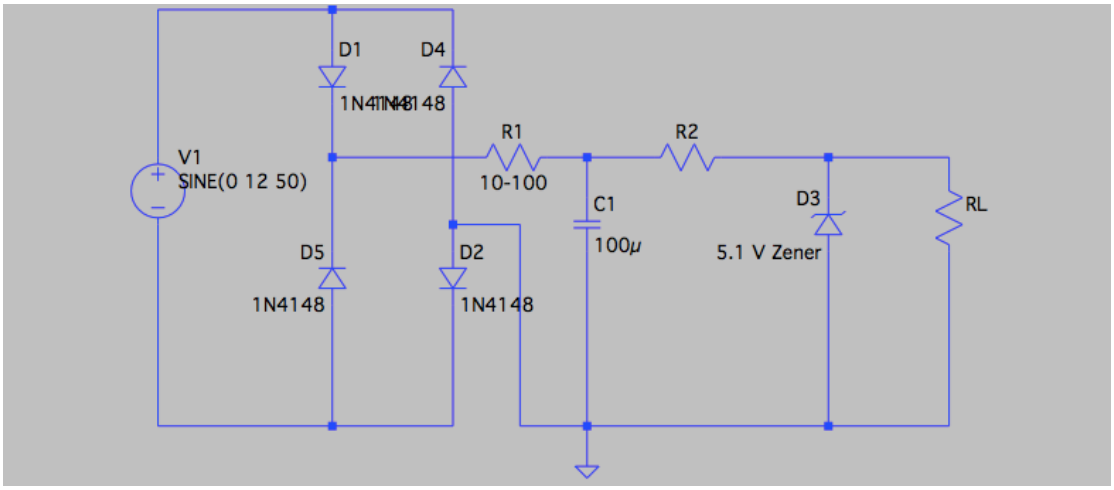
EEE313 Lab Exercise 2 10-10-2018

Zener regulator

This lab is related to voltage regulation using a Zener diode. The following circuit may be used. [R1 is for limiting the current peaks charging the capacitor so that the signal generator is not harmed. In this lab take R1 = 0 because the signal generator in tha lab has 50 Ohms output resistance and thus current through is limited anyway.] You should find an appropriate value for R2 so that the Zener is always in proper mode in min-load-current and max-load-current conditions. RL is the load resistor which determines the load current. C1 is chosen to be 100µF because it is available in the lab.

We have some no-name 5.1V Zeners in the lab. The specs of these Zeners are not known but they look like low power Zeners say with 500 mW power rating.



Lab work:

a) Look at the ripple on the capacitor and also the output for 10V peak input at 50 Hz (i.e. signal generator output is set to 10 Vpeak) and 0.5K load. Draw the waveforms. Use an R2 value such that the Zener current is large enough so that the ripple on the load is acceptable. The Zener current is not constant but changes a lot while the capacitor voltage changes. It would be nice if you can have the Zener current remain in the range 10 to 100 mA.

b) Replace the signal generator with a variable DC voltage source and eliminate the bridge and the capacitor (R1 is again zero). The circuit now is composed of DC supply, R2, Zener, and RL. Apply 8 volts DC. Use the value of R2 you found above (or a better R2 if you think so). Find the change in output voltage for a ±1 V change in the supply. Calculate source regulation. Also find the voltage at which Zener comes out of regulation by more than 100 mV.

c) Keep source at 8V DC. Calculate load regulation for when RL changes between infinity and 0.5K

In each case above present and explain your results and procedures in your report. Use graphs, screenshots, tables etc.

Do not forget to show your results and set-up to your assistant and get his/her check. You are expected to upload your report to Moodle after yor check before the deadline which will be announced later.

Note regarding the signal generator: The Stanford signal generator assumes that it drives a load of 50Ω. Thus when you choose 10V p-p using its controls, it actually applies 20V p-p so that by voltage division the actual voltage on the load becomes 10V p-p. However if the load that you connect to the signal generator has high impedance then no voltage division occurs and you see 20V p-p on the load. Therefore in general when high impedance loads are considered, what you see on the load is twice what you choose.