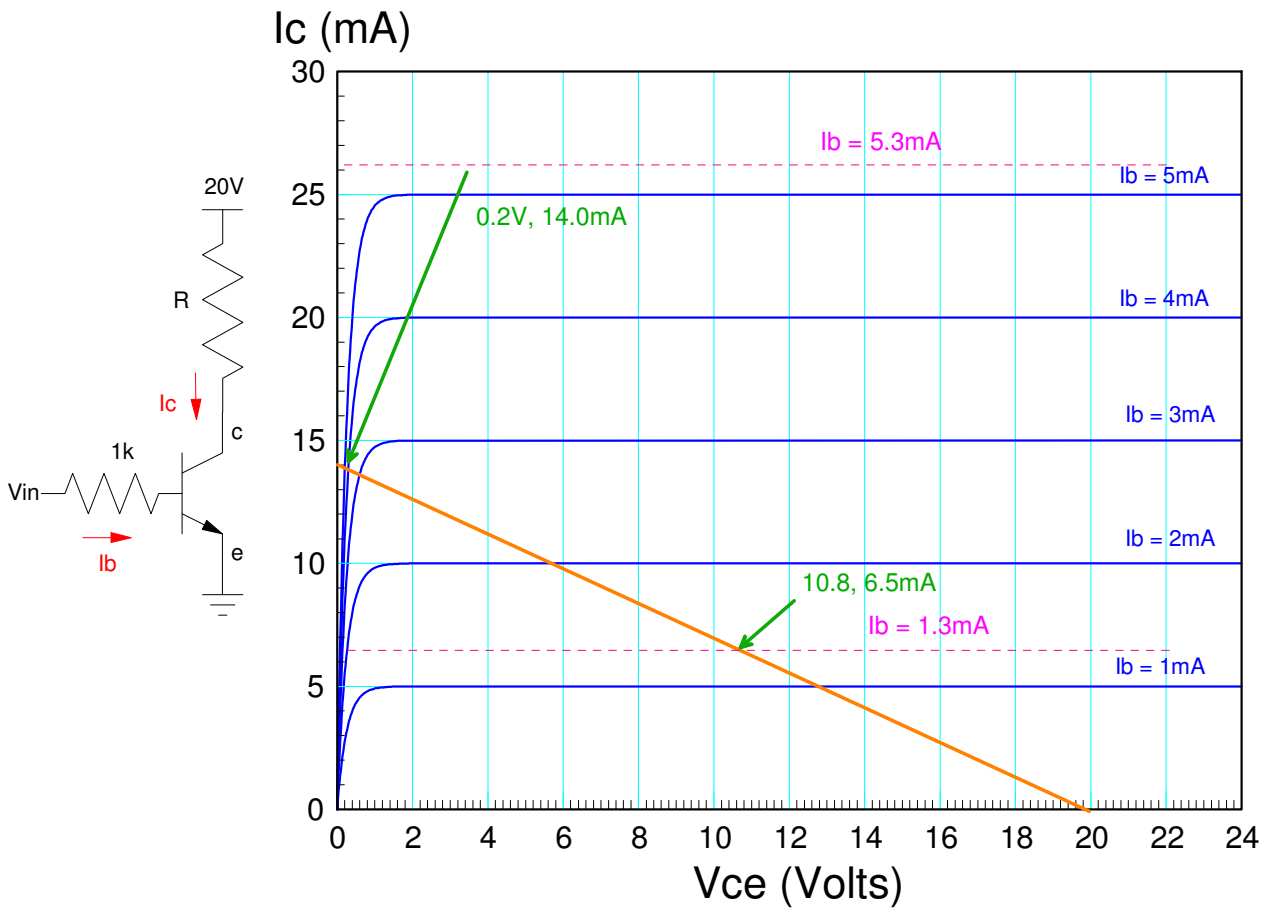
5) The VI characteristics for an NPN transistor are shown below

- Draw the load line for the following circuit
- Show on the load line the operating point (Vce, Ic) when Vin = 2V & 6V.

Assume

- Vbe = 0.7V
- Vce = 0.2V when saturated

R 900 + 100*Mo + Day	Load Line	Vin = 2.0V	Vin = 6.0V
1414	x = 20V y = 14.14mA	Vce = 10.8V Ic = 6.5mA Active	Vce = 0.2V Ic = 14.0mA Saturated



6) The voltages for the following circuit are measured (shown below). From these measurements, determine the following:

R 900 + 100*Mo + Day	Ib (mA)	Ic (mA)	Current Gain (beta)	Operating Region off / active / saturated
1414	3.055mA	918.0mA	300.5	Active Vce > 0.2V