## ECE 320 - Homework #4

AC to DC Converters, Min/Max Circuits, Clipper Circuits. Due Monday, February 5th, 2018

## AC to DC Converters

1) (Analysis) For the following half-wave rectifier, determine the voltage at

- V1 (DC and AC), and
- V2 (DC and AC)

2) (Simulation) Simulate this circuit in PartSim to verify your calculations.

3) (Validation) Build this circuit in lab to verify your simulations and calculations.

Note: The resistance of the 10H inductors in lab is approximately 270 Ohms. When you build the circuit, you don't have to add another 270 Ohms - it's part of the 10H inductor.





4) Design a half-wave rectifier (i.e. specify R, L, C) to meet the following requirements. Assume an ideal inductor  $(R_L=0)$ 

Input: Wall transformer

• 20Vp, 60Hz, capable of 500mA

Output: A load which draws 100mA

Relationship:

- The ripple at V1 (across the capacitor) is 1Vpp when the load draws 100mA
- The ripple at V2 (across the load) is 0.1Vpp when the load draws 100mA

5) Check your design for problem #4 with a simulation using PartSim (or similar program)

## **Min/Max Circuits**

Assume ideal silicon diodes.

- 6) Determine the voltages for the following max/min circuit with R2 = 10k
- 7) What logic function does this circuit implement?

$$Y = f(A, B, C, D)$$



## **Clipper Circuits**

8) Design a clipper circuit to approximate the following function

