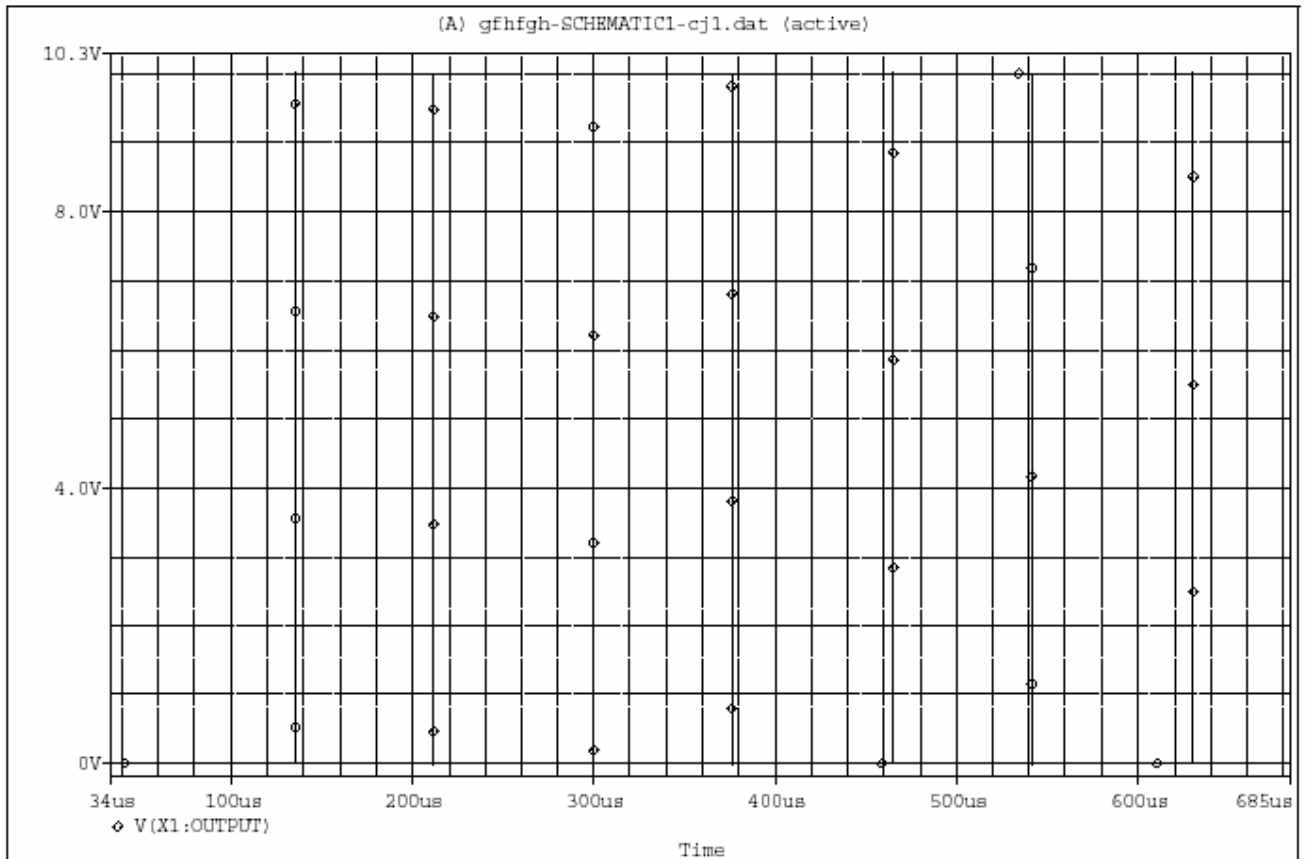
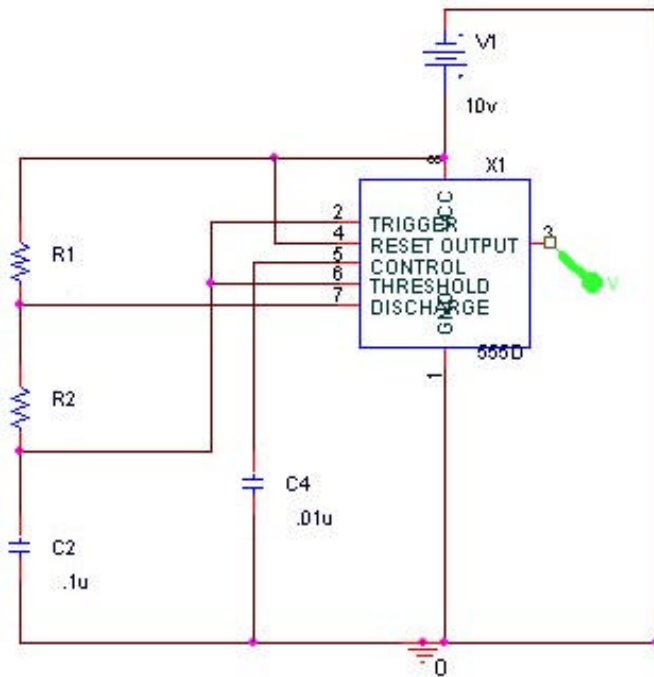


1) 555 Timer (20pts)



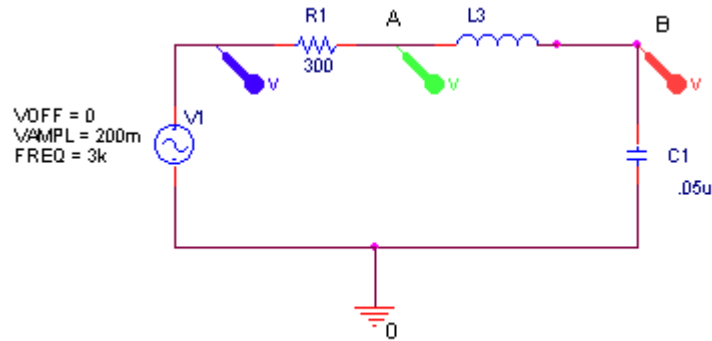
Name \_\_\_\_\_

Section \_\_\_\_\_

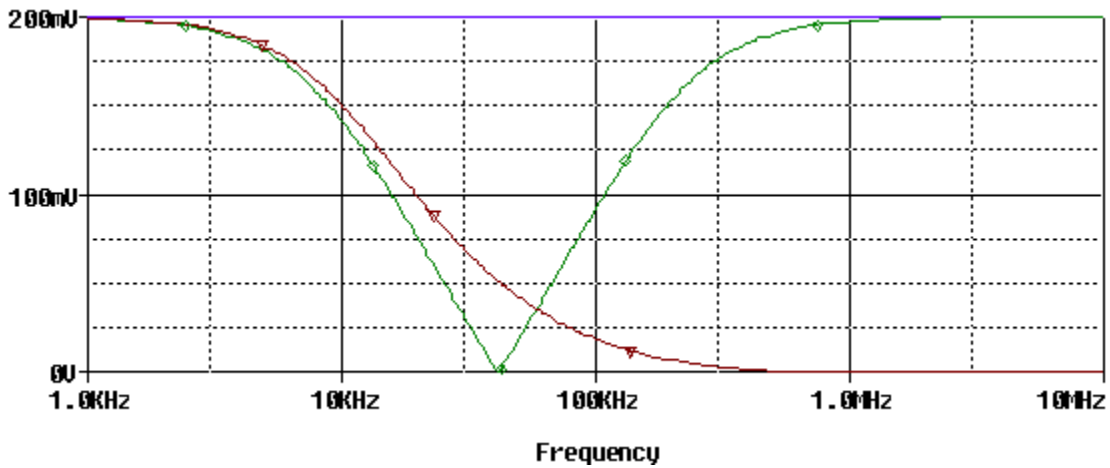
- a) What is the Frequency of the 555 set at, What is T1, T2? 9pts
- b) Calculate R1, R2 8pts
- c) What are the two voltage thresholds at which the 555 switches? 3pts

2) Inductance Measurement (20 points)

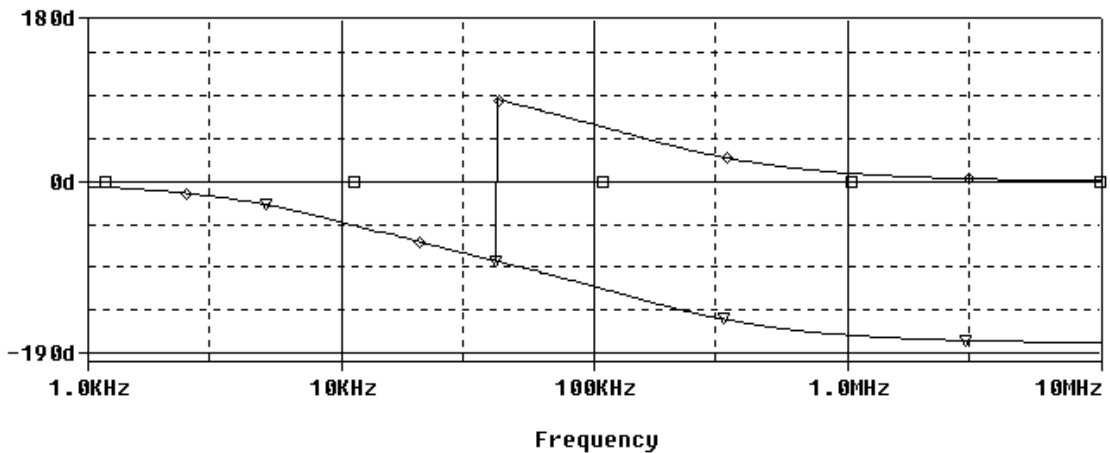
In the circuit below,  $V_{in} = 200\text{mv}$ ,  $R_2 = 300\ \Omega$ ,  $C_1 = 0.05\ \mu\text{F}$  and  $L_1$  is unknown.



Plot I: Displays an AC sweep of the voltage at points A and B.



Plot II: Displays an AC sweep of the phase at points A and B.



Name \_\_\_\_\_

Section \_\_\_\_\_

a) Find the transfer function,  $H(j\omega)$ , at point B. Determine the value of the function, the magnitude and the phase at hi and low frequencies.

(2 pts)  $H(j\omega) =$

(1 pt)  $H(j\omega_{lo}) =$

(1 pt)  $H(j\omega_{hi}) =$

(1 pt)  $|H(j\omega_{lo})| =$

(1 pt)  $|H(j\omega_{hi})| =$

(1 pt)  $\angle H(j\omega_{lo}) =$

(1 pt)  $\angle H(j\omega_{hi}) =$

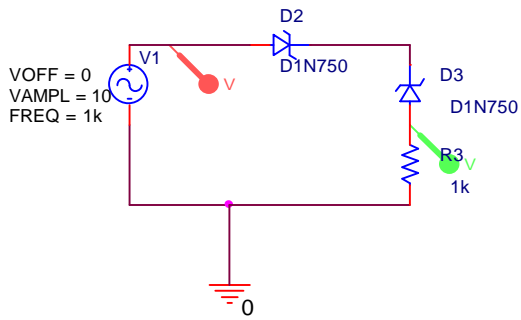
b) Based on your results from part a), indicate on plot I the trace for the magnitude of the voltage at point B (2 pts).

c) Based on your results from part a), indicate on plot II the trace for the phase at point B (2 pts).

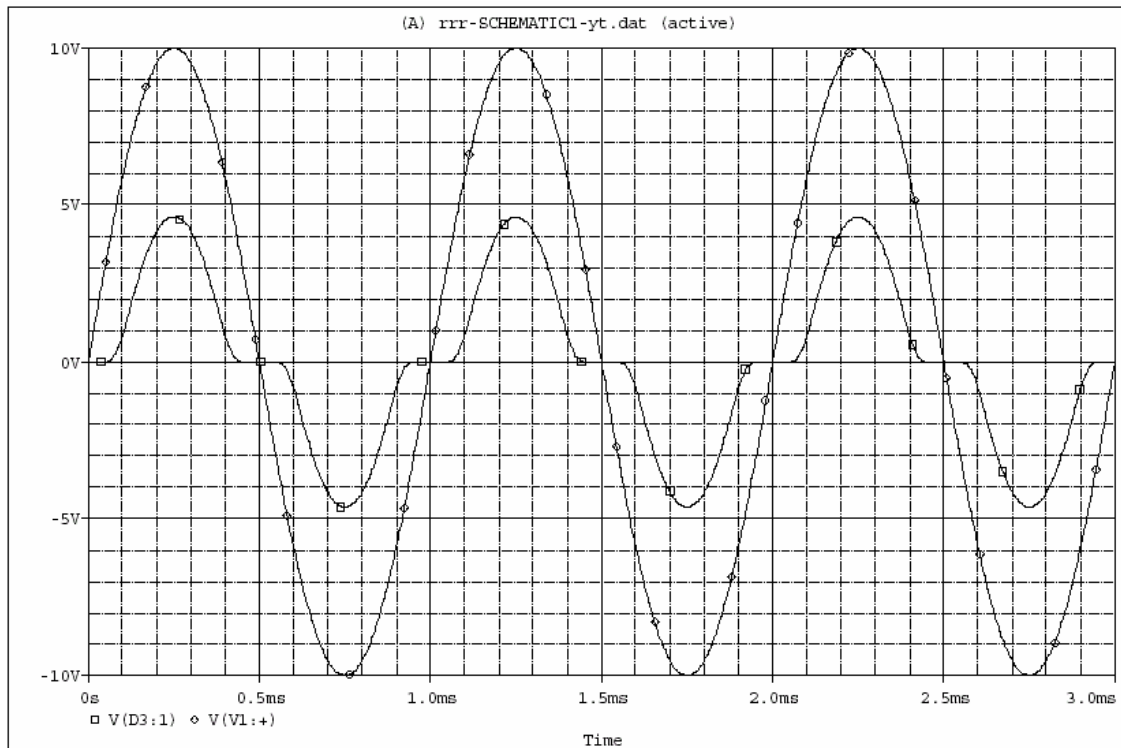
d) Find the resonance frequency  $f_0$  from the plot. Notice that the x-axis has logarithmic scale. (ie.  $10^{0.5} = 3.16$ ) (2 pts)

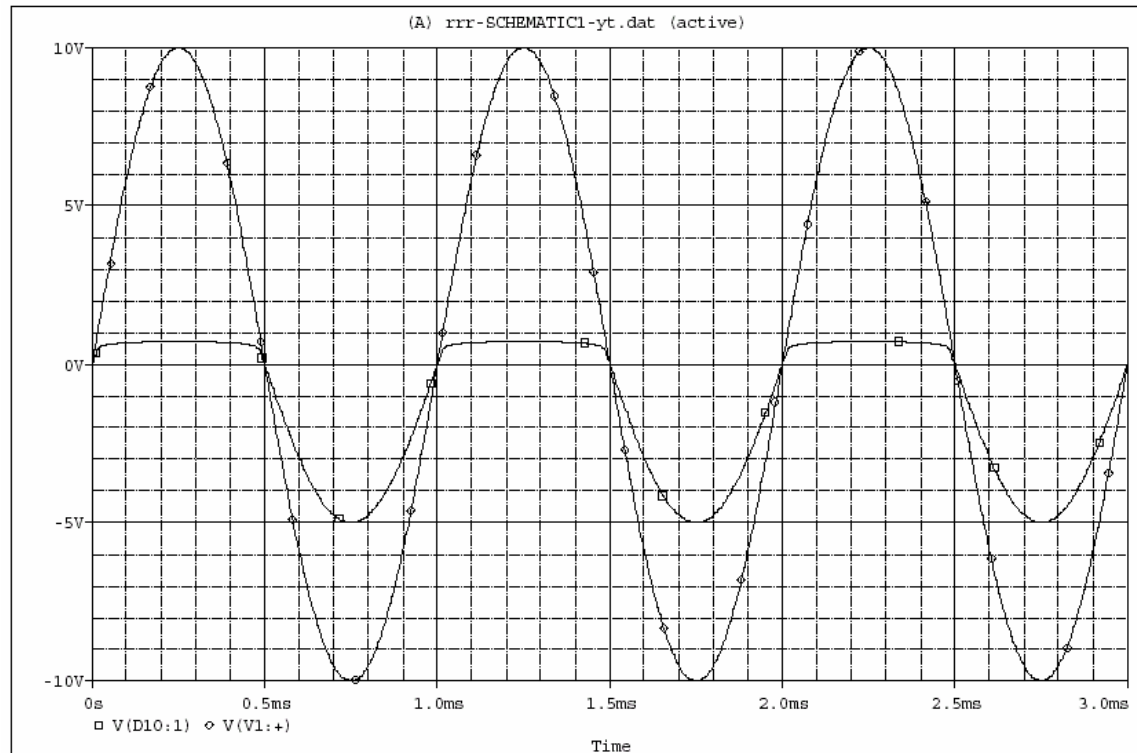
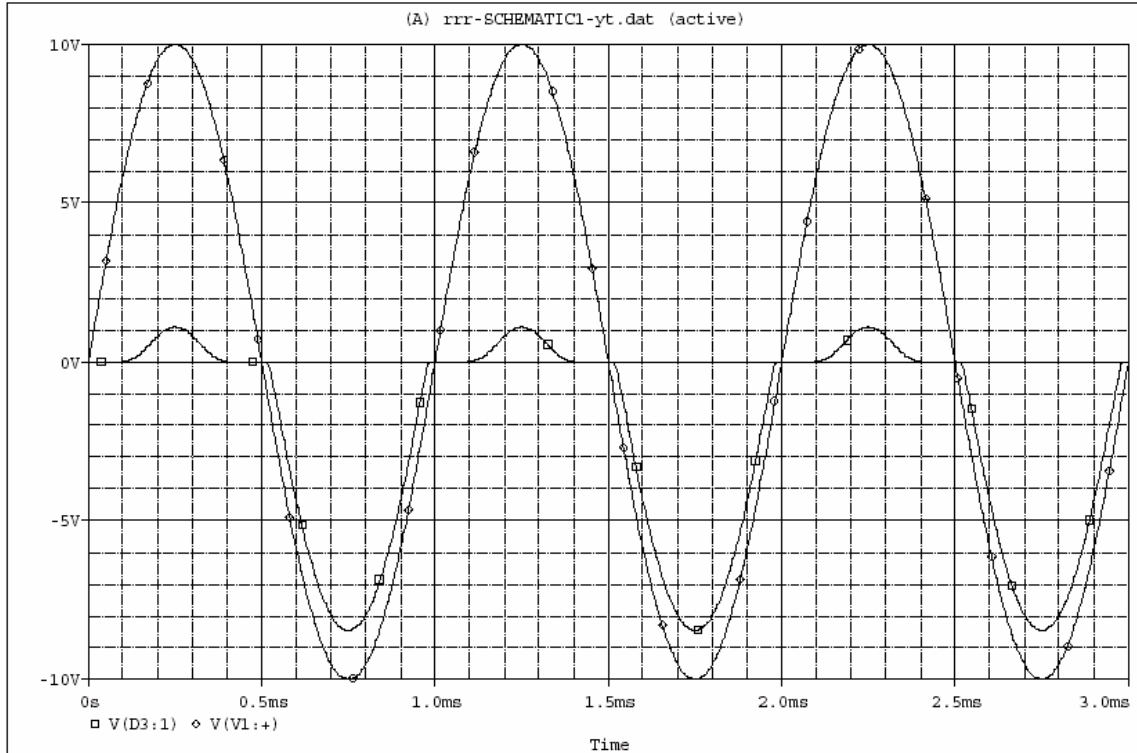
e) Solve for the unknown inductance. (6 pts)

3) Zener Diodes (20 pts)

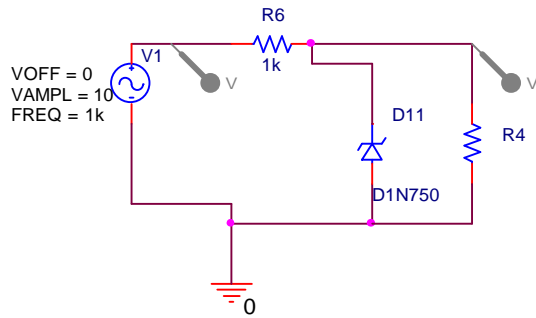


a) Which Plot matches this circuit diagram (7pt)

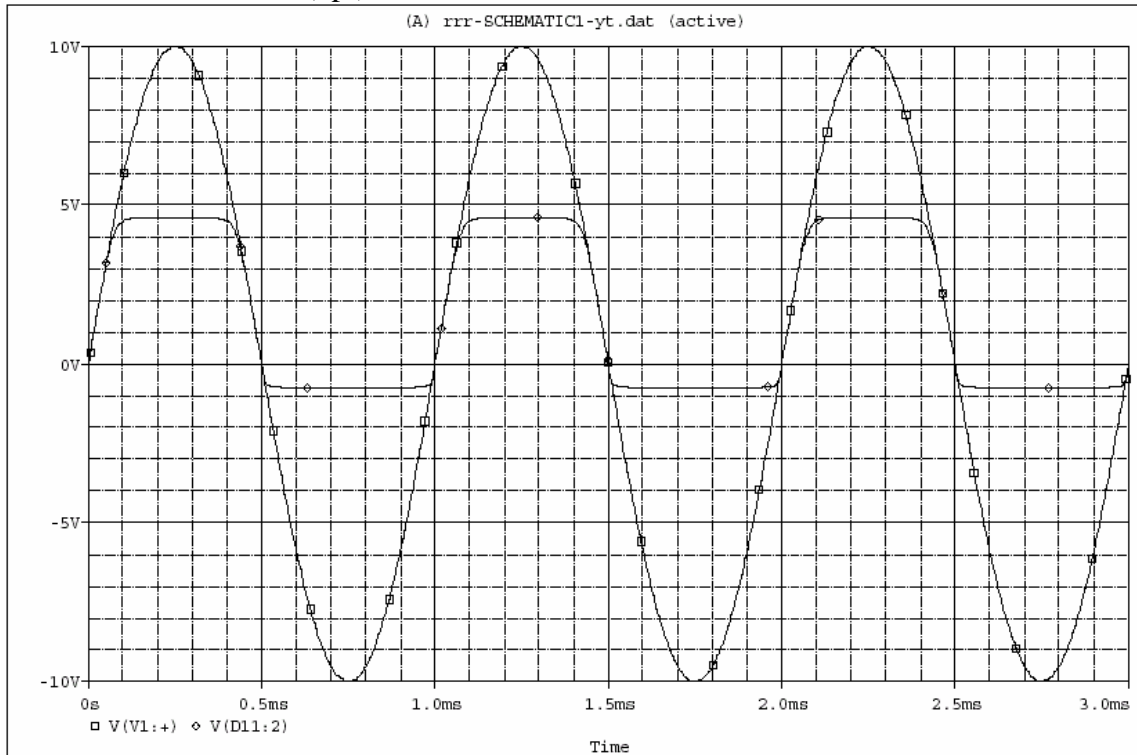


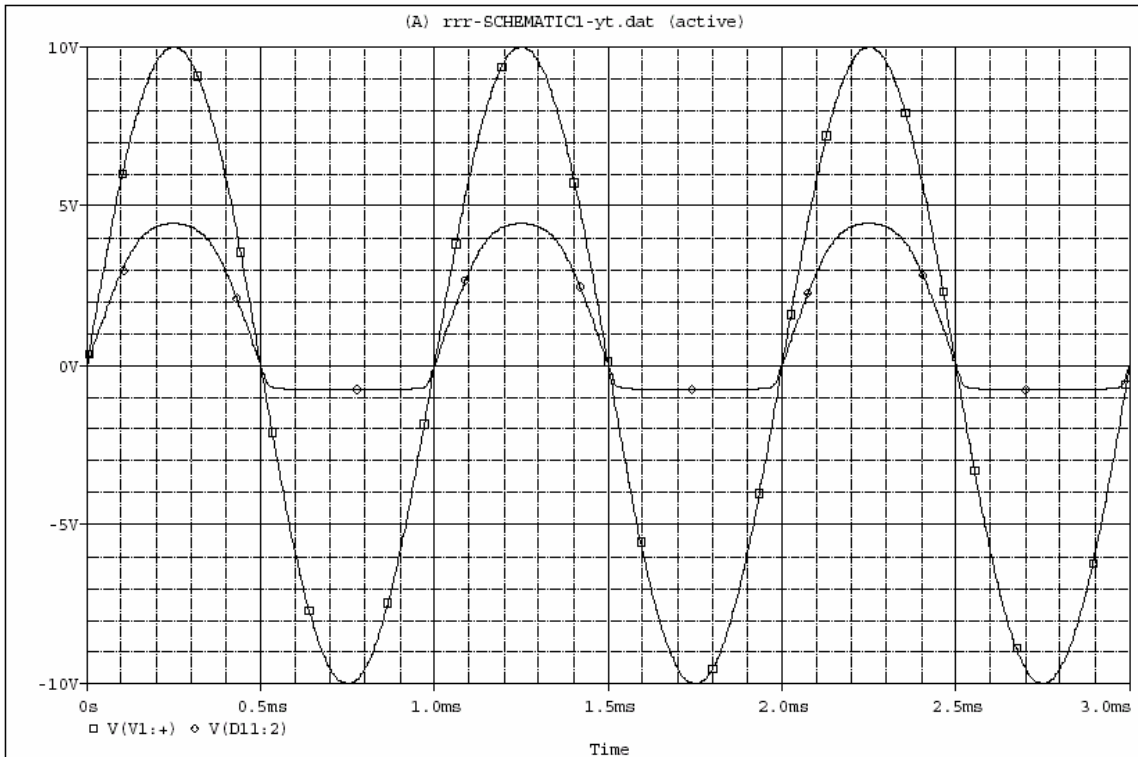
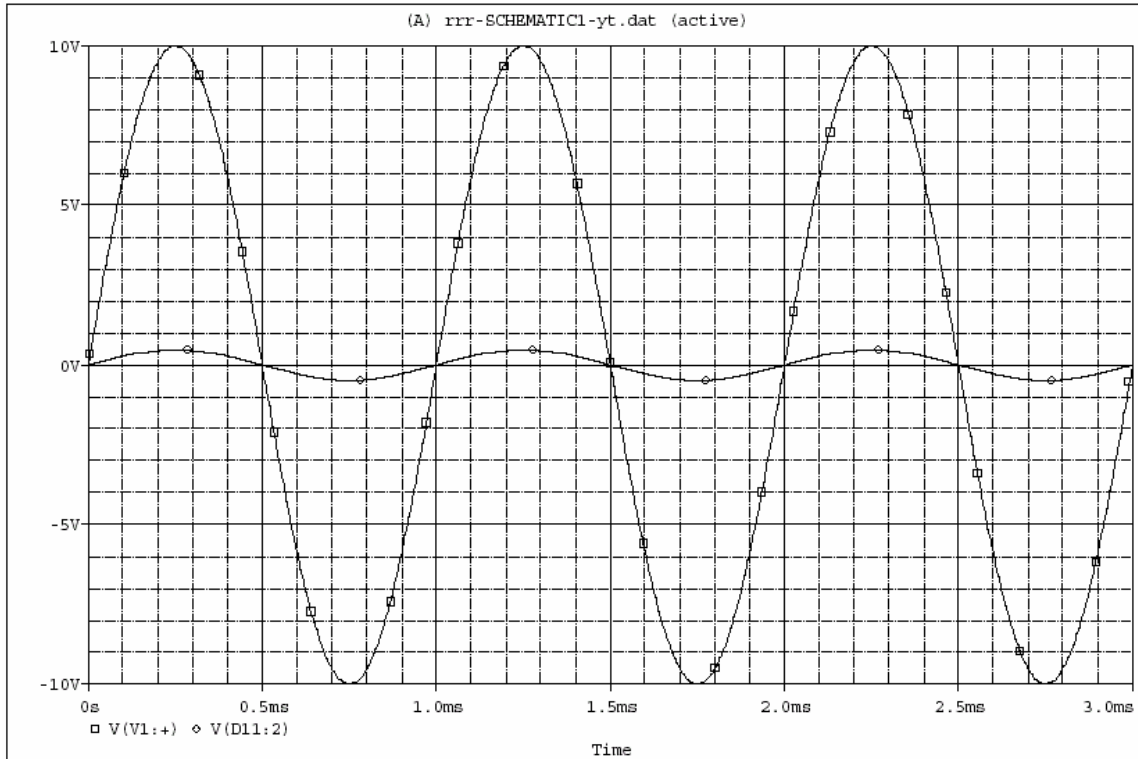


B)



Below are 3 graphs that match 3 values for R4. Choose which goes with 50 ohms, 5000 ohms and 50000 ohms. (6pt)





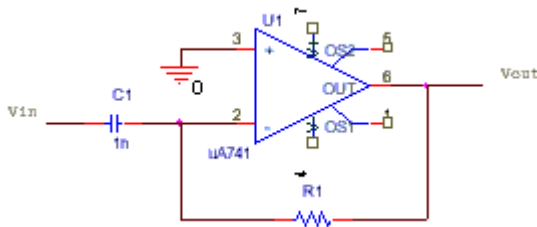
C) What is the main difference between standard diode, and a zener diode?? (7pt)



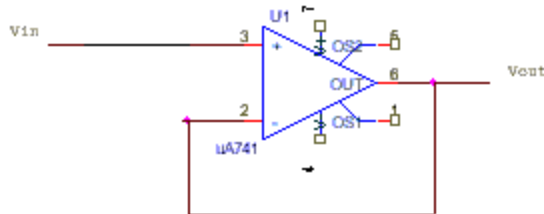
4) Op-Amp Configurations (20 points)

a) Seven circuits are shown below. (Connections to power supply are not displayed but assumed). For each circuit, identify the function (1 pnt each) and give the mathematical relationship that relates the input and output voltages (1 pnt each).

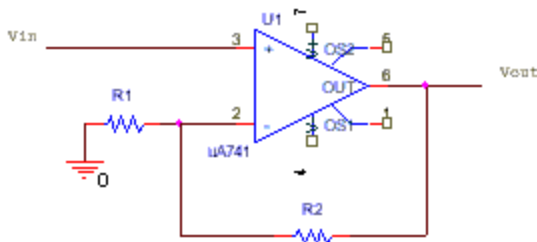
1.



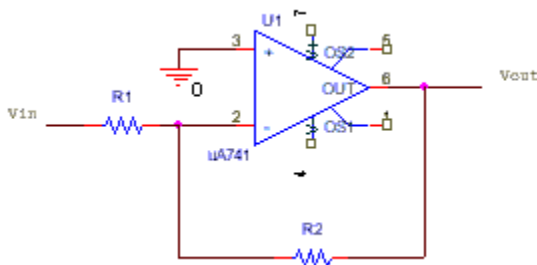
2.



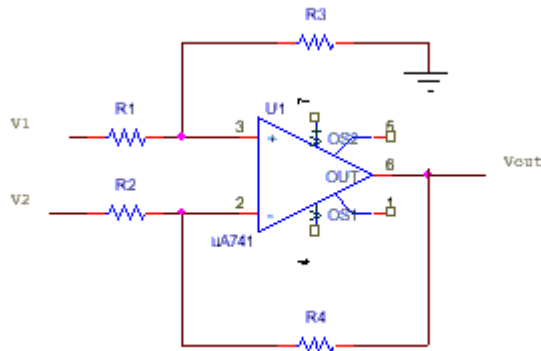
3.



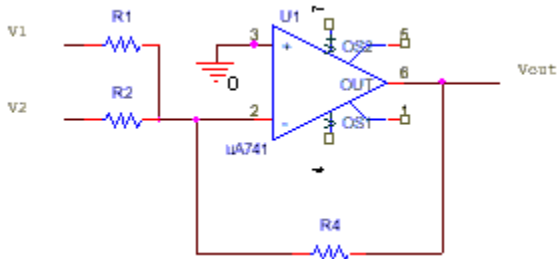
4.



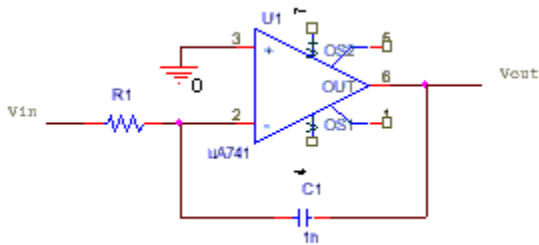
5.



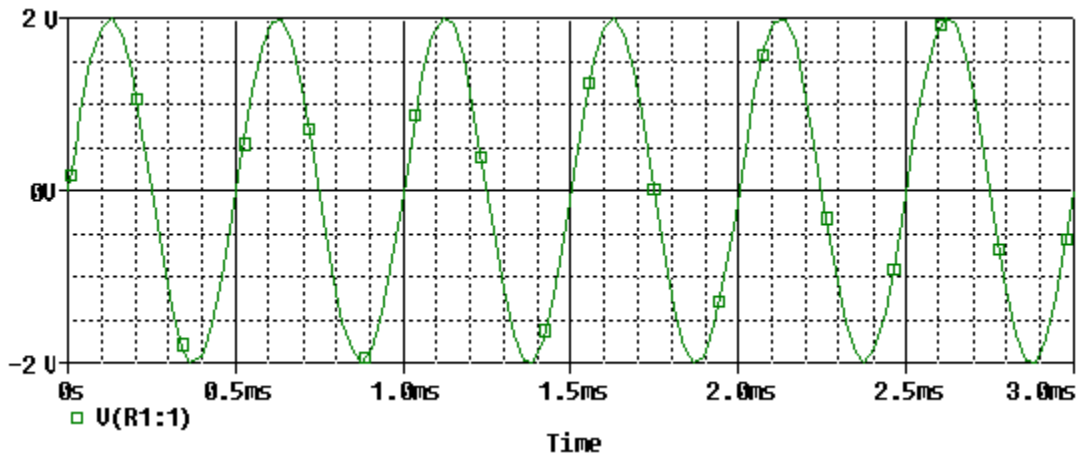
6.



7.

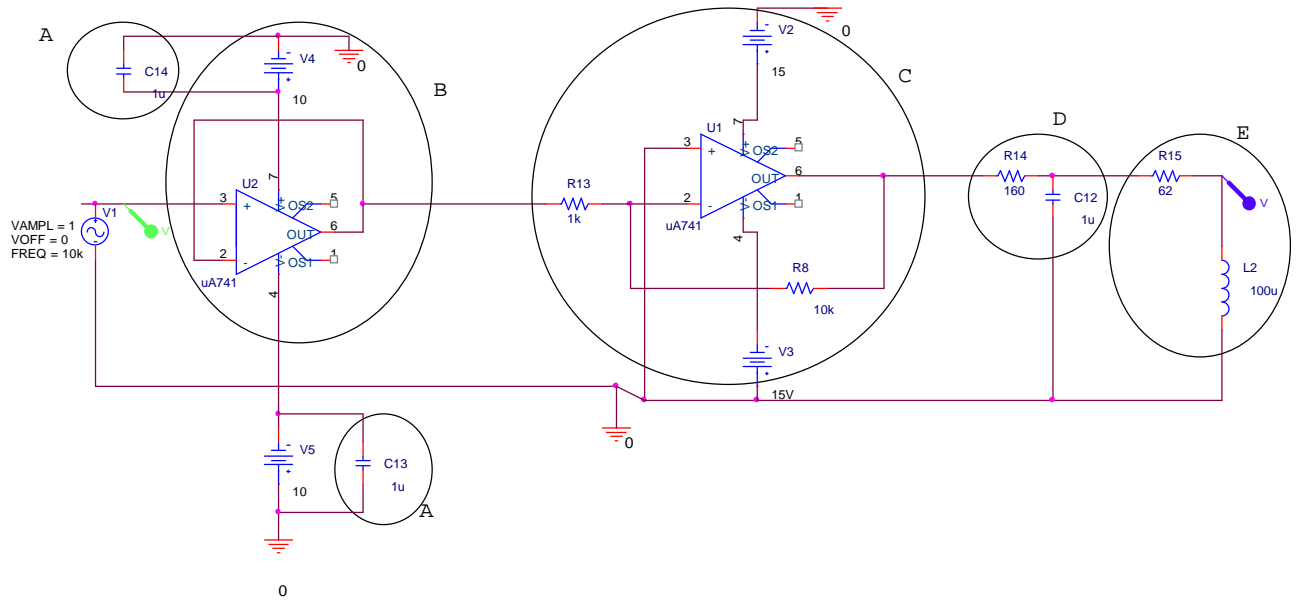


b) Consider the following input plot:

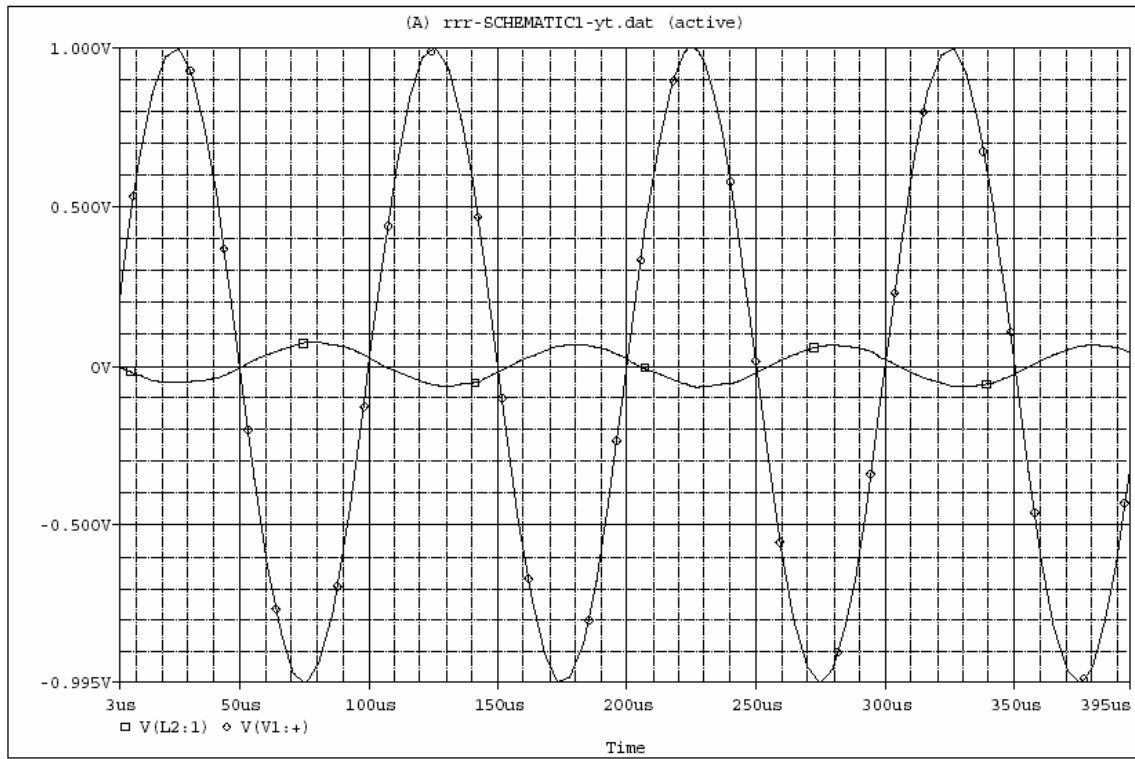


If this was used as the input to the circuit in 1 of this question, sketch what the graph of the output would be. Make sure the frequency and the amplitude and the value at 0 seconds are clearly indicated. Assume  $C1=1\text{ nF}$  and  $R1=1\text{ K ohms}$ . Show your work.

5) Circuit Functionality (20 pts)



Below is a graph of the input and output, just to give you some reference of what the circuit will do. The source is 1V at 10KHz.



**ENGR4300**

**Test 3**

**Spring 2002**

Name \_\_\_\_\_

Section \_\_\_\_\_

List the functionality of each block, A,B,C,D and E. (4 pt each)