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Introduction

The report for lab 3 i.e., Diodes took place on 10 Feb 2021.Appendix at the end is the prelab Assignment.

Objective

The objective of lab 3 is to know the properties of the diode as a bridge rectifier. The load resistance was changed in designing the converter which changes AC to DC.

Circuit under Test

Diagram, schematic

Description automatically generated

E2.) This experiment has two parts. First part is to replace the 4 LEDS with 1N4148 diodes and the rest is same with respect to the diagram above. Moreover, the green LEDS are replaced with wire such that only 1KΩ is left as a load resistance. The second step was to show the importance of having a common ground and two different grounds effect the behaviour of the full wave rectifier. The above figure represents the steps we have implements in the figure.

Diagram, schematic

Description automatically generatedE3.) In this experiment, the bridge rectifiers true capability can seen by connecting a 1 µF capacitor across the output terminal parallel to load resistance as shown in the figure above. The value of can be measured by differential method using oscilloscope. Here we can see the same step repeated as the above experiment which is the difference in the behaviour of the full wave rectifier with a common ground and with two different grounds.

Experimental Result

The circuit above used 4 1N4148 diodes and this experiment was conducted in Multisim. After completing the circuit, we gradually increase from zero with frequency 0.5Hz. since the negative terminal is connected to the ground the oscilloscope, we used to get the value of differential output voltage of . is adjusted to produce a frequency of 500 HZ at 16 V pk-pk in sinusoidal waveform.

A picture containing chart

Description automatically generated

GRAPH E2: bridge rectifier’s DC output voltage waveform.

In the below graph we add 1µF capacitor in parallel with the load resistance(5.6KΩ) while the other part is disconnected from the source voltage and the other voltages and the frequencies are not disturbed. The was connected to the circuit and the output waveform was recorded in AC coupled mode.

Chart, line chart

Description automatically generated

GRAPH E3(a): differential waveform of output voltage.

A picture containing application

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GRAPHE3(b):AC coupled waveform.

From the above table we can say that the values of and with this we can calculate the slope.

SLOPE ====-1.14

|  |  |
| --- | --- |
|  |  |
| 6.1 | 0.8 |

Table E3: Experimental values of ripple voltage and output voltage.

It is apparent that ripple voltage differs from our calculated 1.14 value, and output voltage differs from our calculated 6.182 V value. The cause of this deviation might lie in the use of a capacitor which was required to use.

Conclusion Remark

C1. Graph p2(a) better agrees with Graph p1 because in manual calculation we assume that In graph p2(a) case the load resistance is 1KΩ and so output voltage is 6.6V but in p2(b) case load resistance is 270Ω and so will be ±8V. According to the graph p2(a) output voltage is 6.6 when is ± 8V in the other graph we see the output voltage is 5.8 when , The error of from the graph p2(a) is comparatively smaller from thee graph p2(b). The voltage drop should be 0.7 but its is more as is has other components in the circuit.

C2. =0 because when Vs> 0.7 V then only on diode is conducting which can be seen in the figure below.

Calendar

Description automatically generated

When Vs < -0.7 V only D4 conducts and the current through the load resistance will be almost zero and the current passing through D4 will be high according to the figure below.

From the above equation we can say that voltage of D4 will exceed 0.7V. the link between the ground and the negative terminal can cause deflections in full wave rectifiers. By the above equation we can also say that if the value of is too high then it can damage the diode D4.

Diagram

Description automatically generated

C4. Graph E2 and Graph p2 are similar, the graph E2 the wave somewhat starts from zero and goes down to negative and then rise back into positive and the graph p2 is a halfwave sinusoidal graph where output voltage >= zero volts at every time interval. The discrepancy could be the small current in the diodes which should be totally off in the circuits and the other could be the faulty probes.

C6. Compared to the step p4 and the full wave rectifier the higher values of resistance on the load will cause lower current to flow through the load during both discharging and charging intervals of capacitor. Low current through the load while discharging means the capacitor will help in maintaining a less fluctuating output voltage waveforms. Moreover, lower resistive values on the load will cause the capacitor to discharge at a much higher rate which causes more fluctuating on the output voltage waveform.

Appendix: prelab-Assignment

P1.

A picture containing text, parking, document, linedrawing

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P2.

Chart, line chart

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A picture containing text, outdoor

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P3.

A picture containing text, map, white

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P4.

Avg voltage = 2

Max voltage Vm = Vimax - 0.14= 8 - 0.14 = 6.6

V ripple = Vdc / 2fc

= 6.6/2\*1000\*\*5.6

V ripple = 0.59V

Output voltage = 6.6