NEUB CSE 214 LAB 3

North East University Bangladesh

Department of CSE

Course no: CSE 214

Experiment no: 03

Experiment Name: Half-Wave and Full-Wave Rectification

CAUTIONS:

1. **Don't switch on the supply of the circuit until you have verified the circuit carefully**
2. **Take readings of apparatus carefully**
3. **Take care of any bare circuit elements in energized condition**
4. **Never try to touch bare live wires**

Objective

The objective of this experiment is to calculate, compare, draw, and measure the DC output voltages of half-wave and full-wave rectifier circuits.

Theory

The primary function of half-wave and full-wave rectification systems is to establish a DC level from a sinusoidal input signal that has zero average (DC) level. The half-wave voltage signal of Fig.1, normally established by a network with a single diode, has an average or equivalent DC voltage level equal to 31.8% of the peak voltage V_m.

$$V_{dc} = 0.318 \times V_{peak}$$

For full wave the output voltage is 2 times the output of half wave rectifier or 63.6% of the peak value V_m.

$$V_{dc} = 0.636 \times V_{peak}$$

For large sinusoidal inputs ($V_m >> V_k$) the forward-biased transition voltage V_k of a diode can be ignored. However, for situations when the peak value of the sinusoidal signal is not that much greater than V_k, V_k can have a noticeable effect on V_{dc}.

In rectification systems the peak inverse voltage (PIV) must be considered carefully. The PIV voltage is the maximum reverse-bias voltage that a diode can handle before entering the Zener breakdown region.

For typical single diode half-wave rectification systems, the required PIV level is equal to the peak value of the applied sinusoidal signal. For the four diodes full wave bridge rectification system, the required PIV level is again the peak value, but for a two diode center tapped configuration, it is twice the peak value of the applied signal.

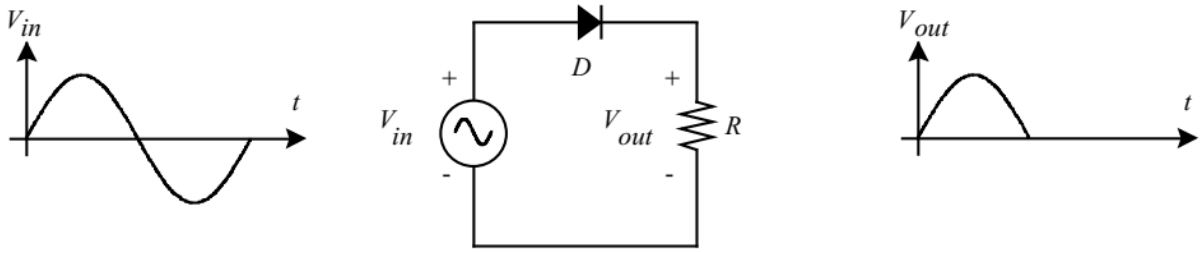

Figure 1 Half wave rectifier

Apparatus Needed

- Trainer Board (Bread board)
- Diodes
- Resistor
- DC Voltmeter
- DC Ammeter
- DC power supply
- Function Generator
- Oscilloscope
- Connecting wires

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Procedure

1. Connect the half-wave rectifier of Fig. 2(a) with a suitable R_L and the diode 1N4001. Determine R_L so that you get a peak-to-peak current of **10mA** for a sinusoidal input signal (V_{in}) of 10 V peak to peak with a frequency of 3 kHz. Sketch the output V_{out} and input V_{in} for one complete cycle.
2. Repeat step 1 with the circuit 2b
3. Fill out the data table 1. For theoretical calculation consider the diodes to be silicon diode.
4. Connect the circuit for full wave rectifier as shown in figure 3 but without the capacitor.
5. Feed the output voltage to the oscilloscope and measure the time period and amplitude of the waveform
6. Noe connect the parallel capacitor with the load and note down the amplitude and time period of the output waveform.
7. Fil out the data table 2.

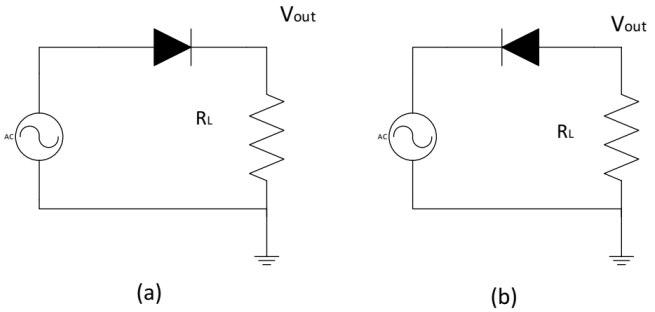

Figure 2 Half wave rectifier circuit for step 1 and 2

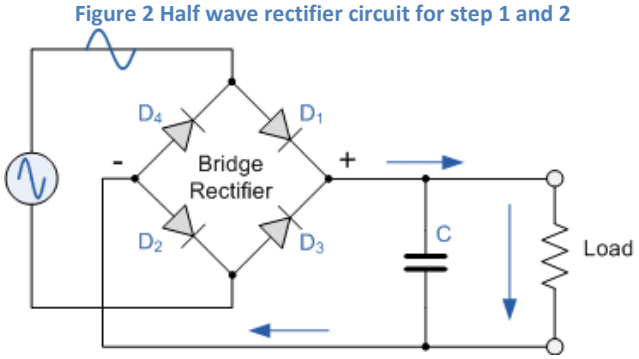

Figure 3 Full wave rectifier

Table 1 Data table for step 1 to 3

	DC Value of V_{out}	RMS value if V_{out}
Theoretical value for fig 2a		
Practical value for fig 2a		
Theoretical value for fig 2b		
Practical value for fig 2b		

Table 2 Data table for step 4-7

	Input	Output without capacitor	Output with capacitor
Amplitude			
Time Period			
Frequency			

Report

1. Carefully Fill all the data for table 1 and 2
2. Submit all the necessary waveforms in tracing paper with the report
3. Comment on the learnings from this LAB