Experiment: FULL WAVE RECTIFIER

Aim:

a) To build a full –wave rectifier circuit with given component values on a breadboard. (without and with a capacitor)

b) To observe the output waveforms on the oscilloscope.

c) To calculate the peak value, RMS value and ripple factor of the output waveforms

d) To plot the input and output waveforms on a graph sheet to scale.

Equipment required: Cathode Ray Oscilloscope (CRO), Signal generator, Multimeter, Breadboard, Probes, and connecting wires, four diodes (e.g., 1N4007), Resistors, capacitors

Theory: Full-wave rectifier is also used to convert a given AC signal into a DC signal as in half- wave rectifier. Unlike the half wave rectifier whose output is zero during the negative cycle, the full-wave rectifier converts input AC signal into half sinusoidal pulse in both positive and negative cycles of the input sinusoidal wave signal. Hence full wave rectifier is efficient than a half wave rectifier. The circuit diagram of a full-wave rectifier is shown in fig. 1.

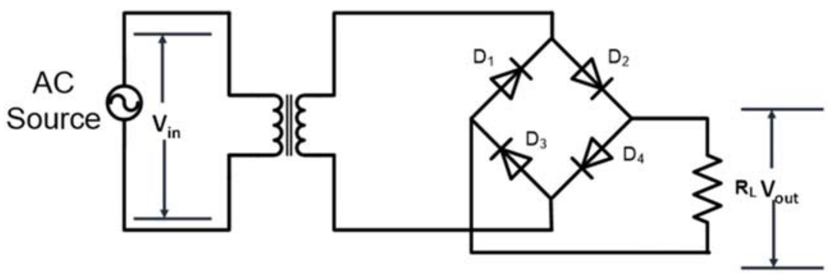

Fig. 1: Circuit diagram of a full-wave rectifier

Circuit Operation: The input waveform applied to a full-wave rectifier is shown in fig. 2. During the positive half cycle, the diodes, D2 and D_3 are in ON state whereas diodes D_1 and D_4 are in off state. Current flows through diodes D_2, D_3 into the output resistor 'R_L.' Output voltage, $V_{out} = V_{in} - 2V_{cutin}$.. Here V_{cutin} is the cut-in voltage of the diode. During the negative half cycle of the input, diode D_1 and D_4 are conducting while diodes D_2 and D_3 are OFF. Current flows through D1 and D4 into the resistor. The direction of current flow in the resistor is the same for both the cases. Hence $V_{out} = V_{in} - 2V_{cutin}$ for negative half cycle also. The output of the waveform of a full-wave rectifier circuit without a Capacitor filter and with a capacitor filter is shown in fig. 3 and fig. 4 respectively.

Experiment Procedure

1. Connect the circuit shown in Fig. 1 (without capacitor) on the breadboard.
2. Apply a sinusoidal signal of a given frequency f across V_{in} and observe the input and output waveforms using channel 1 channel 2 of the oscilloscope.

3. Trace the input waveform and the output waveforms with respect to the input waveform to scale on a graph sheet as per the scale.
4. Using the XY mode in an oscilloscope, trace the input versus output waveform.
5. Now connect a capacitor of value C μF across and repeat steps 1 to 4.
6. Make a table of the following observations.

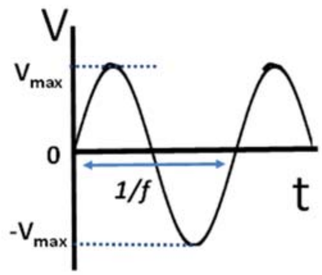

Fig. 2: Input sinusoidal waveform applied to the full-wave rectifier circuit

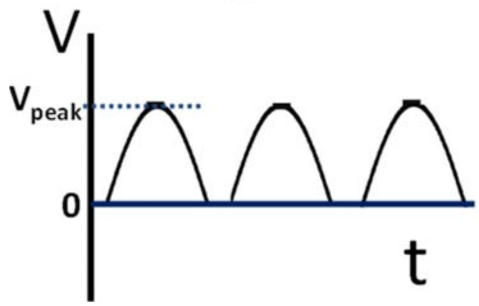

Fig. 3: Output waveform of the full-wave rectifier circuit without a capacitor filter.

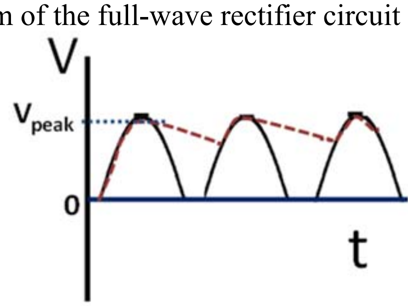

Fig. 4: Output waveform of the full-wave rectifier circuit with a capacitor filter.

<u>Observations</u>

	Without the capacitor	***With capacitor***
AC Input voltage (RMS) Vrms		
DC output voltage (V_{DC})		
DC current (I_{DC})		
AC output voltage (Ripple voltage, V_r)		
Ripple factor: (V_r/V_{DC})		

Observed Waveforms: Draw the waveforms when the capacitor is added and not added to the circuit

Conclusion: