Indian Institute of Information Technology, Allahabad

ELECTRONICS AND COMMUNICATION ENGINEERING DEPARTMENT

Course Name: Fundamental of Electrical and Electronics

EXPERIMENT NO: 13

Objective:

To study the input and output waveform of full wave rectifier with and without filter and calculate ripple factor.

Components and equipment required:

Diode, resistor, Transformer, Voltmeter, Ammeter, Breadboard and CRO.

Theory

Full wave rectification can be perform in two ways : 1. Centre tap full wave rectifier , 2. Bridge rectifier

Centre Tap full wave rectifier

Full Wave Rectifier During the positive half cycle of the transformer secondary voltage, D_1diode is forward biased and D_2 is reverse biased. So a current flows through the diode D_1 , load resistor and upper half of the transformer winding. During the negative half cycle, D_2 diode becomes forward biased and D_1 becomes reverse biased. The current then flows through the diode D_2, load resistor and lower half of the transformer winding. Current flows through the load resistor in the same direction during both the half cycles. Peak value of the output voltage is less than the peak value of the input voltage by 0.6V because of the voltage drop across the diode.

Bridge rectifier

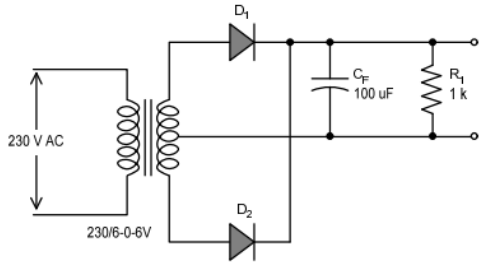
During the positive half cycle of the secondary voltage, diodes D_1 and D_2 are forward biased and diodes D_3 and D_4 are reverse biased. Therefore, current flows through the secondary winding, diode D_1, load resistor R_L and diode D_2. During the negative half cycle, D_3 and D_4 are forward biased and diodes D_1 and D_2 are reverse biased. Therefore, current flows through the secondary winding, diode D_3. Load resistor R_L and D_4. During both the half cycles, the current flows through the load resistor in the same direction. Peak value of the output voltage is less than the peak value of the input voltage by 1.2V due to the voltage drop across two diodes. The ripple factor of the bridge rectifier is the same as that of full wave rectifier.

For a full wave rectifier, $V_{rms} = V_m/\sqrt{2}, V_{dc} = 2V_m/\pi$

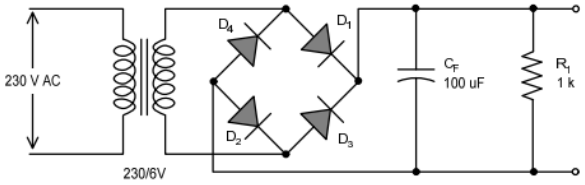
Ripple factor r= $\sqrt{(V_{rms}/V_{dc})^2 - 1} = 0.48$

Circuit diagram

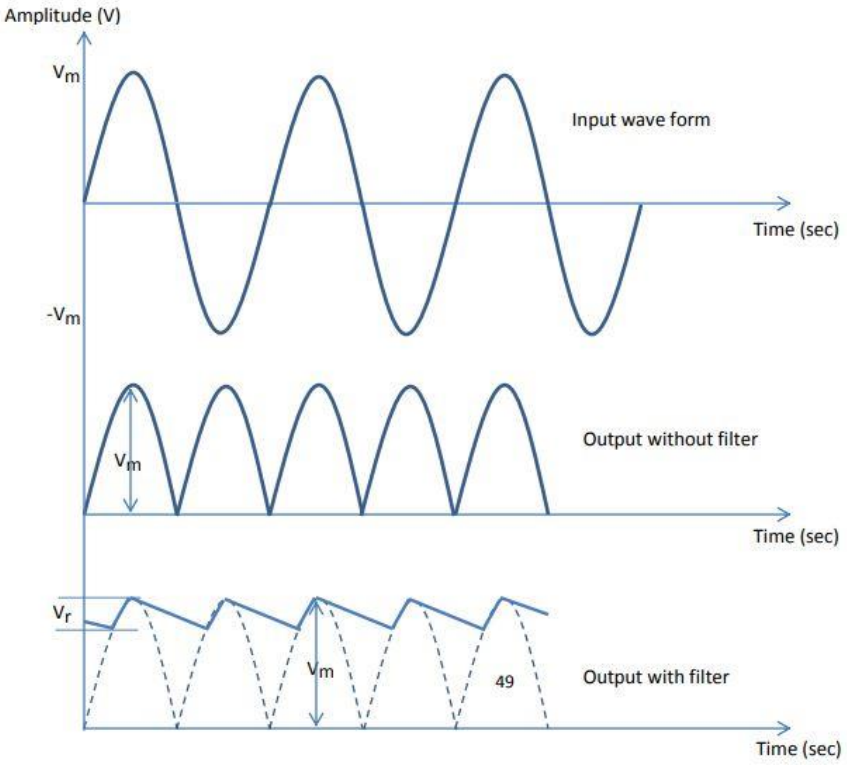
Full wave rectifier with filter:



Bridge rectifier with filter:



Output Waveform:



Calculation:

S.no.	V_m	$V_{rms} = V_m/\sqrt{2}$	$V_{dc} = 2V_m/\text{pi}$	$\sqrt{(\frac{V_{rms}}{V_{dc}})^2 - 1}$

Results:

Ripple factor of half wave rectifier without filter is = …….
Frequency of the output waveformf_{out}= ……f_{in}

Precautions:

1. While doing the experiment do not exceed the ratings of the diode. This may lead to damage the diode.
2. Do not switch ON the power supply unless you have checked the circuit connections as per the circuit diagram.