Zener Regulator

Preliminary Questions

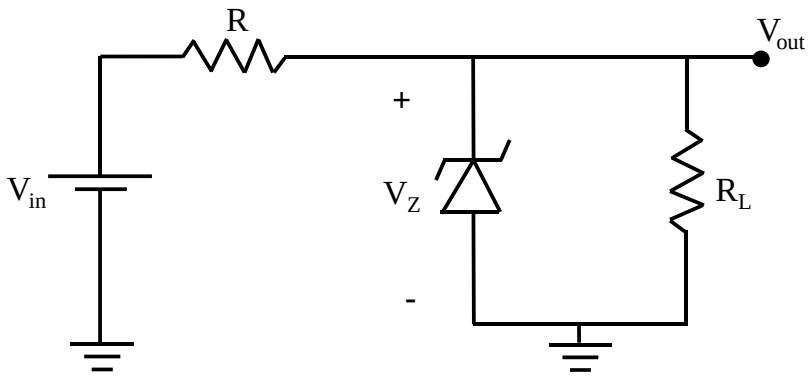
Please study the Zener diode from the lecture notes (diodes-5 lecture note in Moodle) or textbook before coming to the lab to understand the experiment.

1. Explain how the maximum and the minimum amount of current passing through the Zener diode are determined.

2. Define source and the load regulation.

Lab Work

This lab is related to voltage regulation using a Zener diode. R_L is the load resistor which determines the load current. 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.



a) Take R_L = 500 Ω, and Vin = 10 V. Find the range of R so that the Zener current is between 10 mA and 100 mA when the input voltage V_{in} changes between 9 and 11 V. Set up the circuit with the R value that you have determined. Use a variable DC supply to check if Zener current limits are satisfied as Vin is changed between 9 and 11 V.

b) Apply $V_{in} = V_{DC} + 0.1\sin\omega t$ V where f = 100 Hz and V_{DC} = 9.5 V. Find source regulation. In this case if your AC source has an input resistance take it into account. Calculate the series resistance of the Zener (r_z) from your measurement.

c) For Vin = 10V find load regulation, take R_L=100Ω for full load condition.

Note regarding the signal generator: The Stanford signal generator has 50 Ω output impedance. It also assumes that it drives a load of 50 Ω. Thus, when you choose $10V_{P-P}$ output 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.

You are expected to demonstrate a working set-up and be able to explain how the circuit works and what your results are. Your assistant may ask you questions about your lab and preliminary work. You are expected to work individually and demonstrate that you fully understand the purpose and results of the lab. You will also write a report about the lab (If you do not pass your check-out, you will not be eligible for submitting your report). In each case above (parts a,

b, and c), present and explain your results and procedures in your report. Use graphs, screenshots, tables etc.

You must obtain the check-out for this lab during your designated lab session on the week of October 2nd. The deadline to submit your report to Moodle is Sunday, October 22nd, 23:55.