ECE 321 - Quiz #2 - Name _____

Push-Pull Amplifiers, Temperature Sensors

Calculators, Matlab permitted.

1) Push-Pull Amplifier: Voltage Output. Assume ideal silicon diodes and ideal silicon transistors with

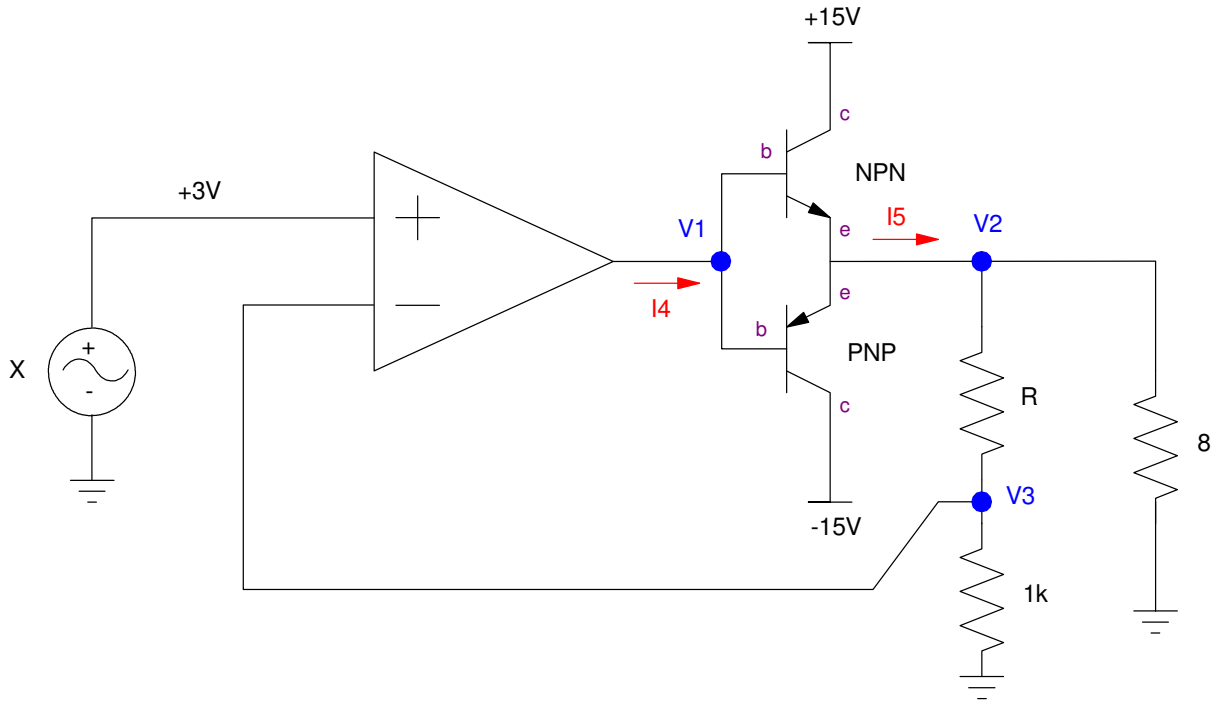
- Vbe = 0.7V
- Current gain = β = 50
- Vce(sat) = 0.2V

Also assume that

- All voltages are limited to -15V to +15V.
- R = 1000 + 100 * (your birth month) + (your birth day). For example, May 14th gives R = 1514 Ohms

Determine the voltages and currents wen X = +3V.

R 1000 + 100*Mo + Day	V1	V2	V3	I4	I5



2) Push-Pull Amplifier: Voltage Output. Assume ideal silicon diodes and ideal silicon transistors with

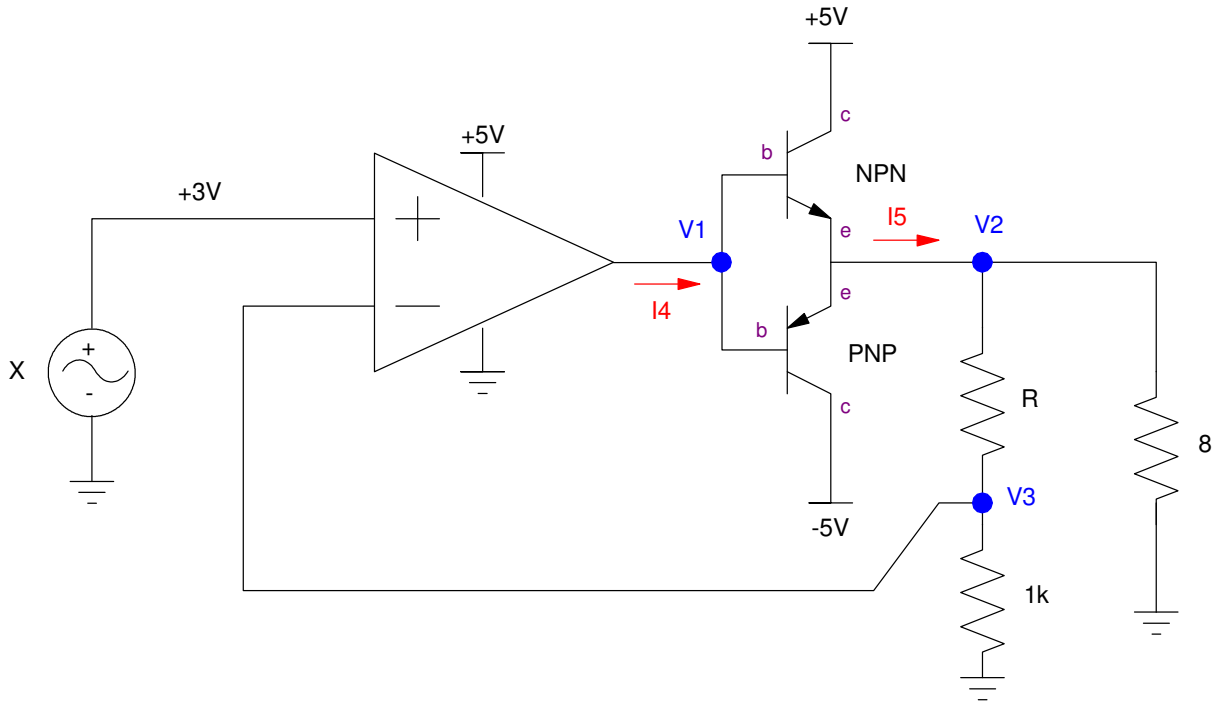
- Vbe = 0.7V
- Current gain = β = 50
- Vce(sat) = 0.2V

Also assume that

- The push-pull amplifier is fed by +5V and -5V,
- The op-amp's output is limited to 0V to +5V, and
- R = 1000 + 100 * (your birth month) + (your birth day). For example, May 14th gives R = 1514 Ohms

Determine the voltages and currents wen X = +3V.

R 1000 + 100*Mo + Day	V1	V2	V3	I4	I5



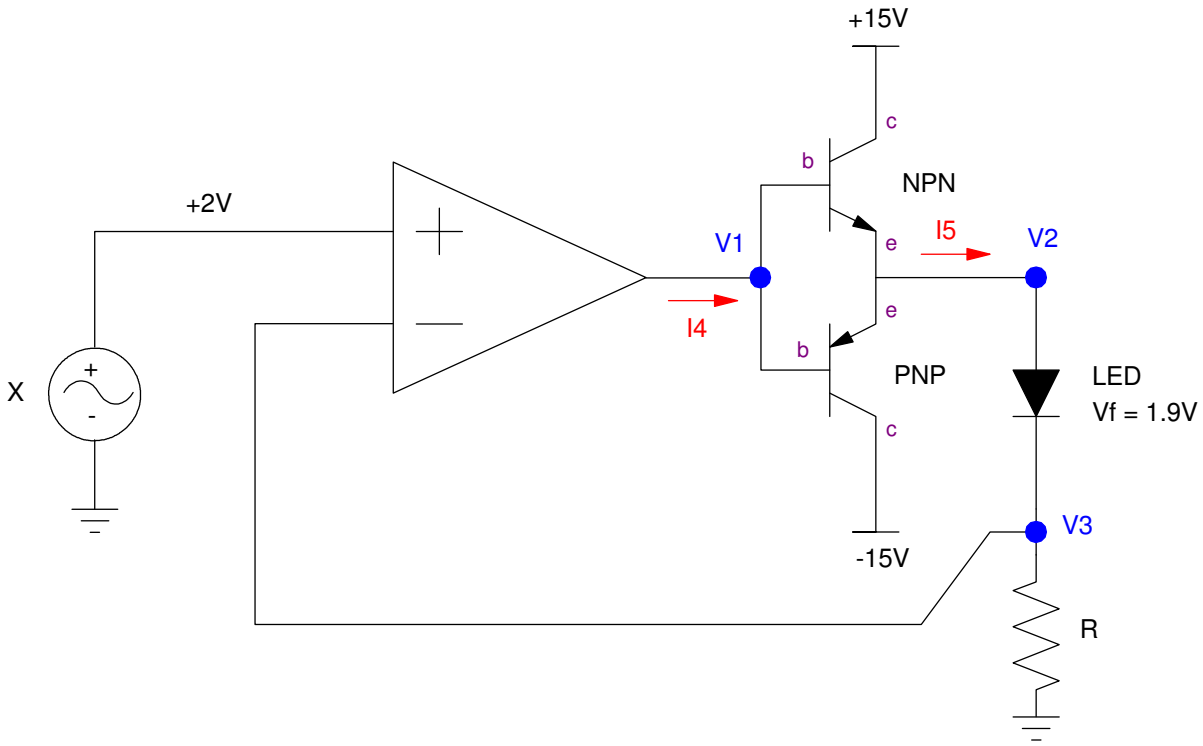
3) Push-Pull Amplifier: Current Output. Assume ideal silicon diodes and ideal silicon transistors with

- |Vbe| = 0.7V
- Current gain = β = 50
- |Vce(sat)| = 0.2V

Determine the voltages and currents wen X = +2V. Assume

- R = 1000 + 100 * (your birth month) + (your birth day). For example, May 14th gives R = 1514 Ohms

R 1000 + 100*Mo + Day	V1	V2	V3	I4	I5



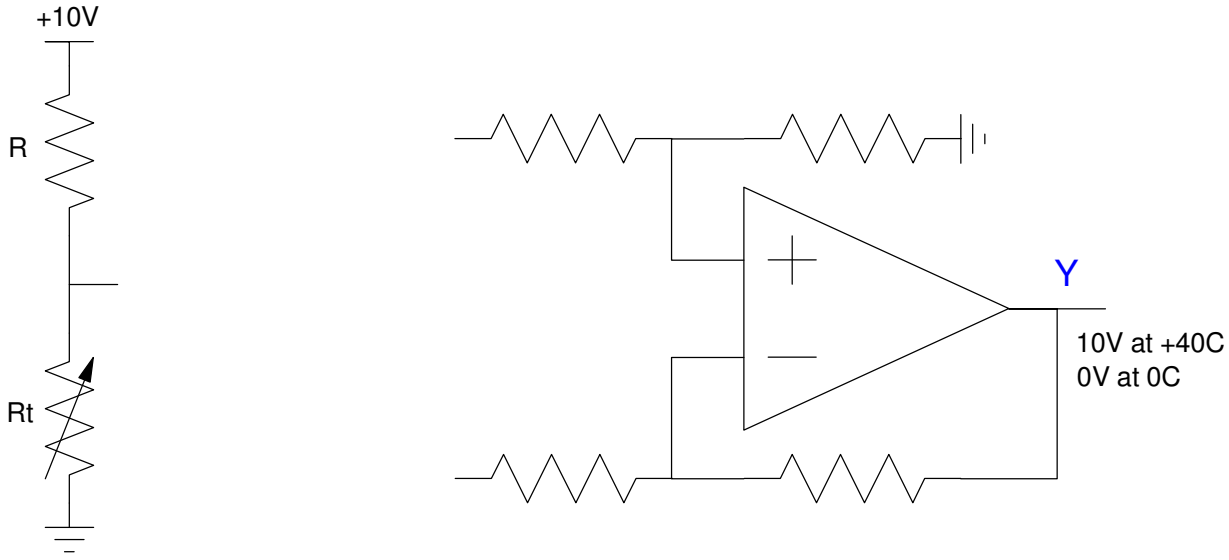
4) RTD. Assume the voltage - resistance relationship for an iron RTD temperature sensor is

$$R_t = 1000 \cdot (1 + 0.00651T)\ \Omega$$

where T is the temperature in degrees C. Design a circuit which outputs

- 0V at 0C and
- +10V at +40C

Let R = 1000 + 100 * (your birth month) + (your birth day). For example, May 14th gives R = 1514 Ohms



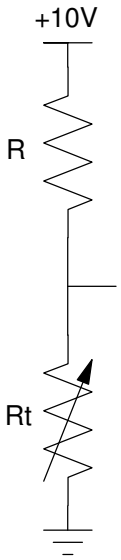
5) Thermistor. Assume the voltage - resistance relationship for a thermistor is

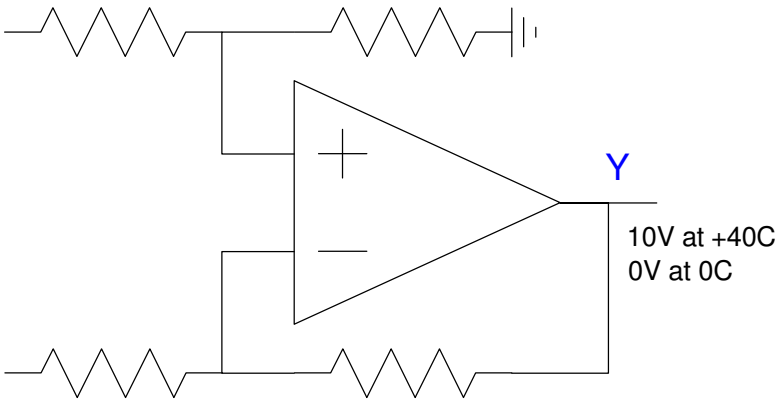
$$R_t = 1000 \cdot \exp\left(\frac{4440}{T+273} - \frac{4440}{298}\right)\ \Omega$$

where T is the temperature in degrees C. Design a circuit which outputs

- 0V at 0C and
- +10V at +40C

Let R = 1000 + 100 * (your birth month) + (your birth day). For example, May 14th gives R = 1514 Ohms





6) Temperature Sensor: 555 Timer. Assume

- Ra = 500 Ohms
- R = 1000 + 100*(your birth month) + (your birthday)

Determine the frequency the 555 timer will output when

- Rt = 3320 Ohms (0C), and
- Rt = 533 Ohms (+40C)

note:

$$T = period = (R_1 + 2R_2) \cdot C \cdot \ln(2)$$

$$f = \frac{1}{T} \text{ Hz}$$

R 1000 + 100*Mo + Day	0C (Rt = 3320)		+40C (Rt = 533)	
	R2	Hz	R2	Hz