

ECE 321 - Homework #1

Op-Amp Amplifiers. Due Monday, November 9th

1) Design an op-amp circuit to implement

$$Y = 10X$$

2) Design an op-amp circuit to implement

$$Y = -10X$$

3) Design an op-amp circuit to implement

$$Y = 7X - 4$$

4) A thermistor has the temperature-voltage relationship of

$$R = 1000 \cdot e^{-0.0515(T-25)} \Omega$$

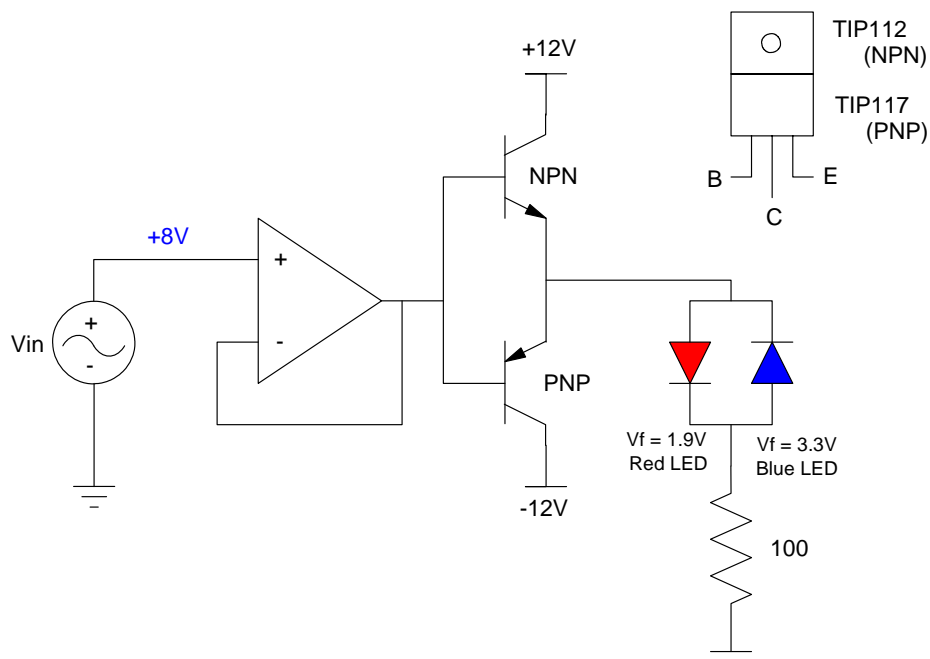
Design an op-amp circuit which output

- 0V at 0C,
- 10V at +40C,
- Proportional (0..10V) for temperatures between 0C and +40C

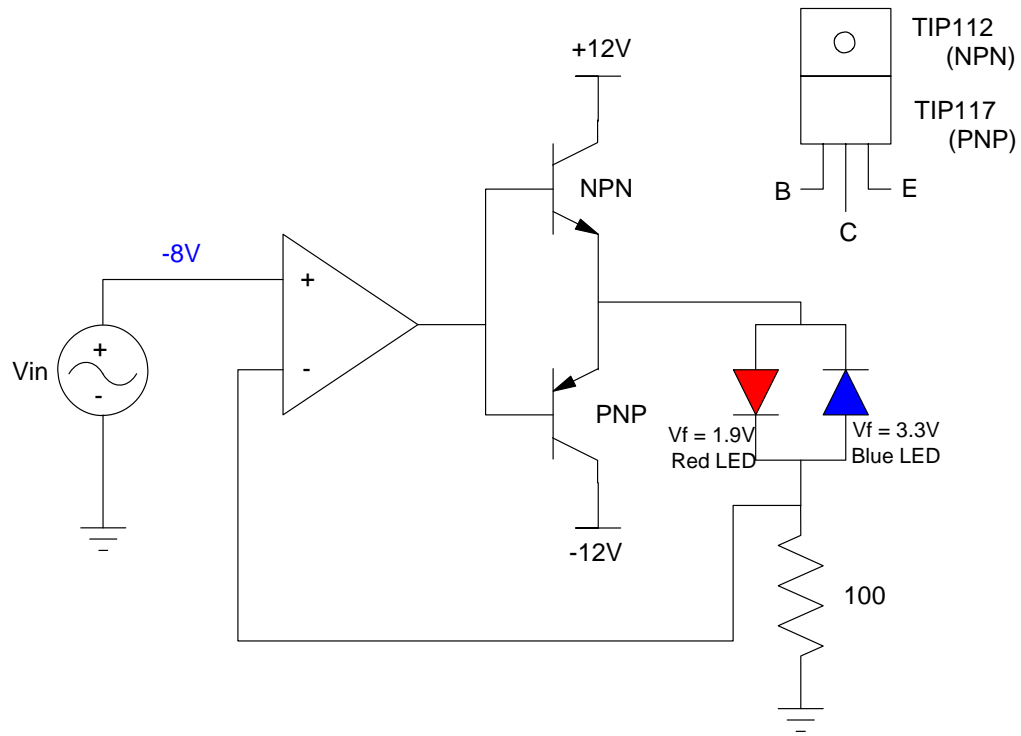
5) Design an op-amp circuit to implement the following differential equation

$$Y = \left(3 + \frac{4}{s} + 5s\right)X$$

6) Determine the node voltages for the following circuit when the input is +8VDC. Assume a TIP112 and TIP117 transistors. ($\beta = 1000$, $V_{be} = 1.4V$, $V_{ce:sat} = 0.9V$)



7) Determine the node voltages for the following circuit when the input is -8VDC. Assume a TIP112 and TIP117 transistors.



8) Design an op-amp circuit with a push-pull amplifier to drive a 100mA light

- 0mA at 0C
- 100mA at 40C
- Proportioanal (0..100mA) for temperatures between 0C and +40C.

9) Simulate your circuit in problem 8 in PartSim (or similar software)

10) Lab: Build the circuit you designed in problem #8 in lab and verify its operation.