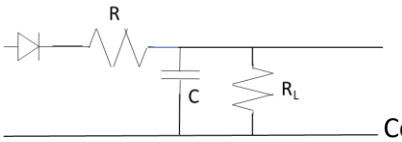
EECS 361

Implementation and Performance Measurement of AC-to-DC Converter

100 homework pts (Equivalent to 10 homework problems)

A DC power supply converts an AC input voltage to an approximate DC output signal. In this assignment an example AC-to-DC converter will be implemented to convert an AC input signal $v(t) = \cos(2\pi 1000t)$ to an output DC signal. The AC-to-DC converter circuit for this assignment is given below.



Component specifications: $R=1k\Omega$, $R_L=10k\Omega$, and $C= 1\mu F$.

1) Use the results of Participation activity 4.5.3: *Fourier analysis of RC circuit, half-wave rectified sine input* (see Homework 8) and http://www.ittc.ku.edu/~frost/EECS_360/Mathematica-360/Power_Supply_Design.cdf to predict the performance of the AC-to-DC converter, specifically the expected DC output value and the % ripple.

2) Check out a Digilent Analog Discovery 2 and associated parts, meter, and kit from the EECS shop. (Use of other test equipment is permitted, however, document your test configuration)

3) Computing environment.
You will use these functions:

- Analog Discovery (with Waveforms Software)
- Oscilloscope (Analog Discovery)
- Function Generator (Analog Discovery)

Options for access to the Digilent software:
a) The Digilent software, Waveforms, is loaded on the EECS Windows workstations, you can plug in the Digilent Analog Discovery 2 to the EECS Windows workstations.
b) Or you can set up your own computing environment on your personal computer to use the Digilent Analog Discovery 2 see https://reference.digilentinc.com/learn/instrumentation/tutorials/analog-discovery-2-getting-started-windows/start. The software is free.

4) Build the circuit above.

5) Use the Analog Discovery waveform generator to create the input signal $v(t) = \cos(2\pi 1000t)$.

6) Use the Analog Discovery oscilloscope to measure the output voltage waveform. Report your measurements including waveforms in a readable form. Print waveforms with white background (Light Analog color). In the Waveforms app go to Settings→Options then set Light Analog color to Light.

7) Compare the predicted and measured performance, i.e., the DC output level and the ripple.

8) Summarize your results clearly and concisely. Your grade on this assignment depends upon the intelligibility of your submission, a well-organized submission, like a technical report, is expected.

9) For grading, send your results of this assignment directly to Professor Frost at vsfrost@ku.edu.