

ECE 3050 Analog Electronics Quiz 14

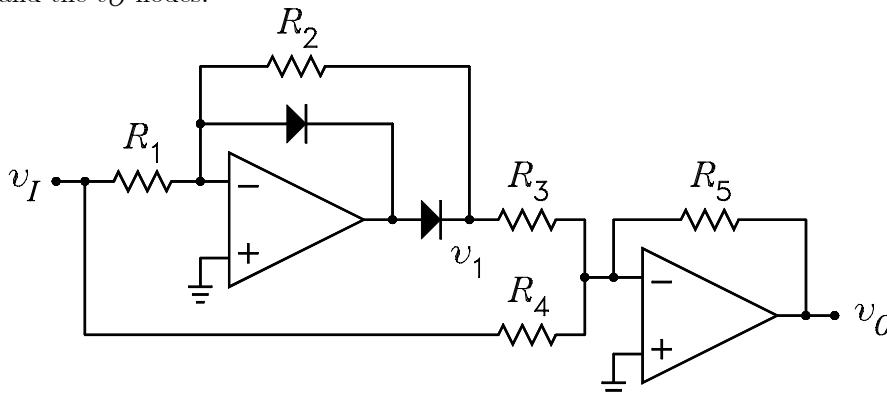
April 22, 2009

Professor Leach

Name _____

Instructions. Print your name in the space above. **Honor Code:** *I have neither given nor received help on this quiz.* Initials _____

- 1 of 2. The figure shows a precision rectifier circuit. The input signal is a sine wave. For $R_1 = 10\text{ k}\Omega$, $R_2 = 10\text{ k}\Omega$, $R_3 = 5\text{ k}\Omega$, $R_4 = 10\text{ k}\Omega$, and $R_5 = 20\text{ k}\Omega$, sketch the time domain waveforms for the v_1 and the v_o nodes.

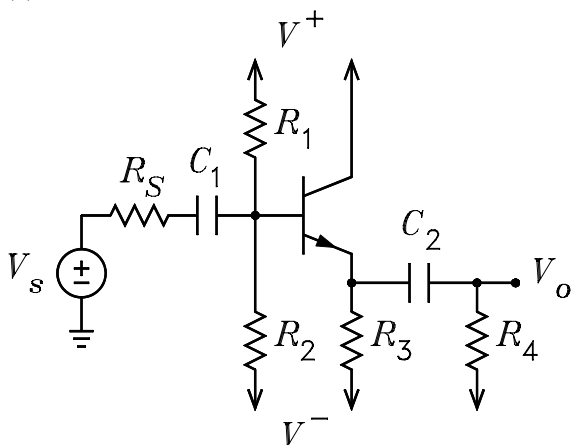


The output signal is a negative going full wave rectified sine wave with a peak voltage of $2v_I$.

- 2 of 2. $R_S = 1\text{ k}\Omega$, $R_1 = R_2 = 30\text{ k}\Omega$, $R_3 = 3\text{ k}\Omega$, and $R_4 = 1\text{ k}\Omega$, $C_1 = 1\text{ }\mu\text{F}$, and $C_2 = 50\text{ }\mu\text{F}$. The impedances seen looking into the base and into the emitter are

$$z_{ib} = 10^4 \frac{1 + s/100}{1 + s/10} \quad z_{ie} = 500 \frac{1 + s/20}{1 + s/2}$$

- For the lower cutoff frequency, solve for the worse case pole frequency for C_1 .
- For the lower cutoff frequency, solve for the worse case pole frequency for C_2 .
- Which pole dominates in calculating the lower cutoff frequency f_L ?



$$R_S := 1000 \quad R_1 := 30000 \quad R_2 := 30000 \quad R_3 := 3000 \quad R_4 := 1000$$

$$r_{ib} := 1000 \quad r_{ie} := 50 \quad \text{worst case values which are the high frequency limits}$$

$$C_1 := 1 \cdot 10^{-6} \quad C_2 := 50 \cdot 10^{-6}$$

$$\tau_1 := (R_S + R_{p3}(R_1, R_2, r_{ib})) \cdot C_1 \quad \frac{1}{2 \cdot \pi \cdot \tau_1} = 82.144 \quad \text{this frequency dominates because it is the highest}$$

$$\tau_2 := (R_{p2}(r_{ie}, R_3) + R_4) \cdot C_2 \quad \frac{1}{2 \cdot \pi \cdot \tau_2} = 3.034$$