4.FULL WAVE RECTIFIER

Aim: To determine the output wave form of Full -wave rectifier.

Theory:

A Full wave rectifier is a circuit, which converts an AC voltage into a pulsating dc voltage using both half cycles of the applied voltage. Two types of full rectifier are centre tapped rectifier and bridge rectifier.Centre tapped rectifier uses two diodes of which one conducts during one half cycle while the other conducts during the other half cycle of the applied ac voltage.

Centre tapped rectifier

During the positive cycle of the input voltage, diode D1 becomes forward biased and D2 becomes reverse biased. Hence D1 conducts and D2 remains off. The load current flows through D1 and the voltage drop across RL will be equal to the input voltage. During negative half cycle of the input voltage, diode D1 becomes reverse biased and D2 becomes forward biased. Hence D1 remains off and D2 conducts. The load current flows through D2 and the voltage drop across RL will be equal to the input voltage.

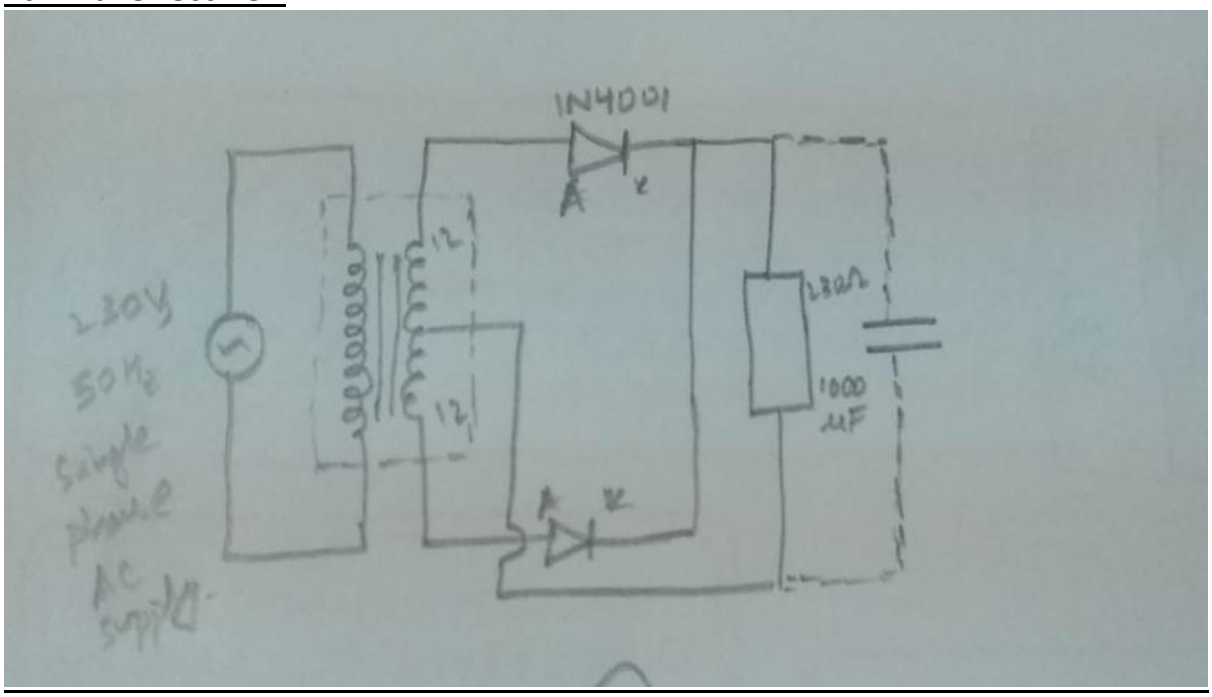
Bridge rectifier

In Bridge rectifier, 4 diodes are arranged in the form of a bridge. The transformer secondary is connected to two diametrically opposite points of the bridge at points A & C. The load resistance RL is connected to bridge through points B and D. During the first half cycle of the input voltage, the upper end of the transformer secondary winding is positive with respect to the lower end. Thus during the first half cycle diodes D1 and D3 are forward biased and current flows through arm AB, enters the load resistance RL, and returns back flowing through arm DC. During this half of each input cycle, the diodes D2 and D4 are reverse biased and current is not allowed to flow in arms AD and BC.

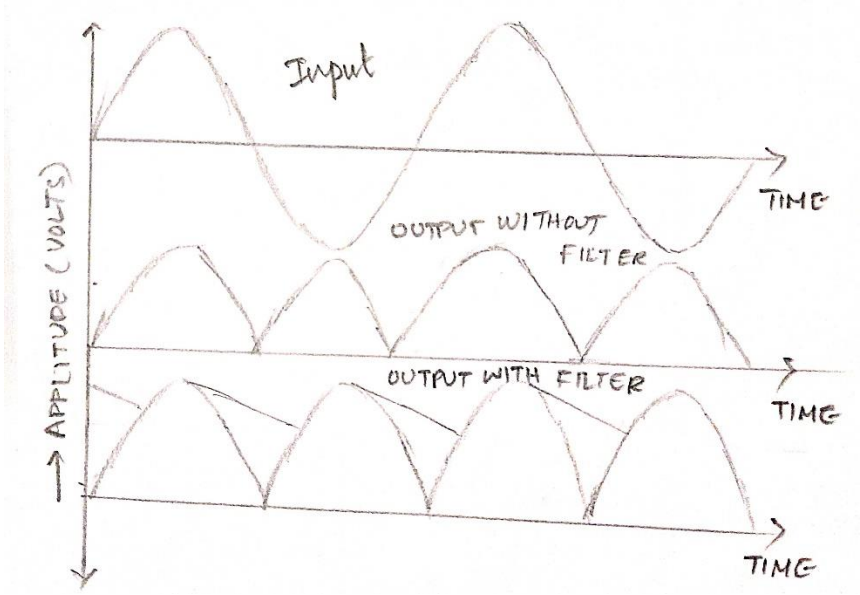
During the second half cycle of the input voltage, the lower end of the transformer secondary winding is positive with respect to the upper end. Thus diodes D2 and D4 become forward biased and current flows through arm CB, enters the load resistance RL, and returns back to the source flowing through arm DA.

Components Required:

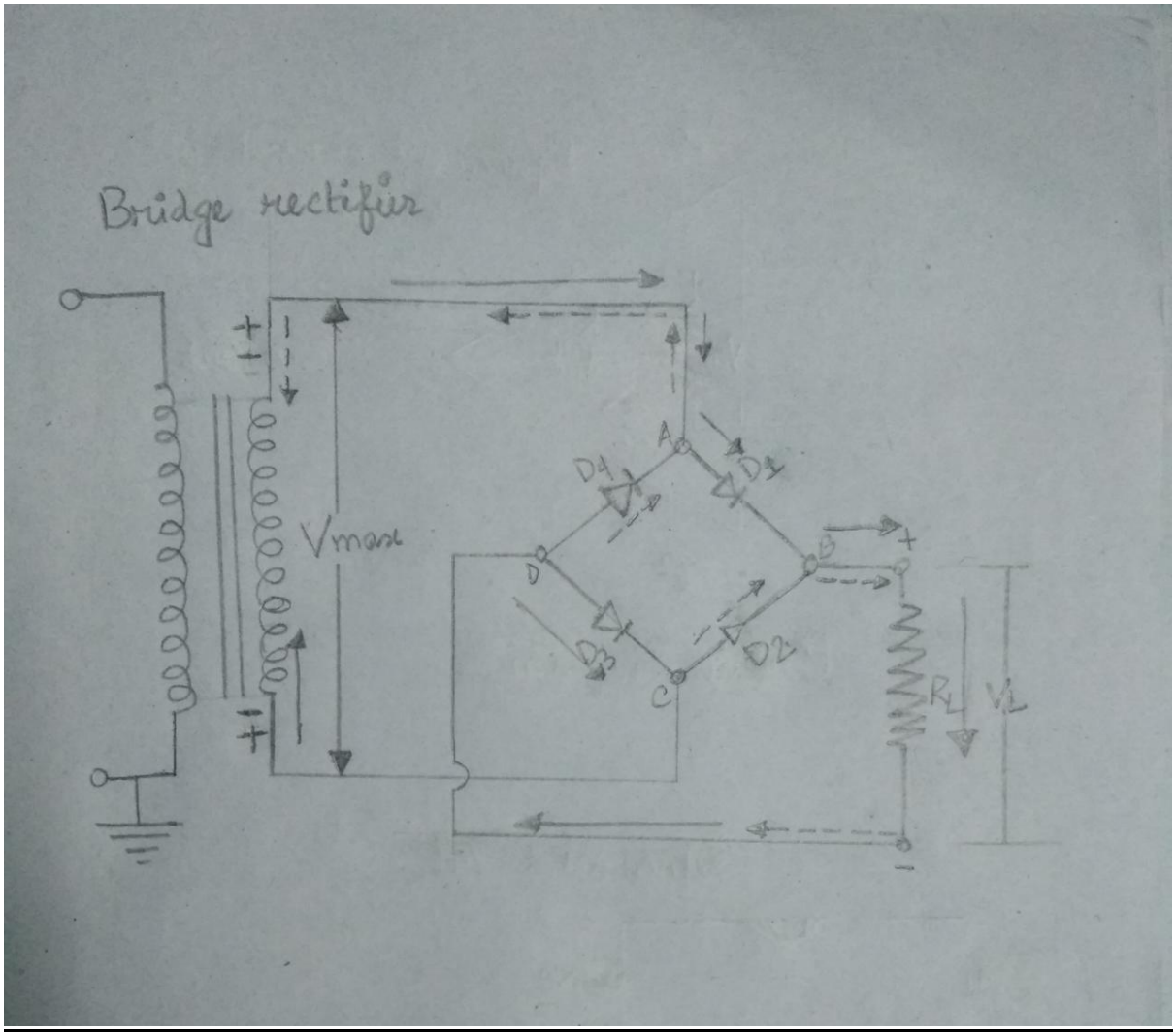
Full wave rectifier:



Model Graph:



Bridge rectifier:



Procedure:

1. Connect the components as mentioned below:
   L1-L7, L4-L7,L12-L5,L12-L11,L8-L9,L6-L10,L3-L11,L10-L8.
2. Click on 'Check connection' button to check the connections.
3. If connected wrong, double click on the wrong connection. Else click on 'Delete all connection' button to erase all the connections.
4. Set the resistor R_L.
5. Double click on 'ON' button to start the experiment.
6. Click on 'sine wave' button to generate input waveform.
7. Click on 'Oscilloscope' button to get the rectified output.
8. Vary the amplitude, frequency, volt/div using the controllers.
9. Click on "dual" button to observe both waveform.
10. Channel 1 shows the input sine waveform, Channel 2 shows the output rectified waveform.
11. Calculate the Ripple Factor. Theoretical Ripple Factor =0.483.

Calculations :-

V_m = 1 volt (amplitude) = peak voltage.

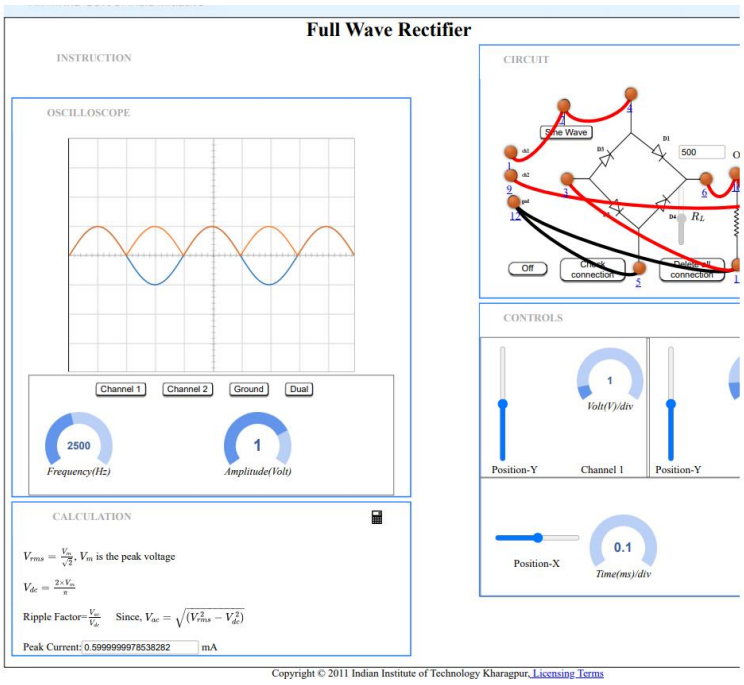
$V_{rms} = \frac{V_m}{\sqrt{2}} = \frac{1}{\sqrt{2}} = 0.707$

$V_{dc} = \frac{2 \times V_m}{\pi} = \frac{2 \times 1}{\pi} = 0.636$.

$V_{ac} = \sqrt{(V_{rms}^2 - V_{dc}^2)} = \sqrt{(0.499 - 0.404)} = \sqrt{0.095} = 0.308$.

Ripple Factor = $\frac{V_{ac}}{V_{dc}} = \frac{0.308}{0.608} = 0.4842$

Peak current = 0.599 mA.



Result:

By this experiment we determined the output wave form of full wave rectifier.

Inferences:

A full wave rectifier is more effective than half wave rectifier.
Full wave rectification rectifies the negative component of the input voltage to a positive voltage, then converts it into DC (pulse current) utilizing a diode bridge configuration. In contrast, half wave rectification removes just the negative voltage component using a single diode before converting DC.