EASTERN MEDITERRANEAN UNIVERSITY

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

EENG341 LAB
ELECTRONICS I

EXPERIMENT 2
HALF-WAVE & FULL-WAVE RECTIFICATION

Std. No.     Name &Surname:
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Group No    :_____________
Submitted to:_____________
Date             :_____________
Objectives:
- To recognize a half-wave rectified sinusoidal voltage.
- To understand the term ‘mean value’ as applied to a rectified waveform.
- To understand the effect of a reservoir capacitor upon the rectified waveform and its mean value.

Simple Half-Wave Rectification
Construct the circuit of Fig. 2.1 where V is the voltmeter. Note that the resistor limits the current to a safe value.

- Switch on the oscilloscope and the sinusoidal supply.
- With the oscilloscope d.c. coupled adjust the time-base and the Y amplifier sensitivity to obtain a steady trace of about 4cm vertical and 5ms/cm horizontal.
- Measure and record time T and peak voltage $V_{pk}$:

- Sketch the waveform and label it to show the periods when the diode is conducting and those when it is not. Time T depends upon the frequency of your power supply.

- Confirm this. $V_{pk}$ should be very nearly equal to the peak voltage of the alternating supply.
Questions
1. Why will $V_{pk}$ not be exactly equal to the peak value of the supply?

2. How much is the difference between the measured and theoretical mean voltage?
   (Hint: The mean value of a half-sinusoid can be shown by geometry to be: $\frac{V_{pk}}{\sqrt{2}}$. But at every half-cycle the voltage is zero. The mean value of the waveform, therefore is: $\frac{V_{pk}}{2\sqrt{2}}$. Note the mean voltage indicated by the voltmeter, and compare it with $0.35V_{pk}$.)

3. The mean voltage you obtain is positive relative to zero. How could you obtain a negative voltage?
   (Hint: Verify your answer by experiment and sketch the waveform.)

Fig. 2.2.

The Effect of a Reservoir Capacitor

Very often when rectifying an alternating voltage, we wish to produce a steady direct voltage free from variations of the sort observed in Fig. 2.2. One way of doing this is to connect a capacitor in parallel with the load resistor as in Fig. 2.3.
- Set C=1μF and R=10kΩ.
- Observe the output waveform on the oscilloscope and note the value of the peak-to-peak variations in voltage. Note also the new mean voltage on the voltmeter.

4. Is the new mean voltage greater or less than it was before?

- Now replace the 1μF capacitor by a much larger value of 22μF, and answer the following questions.

5. The variations on the rectified waveform are called RIPPLE. Is the ripple now less than it was with the lower value capacitor?

6. Is the mean rectified voltage now greater or less?
A Bridge Rectifier with Resistive Load
Construct the circuit of Fig. 2.4. Note that the resistor limits the current to a safe value.

![Bridge Rectifier Circuit Diagram]

- Switch on the sinusoidal supply.
- Measure and record time mean value of output voltage indicated on the voltmeter $V_m$.

- Compare the mean value of output voltage indicated on the voltmeter those obtained in the Half-Wave rectification.

Questions
7. The mean value of output voltage indicated on the voltmeter is it the same as it was for half-wave rectifier? If there is any difference explain why?

8. How does the mean value compare with that found for half-wave rectification?

(Hint: the mean value of a half-sinusoid can be shown by geometry to be: $V_{\text{pk}} \frac{\sqrt{2}}{2}$ and $V_{\text{pk}}=10V$. Then every half-cycle is present, this should be the mean value measured. Confirm this from your readings.)
The Effect of a Reservoir Capacitor in the Bridge Rectifier

- Add a 1\(\mu\)F capacitor in parallel with the load resistor and note the new mean value of the rectified waveform. Compare this values with those obtain in the Simple Half-Wave rectification for the same load and capacitor values.

**CONCLUSIONS:**