ECE 320 - Homework #4

AC to DC Converters, Max/Min Circuits, Clipper Circuits. Due Monday, Feb 4th, 2019

AC to DC Converters

1) Determine the voltage at V1 and V2 (both DC and AC).

2) Simulate this circuit using PartSim (or similar program) to verify your answers for problem 1

3) Lab: Build this circuit in lab and compare your measured values to calculated and simulated values.

Note

- The 20Vp source is a 12VAC wall transformer in room 211 capable of 500mA. 12V is the rated RMS voltage. It's peak voltage is actually about 20V.
- The 10H / 277 Ohm resistor are the 10H inductors in room 211. The inductor's DC resistance is 277 Ohms: you don't have to add another 277 ohms to this circuit.
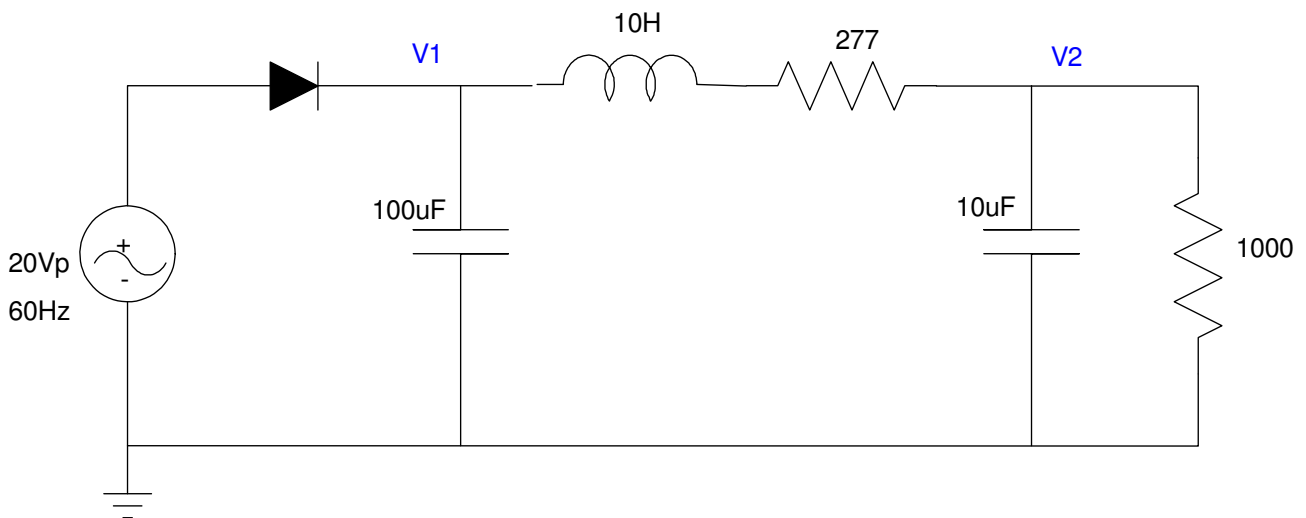
Problem 1-3

4) Calculate the value of the two capacitors so that

- V1 = 1Vpp
- V2 = 0.2Vpp

Max/Min:

5) Determine the voltages and currents for the following max/min circuit. What function does this circuit implement?   Y = f(A, B, C, D)
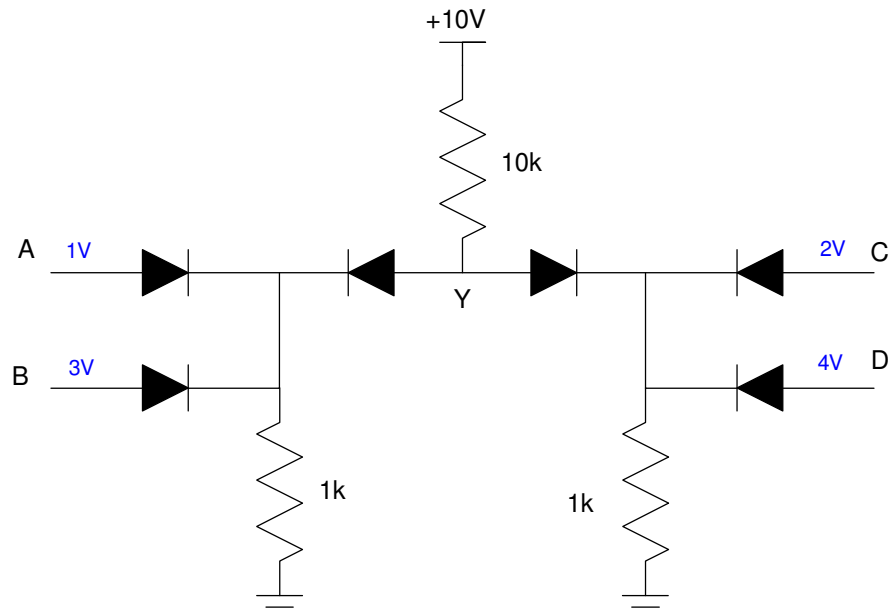
6) Check your results in PartSim (or similar program)

Clipper Circuits:

7) Design a circuit to approximate the following function subject to the following requirements:

- Input: 0 .. 10V, capable of 100mA
- Output: 100k resistor
- Relationship: Graph below, +/- 200mV
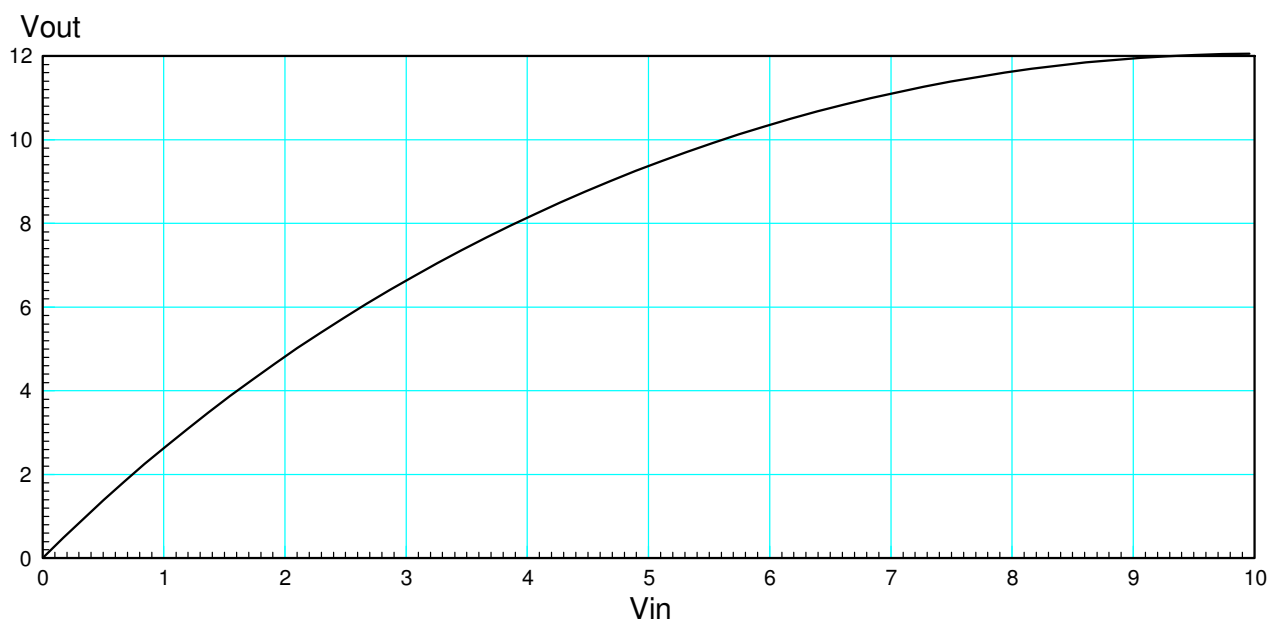
8) Check your design in PartSim

9) Design a circuit which meets the following requirements:

- Input: -10 .. +10V, capable of 100mA
- Output: 1k resistor
- Relationship:

$$V_{out} = \begin{cases} +5V & V_{in} > +5V \\ V_{in} & -5V < V_{in} < +5V \\ -5V & V_{in} < -5V \end{cases}$$

Prob lem 5-6

Prob lem 7 - 8