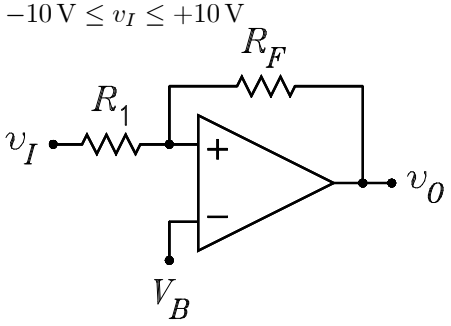
ECE 3050 Analog Electronics Quiz 7

July 7, 2010

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. Given $R_1 = 5\,\text{k}\Omega$, $R_F = 30\,\text{k}\Omega$, $V_B = 3\,\text{V}$, and $V_{SAT} = 12\,\text{V}$. Sketch the graph of v_O versus v_I for $-10\,\text{V} \le v_I \le +10\,\text{V}$



A non-inverting Schmitt trigger with trigger points v_{I1} and v_{I2} solved for as follows:

$$\begin{aligned} v_{I1}\frac{R_F}{R_1+R_F} + V_{SAT}\frac{R_1}{R_1+R_F} &= V_B \quad \Longrightarrow \quad v_{I1} = 1.5\,\text{V} \\ v_{I2}\frac{R_F}{R_1+R_F} - V_{SAT}\frac{R_1}{R_1+R_F} &= V_B \quad \Longrightarrow \quad v_{I2} = 5.5\,\text{V} \end{aligned}$$

2. Given $R_1 = 1\,\text{k}\Omega$, $R_2 = 2\,\text{k}\Omega$, $R_3 = 3\,\text{k}\Omega$, $R_4 = 4\,\text{k}\Omega$, $R_5 = 5\,\text{k}\Omega$, $R_6 = 6\,\text{k}\Omega$, $R_7 = 7\,\text{k}\Omega$, $R_8 = 8\,\text{k}\Omega$, $R_9 = 9\,\text{k}\Omega$, and $R_{10} = 1\,\text{k}\Omega$.

(a) For $v_{in} = 1\,\text{V}$ and $i_{in} = 0$, solve for v_o.

$$v_o = v_{in}\left(-\frac{R_3}{R_1}\right)\left(-\frac{R_6}{R_4}\right) = 4.5\,\text{V}$$

(b) For $v_{in} = 0$ and $i_{in} = 1\,\text{mA}$, solve for v_o.

$$v_o = i_{in}\,(R_8 \| R_9)\left(-\frac{R_{10}}{R_9}\right)\left(1 + \frac{R_6}{R_4 \| R_5}\right) = -1.74\,\text{V}$$