East West University

Department of CSE

PROJECT REPORT

Course Name: Electronic Circuit		
Course Code: CSE251 **Sec:** 01		
Project name: Design a DC Power Supply		
Semester and Year: Fall 2021		**GROUP NO: 07**
Name of the student	**Student ID**	**Course Instructor information:** Rizwan Shaikh Department of ECE East West University
Mahmudul Islam Partho	2019-3-60-027	
Navid Zaman	2020-2-60-044	
Fahad Ahammed	2020-2-60-174	
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Problem Statement:

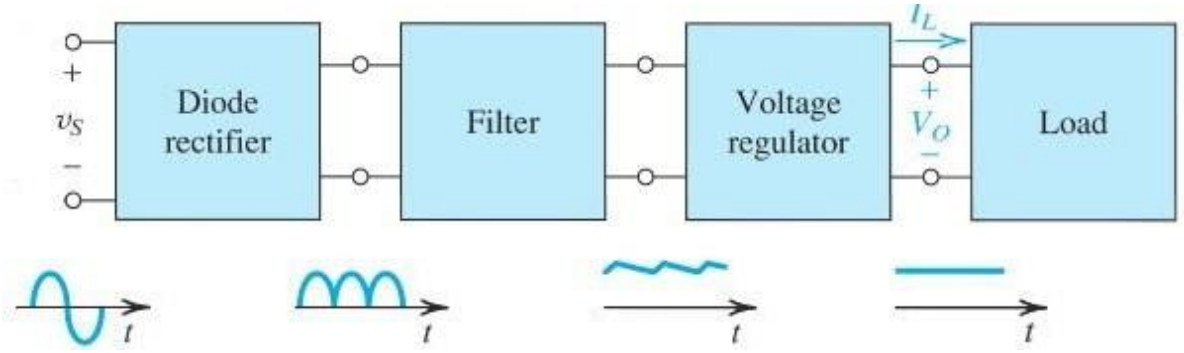

Figure: 01

Fig.01 shows the block diagram of a dc power supply design process. The design process includes three design segments: a diode rectifier, a filter, and a voltage regulator to get the final output v_o. The diode rectifier converts the input sinusoid v_S to a unipolar output, which can have the pulsating waveform. The variations in the magnitude of the rectifier output are considerably reduced by the filter block. The output of the rectifier filter contains a time dependent component, known as ripple. To reduce the ripple and to stabilize the magnitude of the dc output voltage against variations caused by changes in load current, a Zener shunt voltage regulator can be implemented.

Introduction:

Circuit diagram of 10V AC power supply is shown in figure 01. The design process includes three design segments, a full wave rectifier (bridge) as diode rectifier, a capacitor to filter the rectifier circuit, a regulator to reduce ripple and to stabilizes the magnitude of the DC output voltage. Firstly, according to the figure, we need todesign a full wave rectifier (bridge). The diode rectifier is required to find the output for the 10V AC power supply. To implement this circuit, we need 4 diodes. After passingthrough the bridge rectifier the input sinusoid voltage converts into a unipolar outputvoltage. We used a 100uF capacitor to reduce the vibrate in the magnitude of the rectifier output, to reduce the ripple and to stabilize the magnitude of the dc output voltage we used a 1KΩ resistor which is connected in series with a Zener diode as a Voltage regulator. Therefore, we will get our expected output.

Theoretical Discussion:

Design Bridge rectifier selected as rectifier, D1N4002 common rectifier diodes are chosen for the same, the capacitor filter chosen 100uF high value capacitor for smooth filtering, and the capacitor filter charges to a voltage =10V-1.4V = 8.6V approximately, where 1.4V is the drop across two diodes while conducting in the bridge rectifier , and the voltage across the capacitor filter is fed to Zener diode through series resistance, here the resistance is chosen such that,

R_6 = 1K

here i is taken just for an example such that load current is to maintain a minimum Zener current. For higher load currents the design can be altered, here the Zener used is 5.1V Zener D1N750 having breakdown voltage 5.1V as we know the voltage applied to the Zener diode here is greater than its breakdown region as such it regulates the unregulated input DC voltage and produces a regulated DC across load.

Circuit Diagram:

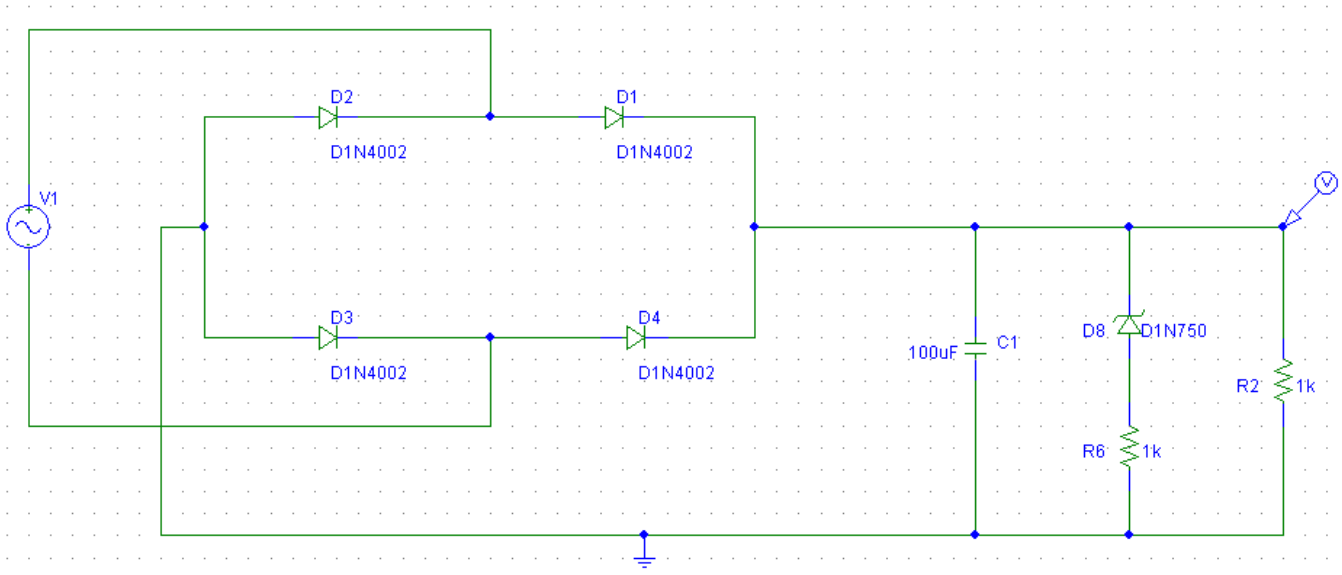

Figure 2

Input Signal:

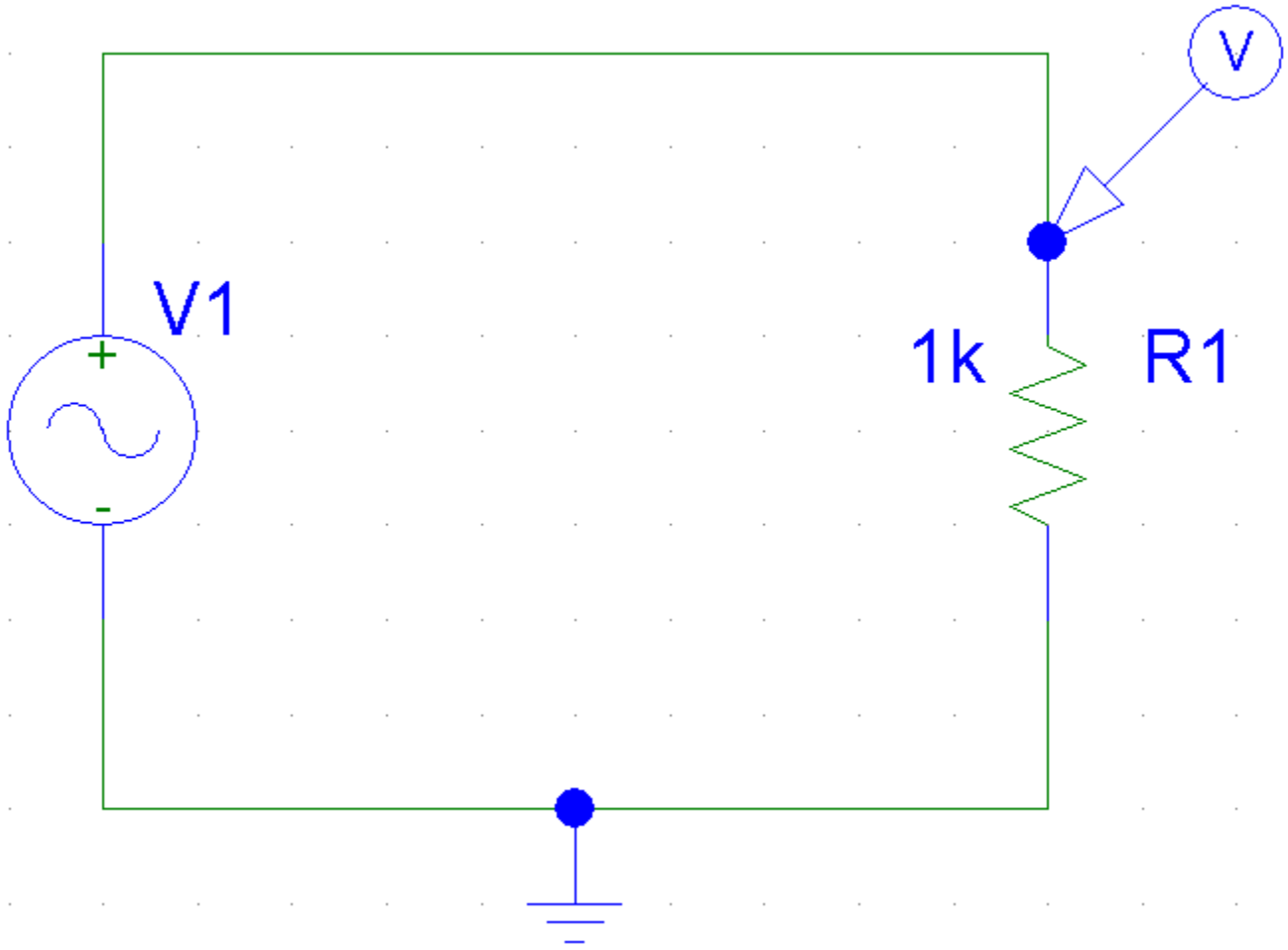

Figure: 03

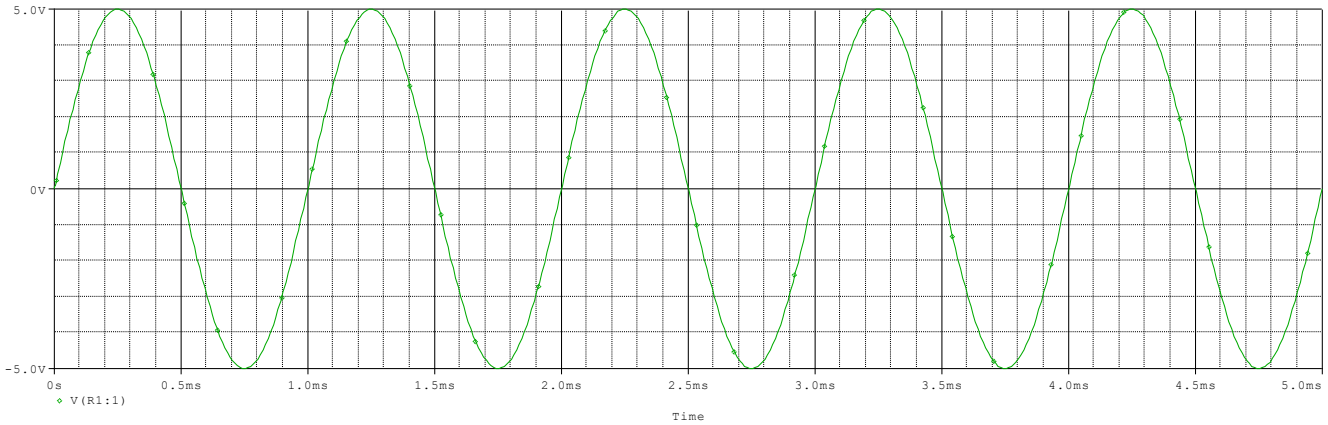

Figure: 04

After Using the Bridge Rectifier, the output:

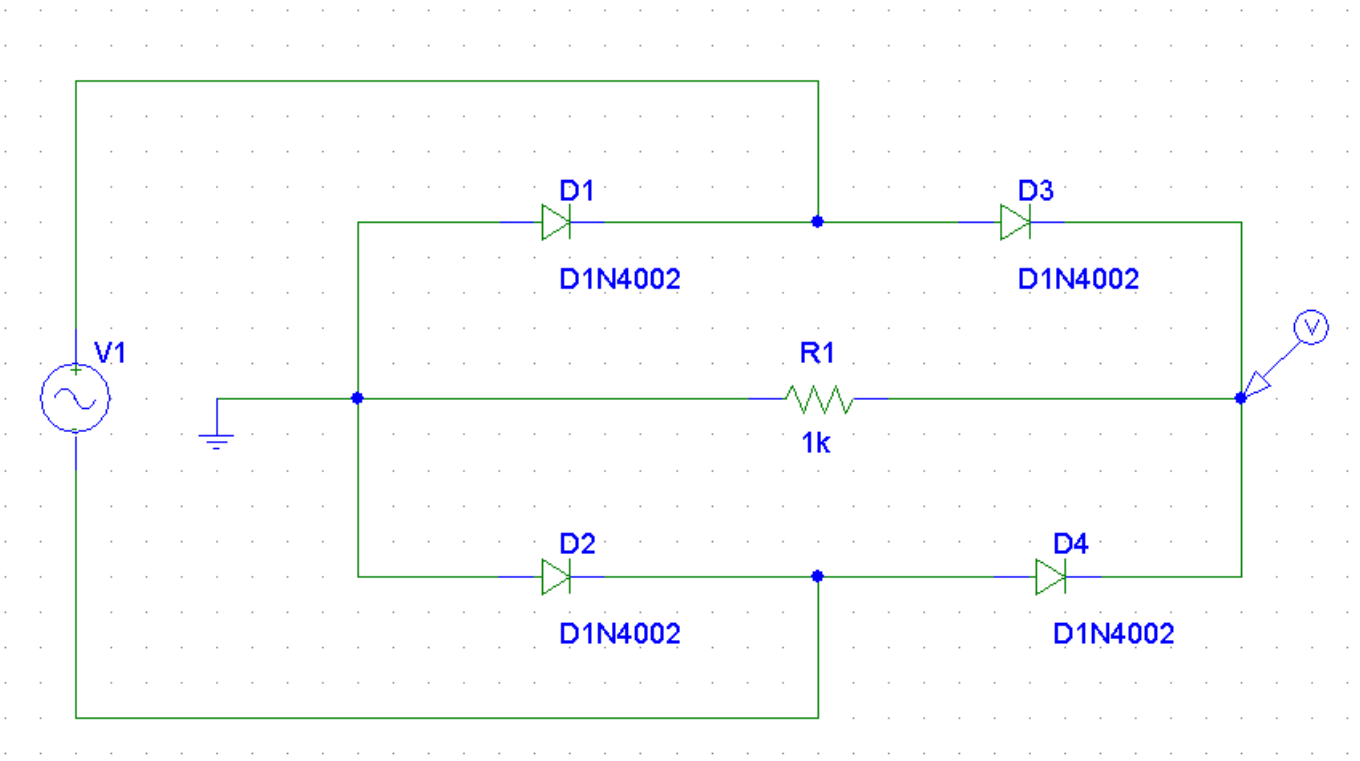

Figure: 05

Simulation Result

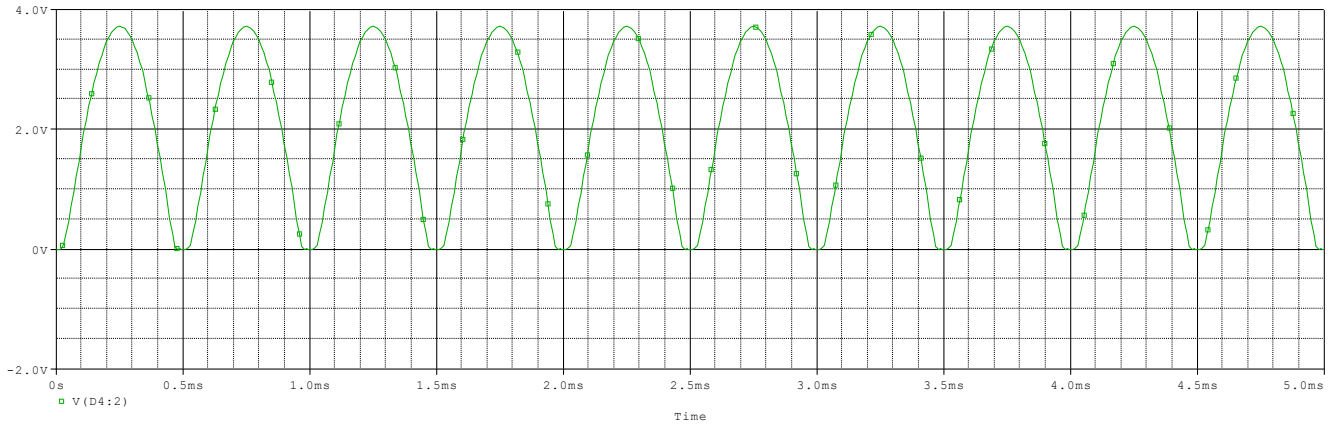

Figure: 06

After using capacitor for filtering, the output:

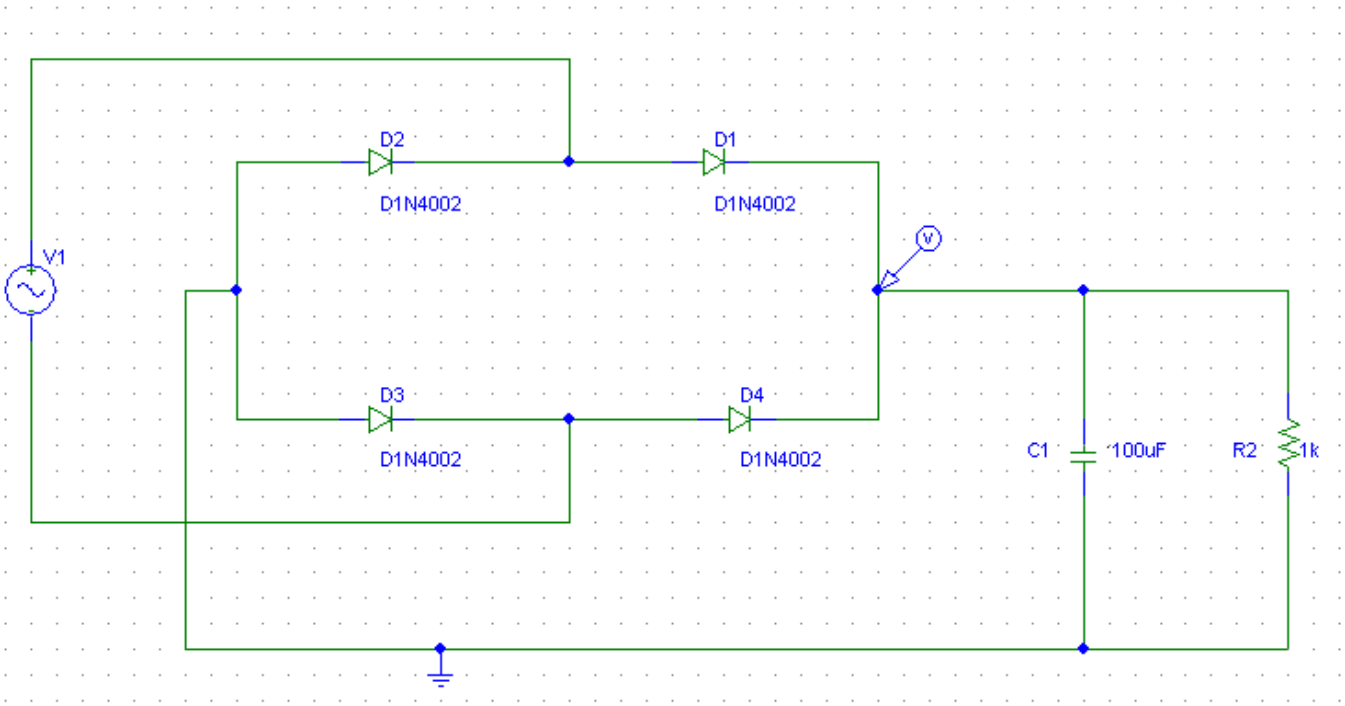

Figure: 07

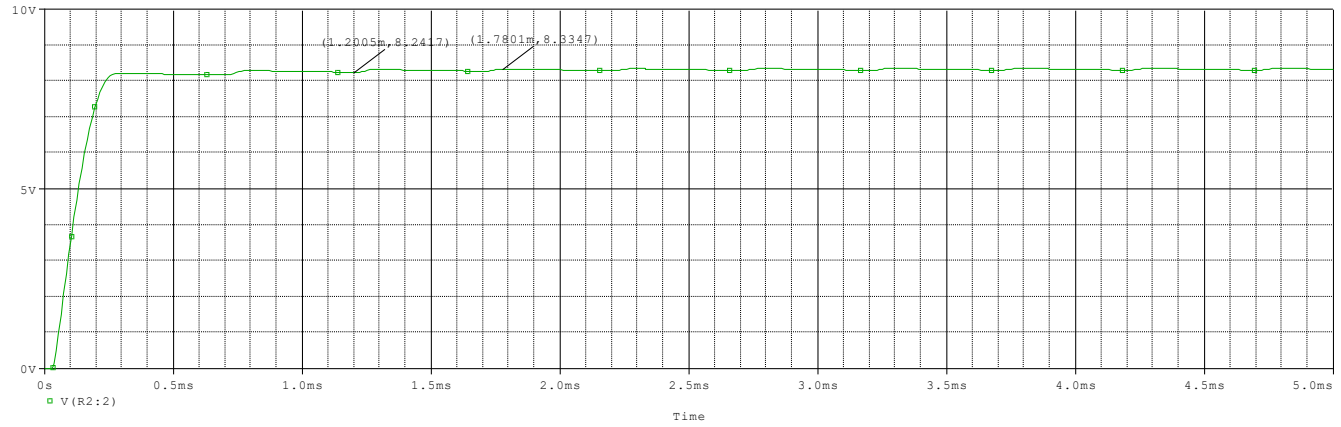

Figure: 08

After using regulator, the final DC output signal:

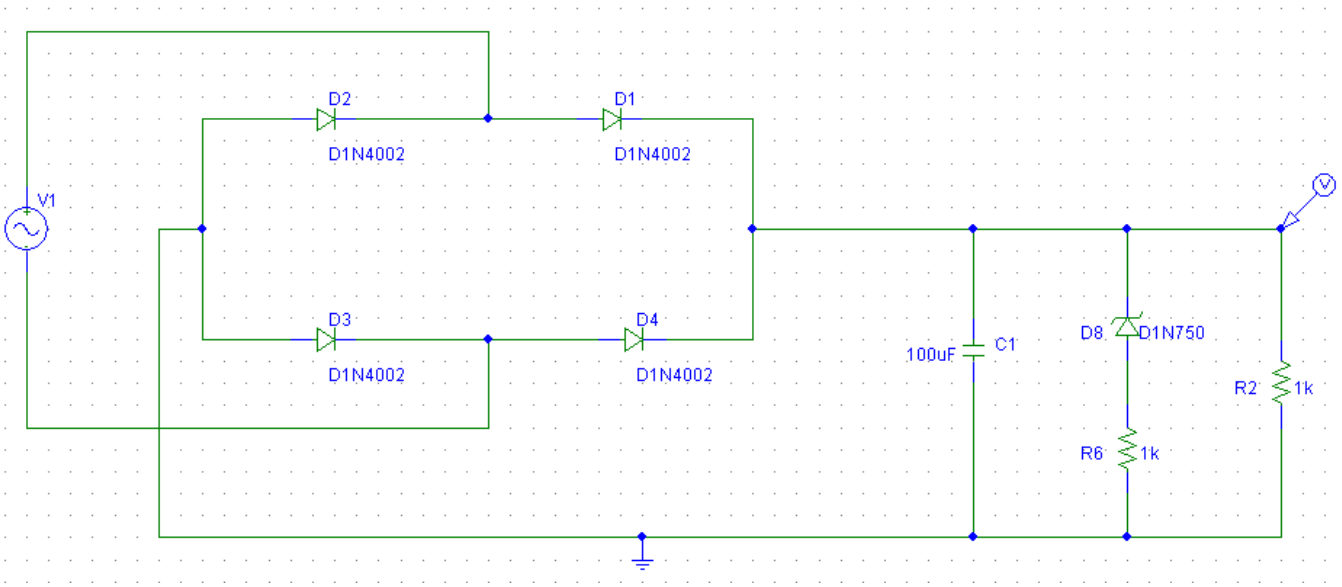

Figure: 09

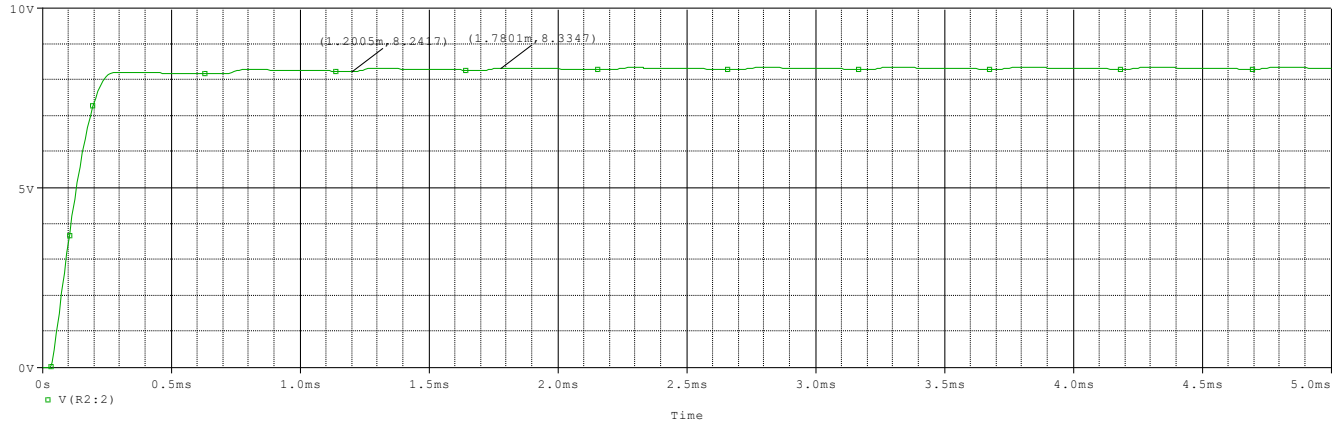

Figure:10

From Figure 10,

V_r = (8.3347 - 8.2417) V

= 0.093V

Theoretical Value:

Here,

R_2 = 1 k**Ω**

R_6 = 1 k**Ω**

f = 1 kHz

C = 100 uF

V_D = 0.7 V

Now,

V_p = 20/2 = 10 V

We get,

$T = \left(\frac{1}{1000}\right) = 1$ ms

Ripple Voltage, V_r = 0.5V

Discussion:

There is a slightest difference between the given value and the simulated value. The given value of the ripple voltage, V_r is 0.5V and the simulatedvalue of ripple voltage, V_r is 0.093V. So, we can say that there is a slightest discrepancy between the two values.

Conclusion:

Therefore, we have found DC power supply by using a full wave rectifier (Bridge), Capacitor to filter the output and finally 1KΩ resistor with a Zener diode as a voltage regulator.