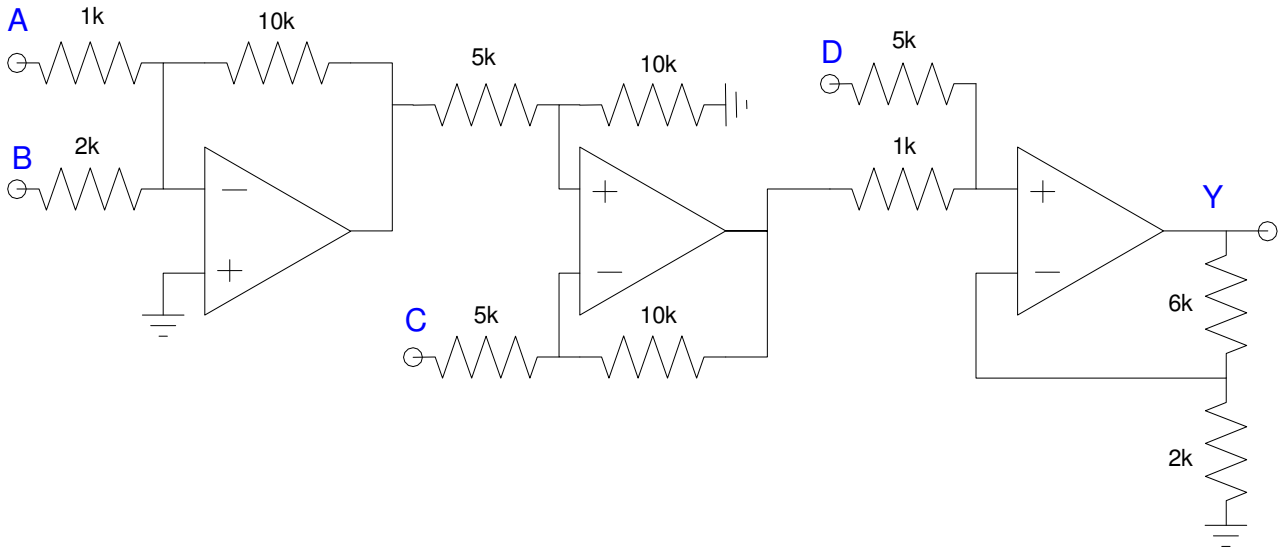
ECE 321 - Final Exam - Name _____

Spring 2022

1. OpAmp Circuits: Determine y as a function of A, B, C, and D. Assume

- Ideal op-amps
- R 900 + 100*(your birth month) + (your birth day).

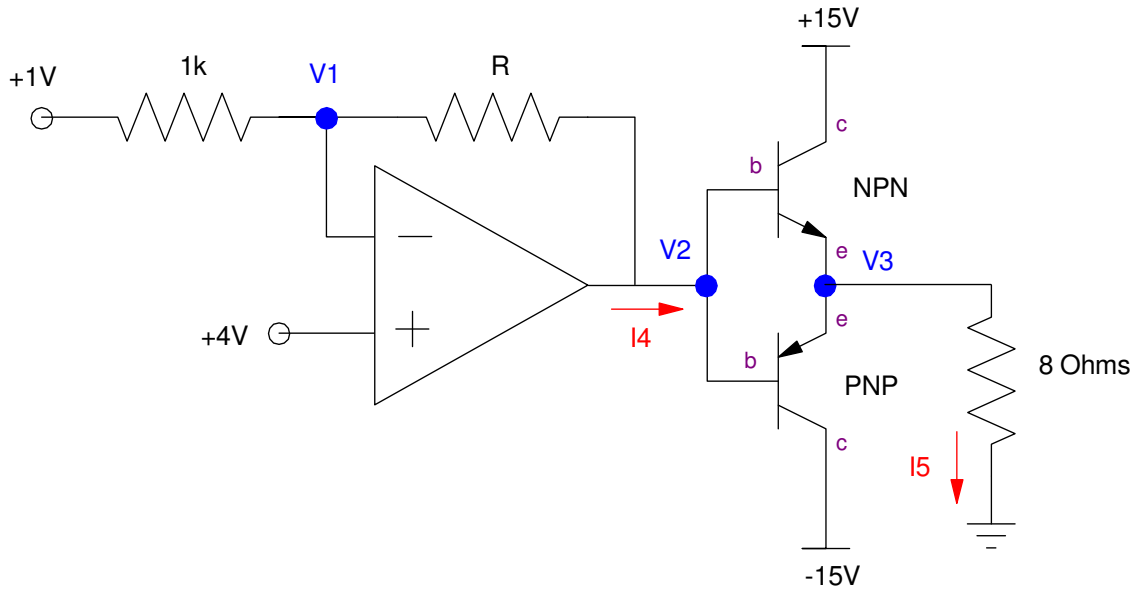
R 900 + 100*mo + day	Y = aA + bB + cC + dD



2. Push-Pull: Determine the voltages and currents for the following push-pull amplifier. Assume

- R = 1100 + 100*(birth month) + (birth day). May 14th gives R = 1614 Ohms
- | Vce | = 0.7V (ideal silicon diodes)
- $\beta = 30$

R 900 + 100*mo + day	V1	V2	V3	I4	I5



3. Instrumentation Amplifier: Assume an RTD has the temperature - resistance relationship of

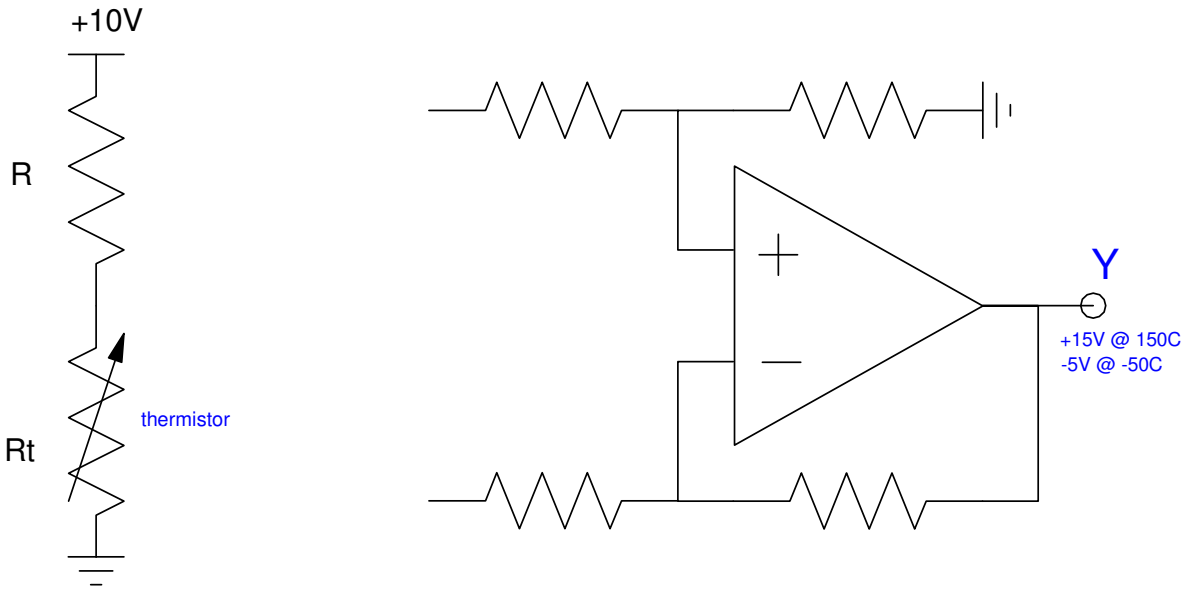
$$R_t = 2000 \cdot (1 + 0.0043T)\Omega$$

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

- +15V at +150C, and
- -5V at -50C

Assume

- R = 900 + 100*(your birth month) + (your birth date)

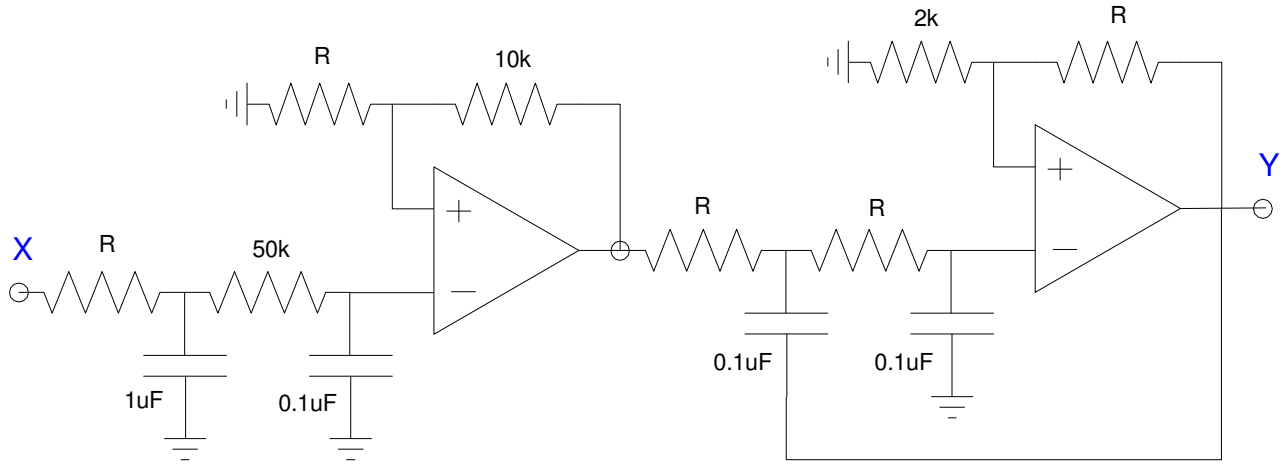


4. Filters: Let

- R 900 + 100*(your birth month) + (your birth day). May 14th would give R = 1614 Ohms

Find the transfer function from X to Y

R 900 + 100*mo + day	Transfer Function Y = G(s) * X



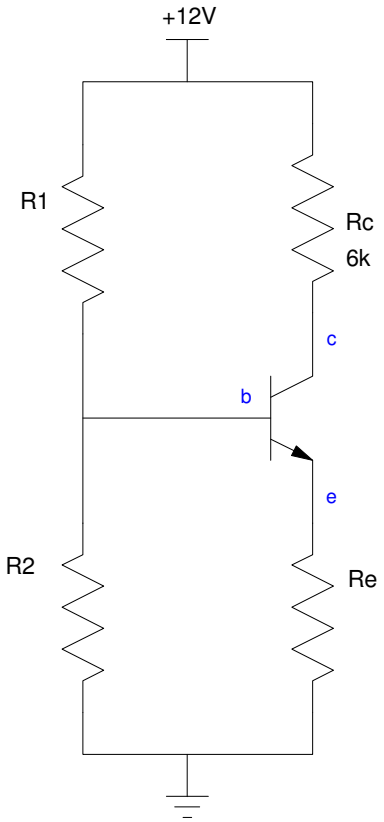
5. CE Amplifiers (DC design): Determine R1 and R2 so that

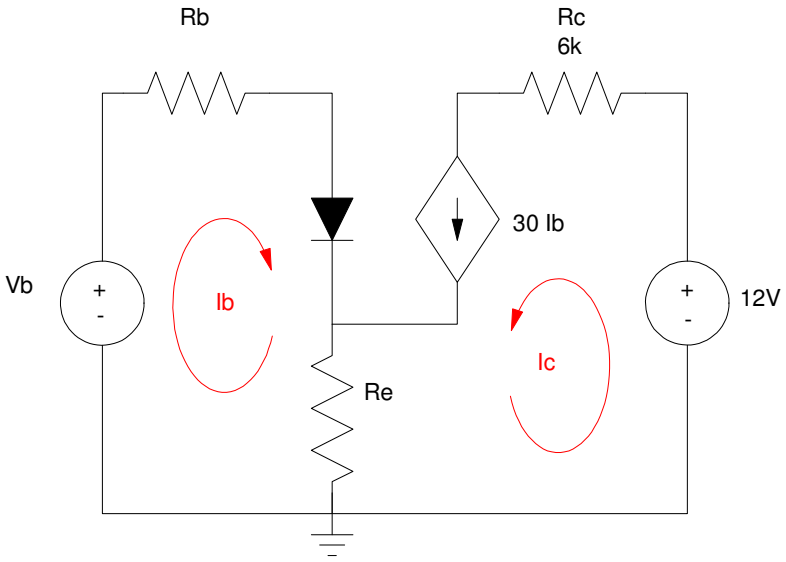
- The Q-point is stabilized for variations in β, and
- Vce = 3.0V

Assume

- Re = 900 + 100*(your birth month) + (your birth date)
- $\beta = 30$
- | Vbe | = 0.7V (ideal silicon diode)

Re 900 + 100*mo + day	R1	R2	Vb	Ic

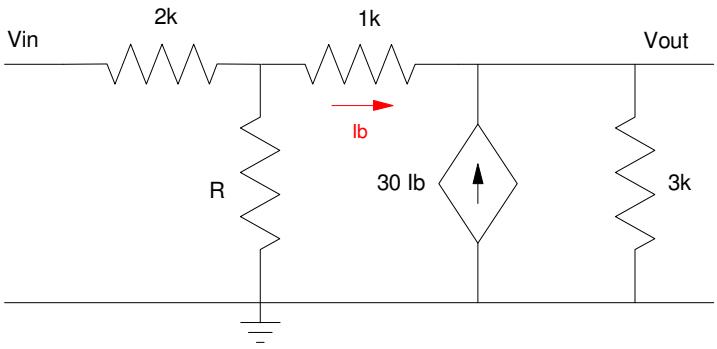


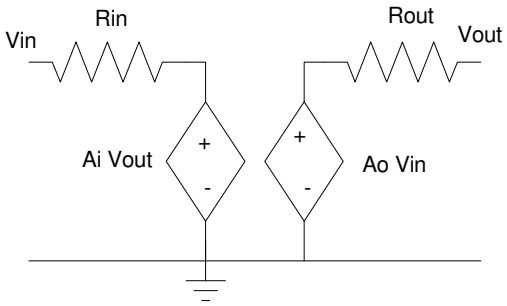


6. 2-Port model: Determine the 2-port parameters for the following circuit. Assume

- R = 900 + 100*(your birth month) + (your birth date) Ohms

R 900 + 100*mo + day	Rin	Ai	Rout	Ao





7. 2-Port model (experimental): Determine the 2-port parameters for an unknown ciruit (shown in blue) given the following experimental data:

Case 1:
- Vin = 1mV @ 1kHz
- Ra = 0 Ohms
- Rb = infinity (open)
- Vout = 96mV @ 1kHz

Case 2:
- Vin = 1mV @ 1kHz
- Ra = R Ohms
- Rb = infinity (open)
- Vout = 63mV @ 1kHz

Case 3:
- Vin = 1mV @ 1kHz
- Ra = 0 Ohms
- Rb = R Ohms
- Vout = 28mV @ 1kHz

Assume
- R = 900 + 100*(your birth month) + (your birth date) Ohms
- Ai = 0

R 900 + 100*mo + day	Rin	Ai	Rout	Ao
		0