

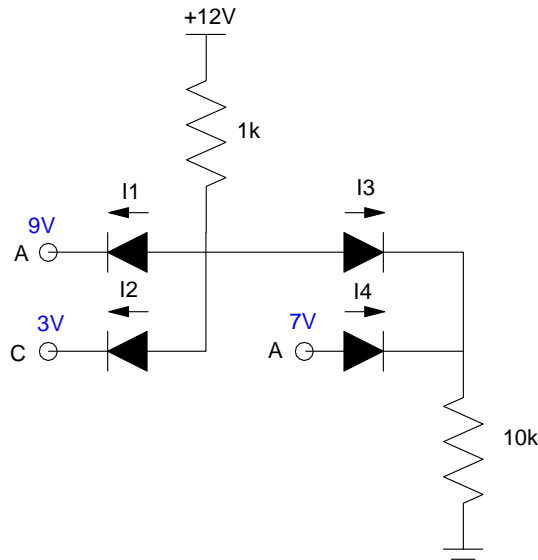
ECE 320 - Homework #4

Max/Min, AC to DC, DC to DC Converters. Due Monday, February 8th

Assume ideal silicon diodes with $V_f = 0.7V$.

Max / Min:

1) Determine the voltages for the following circuit.



Problem 1

2) Design a circuit to meet the following requirements:

Inputs: A, B, C, 0 .. 10V signals, capable of 20mA

Outputs: Y, capable of driving 1uA

Relationship: $Y = A + BC = \max(A, \min(B, C))$

AC to DC Converters:

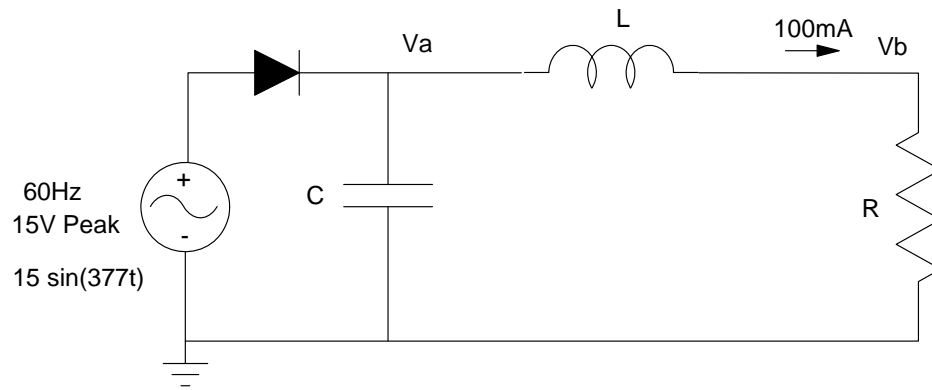
3) Assume $L = 0$. Design an AC to DC converter to drive a 100mA load with a ripple less than 500mVpp.

Input: 15Vp, 60Hz sine wave, capable of driving 1A

Output: 0 .. 100 mA load

Relationship: The output should be a DC signal with less than 500mVpp ripple. (Target = 500mVpp with a load of 100mA).

4) Modify your design for problem #3 to include an inductor so that the ripple is reduced to 100mVpp with a load of 100mA.



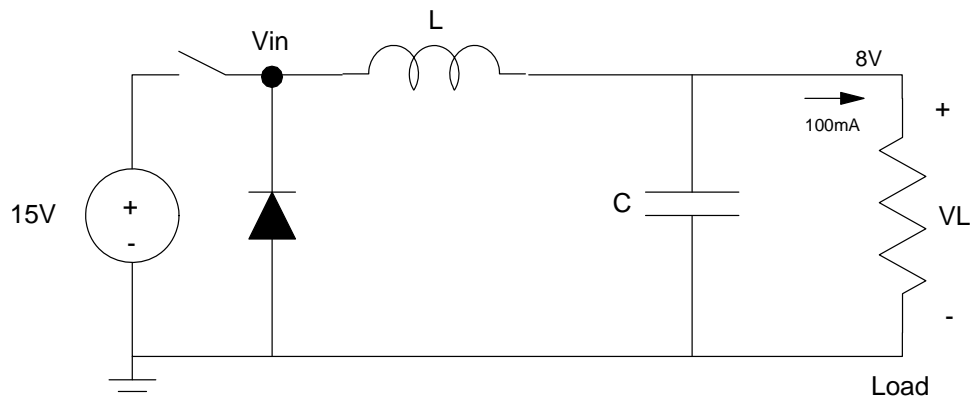
Problem 3 & 4

DC to DC Converter (Buck converter)

Design a circuit to convert 15VDC to 8VDC.

5) Assume $C = 0$. Find R , L , and the duty cycle with a switching frequency of 1kHz to convert 15VDC to 8VDC with a ripple of 500mVpp when the load is 100mA.

6) Modify your design for problem 5 to include a capacitor so that the ripple is reduced to 100mVpp with a load of 100mA.



Problem 5-6

Lab:

7) Testing: Simulate one of these circuits in PartSim to test your analysis

8) Validation: Build one of these circuits in lab and verify the voltage and the ripple.