ECE 320 - Homework #7

DC to AC Converters, Semiconductor Relays, Op-Amps. Due Monday, October 9th, 2017

DC to AC Converter

Assume an H-bridge outputs the following voltatge to an AC motor:

- +10V for 3/8th of the time
- -10V to 3/8th of the time
- 0V inbetween



- 1) Determine the Fourier transform for this waveform out to the 3rd harmonic
- 2) Determine the efficiency of this DC to AC converter

Semiconductor Relay

- 3) Determine the voltages at V1 and V2 (DC and AC) assuming a firing angle of 20 degrees
- 4) Determine the firing angle, L, and C so that
 - The DC voltage at V2 is 5V
 - The ripple at V2 is 200mVpp





The DC servo motors in the lab have the following characterisics

- Ra = 24 Ohms
- La = 12mH

5) Determine the DC voltage at Y and the peak-to-peak voltage at Y (which is also the current through the DC motor) for a duty cycle of

- 25%
- 50%
- 75%

6) Check your calculatins in PartSim. Compare the results to your comutations.

7) (Lab): Build the above circuit in lab and measure the voltage at Y (DC and AC) with the motor stalled (hold the motor so it doesn't spin) with a duty cycle of 25% / 50% / 75%. Compare the results to your computations and simulation results.

8) (just for fun): Let the motor spin freely and measure the voltage at Y (DC and AC). Note: This won't match up with your computations or simulations due to the back emf of the motor.

Term Project

Propose a project for your term project. It must include at least two different circuits we cover in ECE 320.

9a) Overall Requirements: Specify the

- Inputs
- Outputs
- How they relate

9b) Project Breakdown. Show how you can split this overall design into 2 or more sections with each section being a circtuit we cover in ECE 320.