EXPERIMENT 2: DIODE CHARACTERISTICS & DIODE APPLICATIONS (CLIPPER CIRCUITS)

Objectives

The objective of Experiment 2 is to learn current-voltage (I–V) characteristics of diodes and the working principle of clipper circuits.

Components Required:

- **Diodes:** 2x1N4001, 1xLED and 2x5.6V zener diode
- **Resistors:** 2x1kΩ
- Breadboard, jumpers, multimeter

Preliminary Work:

1. Study the characteristics of the diodes (frequency ranges, maximum conduction currents, breakdown voltages).
2. Perform simulations of the part of experimental work in OrCAD.
   a) **Part 1:** Plot current–voltage (**ID–VD**) characteristic of the diodes) and add them to your report.
   - You will perform DC sweep analysis. You can find an example in the link below for your simulations.
     https://www.youtube.com/watch?v=WEio1P1oA_g

   b) **Part 2:** Setup the circuits given in Figure 4 and Figure 5 in OrCAD. Use 1N4001 diode model. Set frequency to 1kHz and plot the input and output voltages on the same plot pane for two time periods. Repeat the simulation for V1= 0 and V1=12V for Figure 4. Repeat the simulation for voltage values given in a, b,c for the circuit given in Figure 5. Observe how the output changes. Explain how the circuits work.

3. Perform simulations of all of the circuits in the experimental work using TinkerCAD.

4. Fill Table 1, draw the characteristic curves in Figure 2 and Figure 3 according to your simulation results and add them to your report .

Experimental Work:

Part 1: Diode Characteristics

1. Setup the circuit given in Figure 1 for the component of 1N4001. Apply eight different input voltages and write down the measured voltage values (V1 & V2) to Table 1.
2. Repeat part 1 for the other components named as LED and 5.6V Zener. Draw the outputs on Figure 2 and Figure 3.

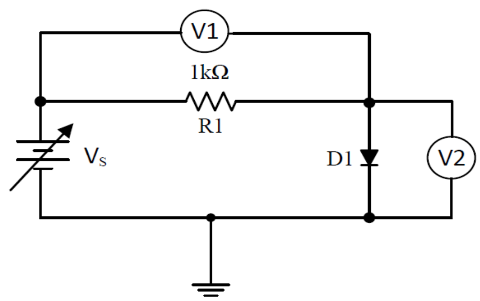

Figure 1

Table 1

Vs	1N4001		Vs	LED		Vs	Zener	
	V1	V2		V1	V2		V1	V2
0.2V			0.2			-7V		
0.4V			0.5V			-6V		
0.6V			0.8V			-4V		
0.7V			1V			-1V		
0.9V			1.5V			0V		
1.5V			2V			0.4V		
2V			2.5V			0.7V		
3V			3V			1V		

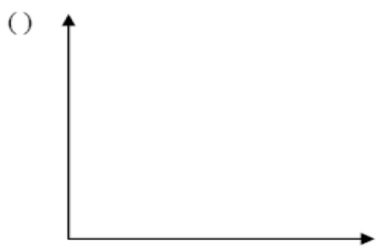

Figure 2

Figure 3

Part 2: Diode Applications-Clipper Circuits

1. Build the circuit given in Fig. 4. Connect a 10**Vp** sinusoidal voltage source and draw the output that you observe on the oscilloscope for V1=0V. Observe how the output changes if V1 is tuned to 5V and 12V.

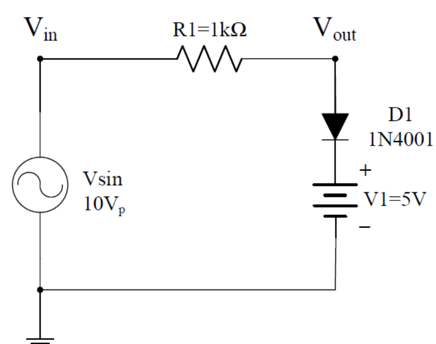

Figure 4

2. Build the circuit in Fig. 5. Draw the output that you observe on the oscilloscope for the voltages of V_1 and V_2 given below.

   a. V_1=5V and V_2=5V
   b. V_1=2.5V and V_2=5V
   c. V_1=2.5V and V_2=1.5V

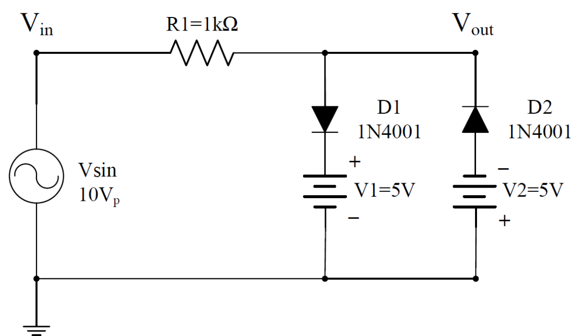

Figure 5