ECE 65 Final Exam

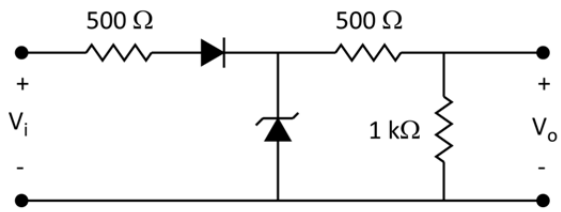
Name________________________________ PID__________________________________

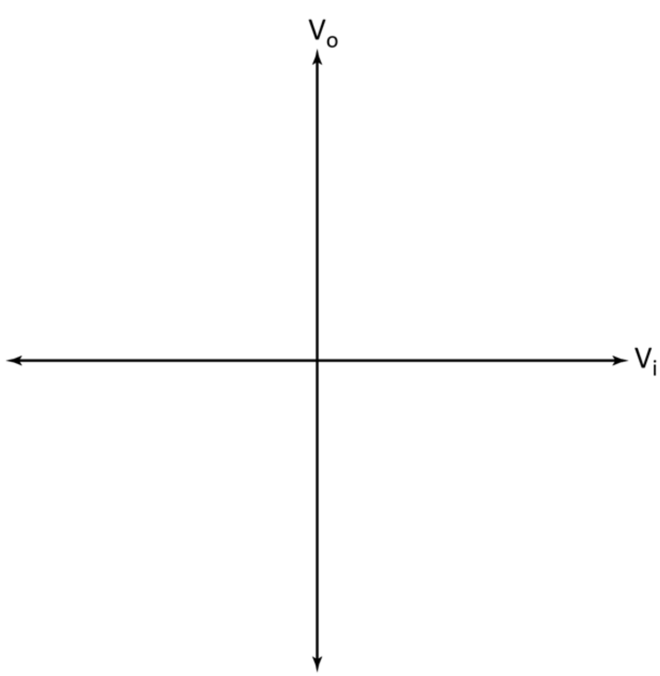
Question 1 (10 points)

Assume silicon diodes. For the Zener diode, V_Z = 6 V.

a) Find the transfer function, V_o for all V_i

b) Plot the transfer function. Label the values of V_i and V_o at any points where the slope is discontinuous.

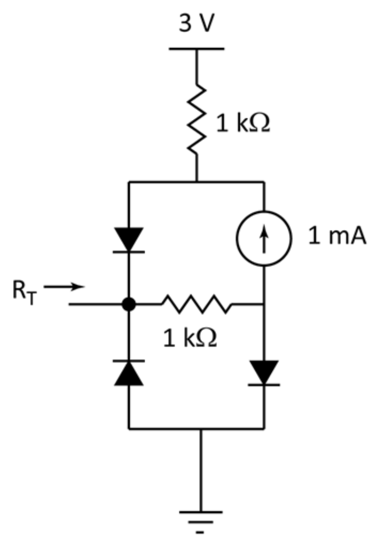




Question 2 (10 points)

Find the small signal Thevenin resistance at the node indicated.

Assume discrete silicon diodes at 300°K.

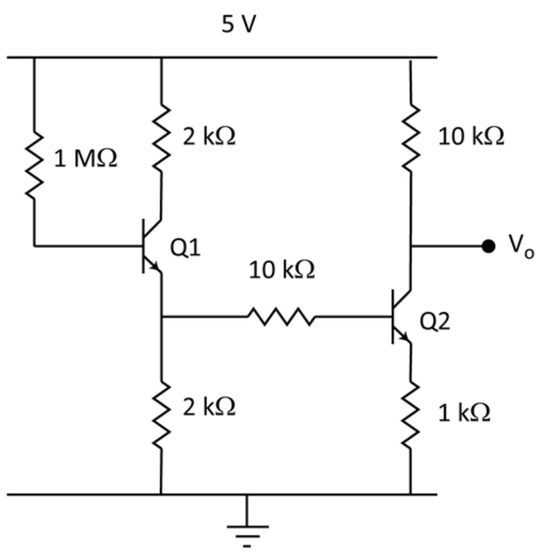


Question 3 (10 points)

Assume silicon BJTs with β=200.

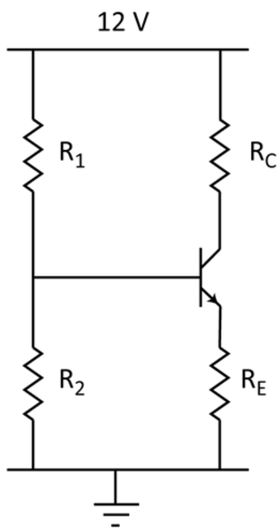
a) Determine the state of both transistors.

b) Find V_o



Question 4 (10 points)

Design the following bias circuit so that I_C will be stable with respect to variations in β from 100 to 200, and variations in V_{BE} of +/- 0.1 V. Also design the circuit so that I_C = 10 mA and V_{CE} = 6 V. Determine the values of R_1, R_2, R_C, and R_E that meet these design goals.



Question 5 (10 points)

For the transistor below, assume $k_p'(W/L) = 1\ mA/V^2$, $V_{tp} = -1\ V$, and $\lambda = 0.02\ V^{-1}$.

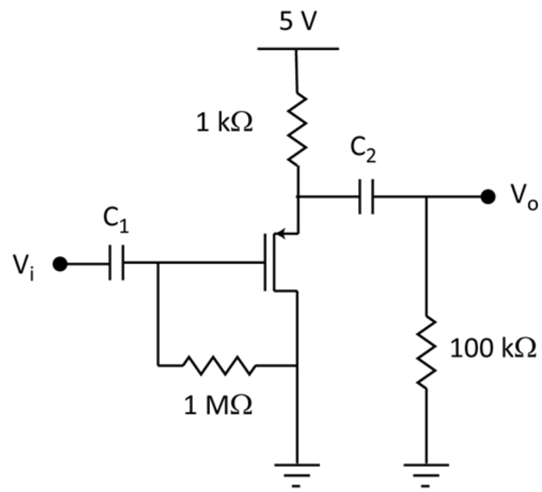
You may ignore channel width modulation for determining bias conditions.

For this amplifier circuit,

a) Find the voltage gain, A_V

b) Find the input resistance, R_i

c) Find the output resistance, R_o



Question 6 (10 points)

For the transistor below, assume $k_n'(W/L) = 1\ mA/V^2$, $V_{tp} = 1\ V$, and $\lambda = 0.02\ V^{-1}$.
You may ignore channel width modulation for determining bias conditions.
Determine the low frequency cutoff for this amplifier.
Assume $R_{sig} = 0$.