Lab-2
Analog Circuits

Diodes: Experiment List

In this session you will perform Diode based practical using components and equipments mentioned below. Based on the class lecture and 1st lab, perform the following exercises. Discuss with your group mates. If you have any difficulty, you may consult TAs.

Components required:

1. 1N4007 Diode
2. LED (3mm and 5 mm)
3. Zener Diode 7.5 V
4. Electrolytic Capacitor 22 µF / 50 V
5. Resistor 1K Ω, 3.3K Ω, 5.6K Ω, 7.5K Ω and 10K Ω

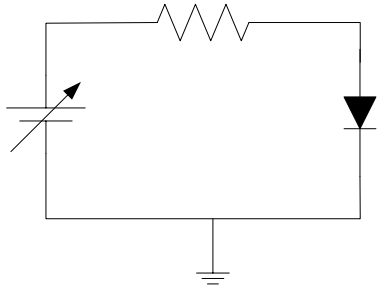
Equipments required:

1. Function generator
2. Oscilloscope
3. Multimeter
4. DC power supply

First, test the diode (forward bias and reverse bias) using digital multimeter.

Plot the waveform for all the below exercises.

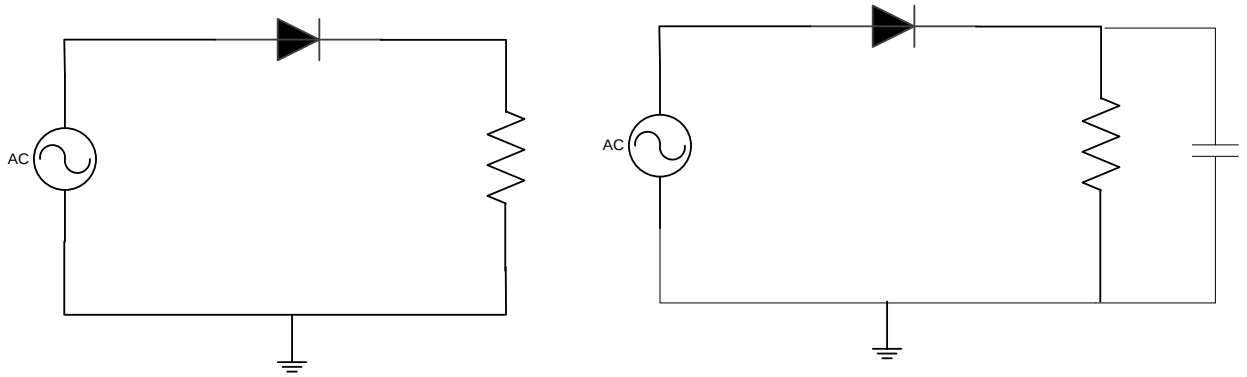
1. Perform diode I-V characteristics.
   a) Design the circuit parameters to simulate for diode I-V characteristics, forward and reverse bias characteristics (R = 10K Ω).
   b) Calculate diode's dynamic resistance.
   c) How much reverse current is there, at -5 V?



Circuit to display I-V diagram of diode

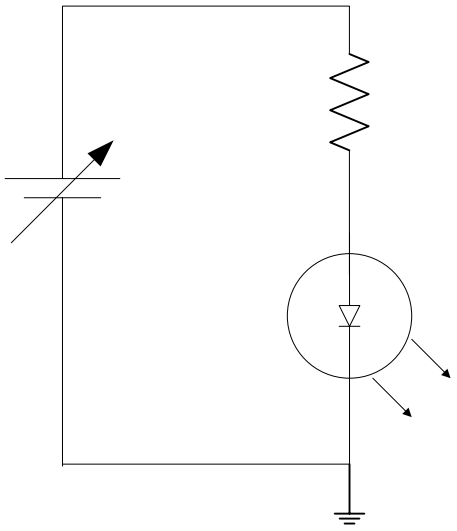
2. Use a function generator and a diode to build a half-wave rectifier circuit with a 60 Hz, 10 V peak-to-peak input signal, R = 1K Ω.

a) Monitor the voltage across the resistor with the oscilloscope.
b) Explain how the AC signal from the function generator is “rectified” by the diode.
c) Now put a low pass filter on the output of your circuit by adding a capacitor, as shown in figure. This converts your AC signal to a DC voltage with some "ripple"
d) Measure the maximum and the mean value of the voltage, and the peak-to-peak amplitude of the ripple at a frequency of 60 Hz for different values of resistor. (You can use 2 to 3 different values from 3.3K Ω, 5.6K Ω, 7.5K Ω and 10K Ω and compare the results).



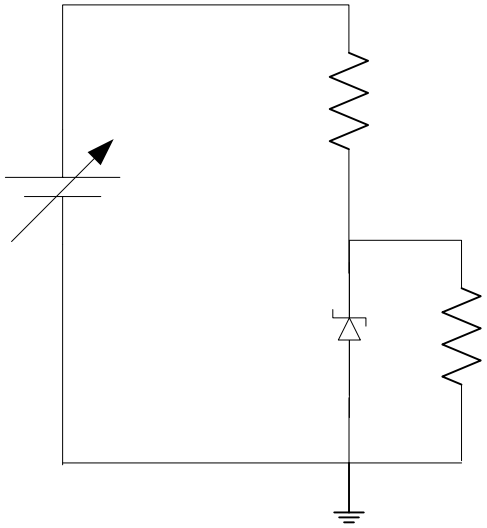
Half wave rectifier

3. Measure the I-V curve of a standard LED to show that it is a diode. What is the highest forward voltage applied for which LED remains dark? What is the lowest voltage at which you see some light from LED? (You can use either 3 mm or 5 mm LED and compare the results with other groups).



Circuit to display I-V diagram of LED

4. Show how a Zener can be used to keep a circuit safe from big voltage swings. Describe the waveform that you see across the Zener.



Zener regulator