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Electrical Engineering 2nd Year
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Principle of Electronics Lab

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EXPERIMENT NO. 3

Full wave rectifier with transformer, bridges and centre tap.

Date:28/08/2020

Time: In between 2pm to 5pm.

Tools used (software/websites):

- Virtual Lab website.
- LTspice software .

Theory:

A full-wave rectifier is exactly same as half-wave rectifier , but allows unidirectional current through the load during the entire sinusoidal cycle (as opposed to only half the cycle in the half wave). A full wave rectifier converts the whole of the input form

to one of constant polarity (positive or negative) at its output. Let us see our full wave rectifier circuit.

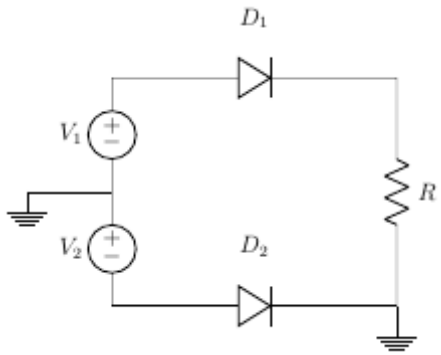


Figure:1(full wave rectifier circuit.)

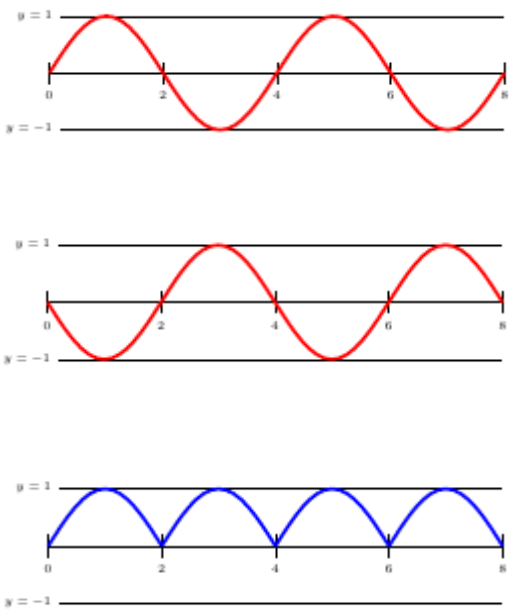


Figure:2(waveforms of full wave)

FULL WAVE RECTIFIER- CENTRE TAPPED TRANSFORMER:

A full wave rectifier can be contructed using Centre tapped transformer- which give us two shifted sinusoids so that exactly one of the waveforms is positive at one time and two diodes. As compared to half wave rectifier we use two diodes instead of one. One of them remains in conduction for alternate opposite cycles of current. At single time only one of the diode is forward biased and conducts. This allows a continuous flow of current through load.

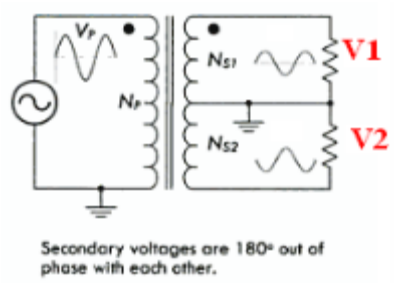
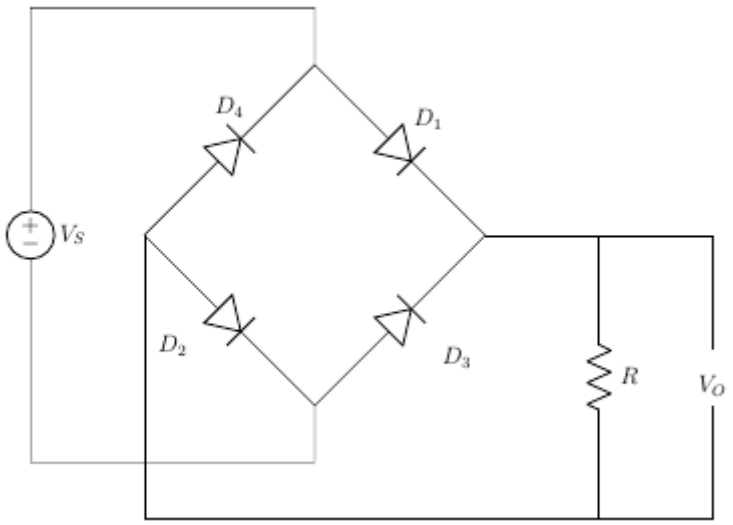


Figure:3 (centre tapped)

BRIDGE RECTIFIER:

Bridge rectifier uses 4 rectifying diodes connected in a “bridged” configuration to produce the desired output but does not require a special centre tapped transformer , thereby reducing its size and cost. The single secondary winding is connected to one side of the diode bridge network and the load to the other side as shown below.



In forward biased the diodes D1 and D2 conducts and in reverse biased the diodes D3 and D3 are in forward biased and the conducts. Thus we get a constant supply of current in both positive and negative halfs.

Object:

After the end of this experiment we will be able to:

1. Explain Rectification
2. Explain Center Tapped Full Wave Rectification
3. Explain Bridge Full Wave Rectification

Procedure:

Bridge rectifier procedure on vlab:

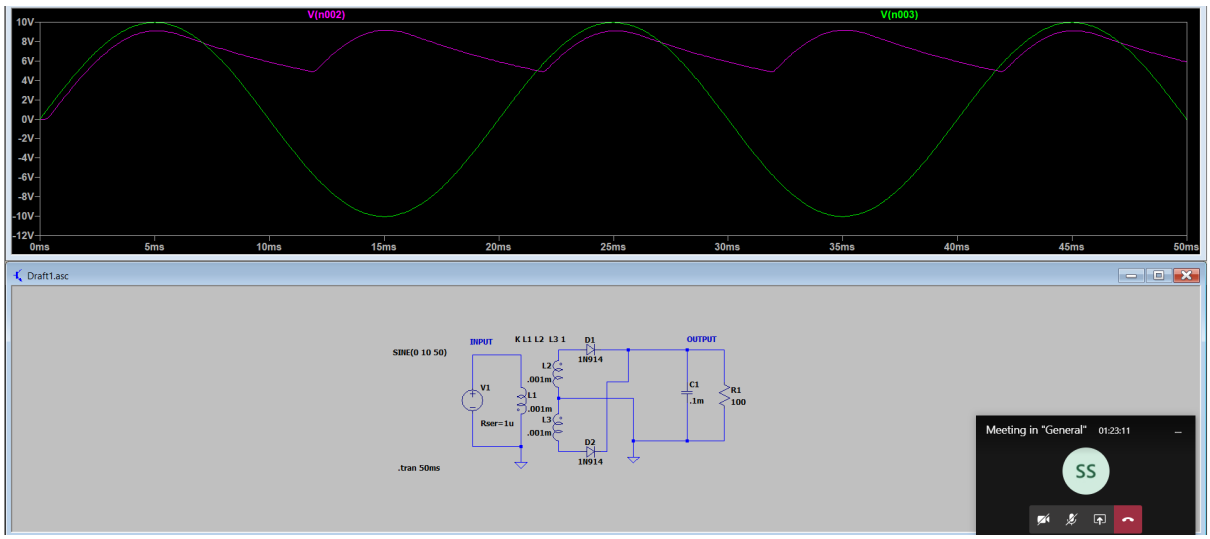
1. Set the resistor RLRL.

2. Click on 'ON' button to start the experiment.
3. Click on 'Sine Wave' button to generate input waveform
4. Click on 'Oscilloscope' button to get the rectified output.
5. Vary the Amplitude, Frequency, volt/div using the controllers.
6. Click on "Dual" button to observe both the waveform.
7. Channel 1 shows the input sine waveform, Channel 2 shows the output rectified waveform.
8. Calculate the Ripple Factor.Theoretical Ripple Factor=0.483.

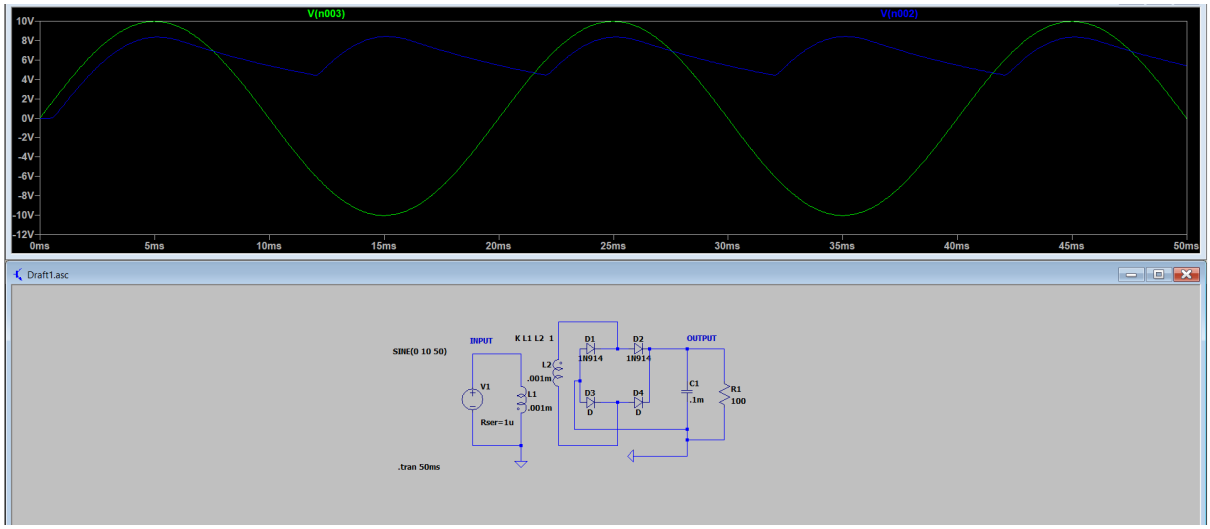
Procedure on LTspice:

1. Open the LTspice application.
2. Select the components (resistors,diodes,Voltage,inductors,capacitors) according to our need and the type of circuit we want to make.
3. Make advanced setting in voltage and set its amplitude and frequency.
4. Set the value of inductors,diodes and resistors.
5. By using the SPICE directive make the transformer/or say link it.
6. Go to stimulate tab->Edit stimulate cmd->click on transient tab->set the stop time.
7. Now run it.
8. Now obtain the graph of input and output.
9. We can also observe the nature of graph by changing the value of the capacitor.

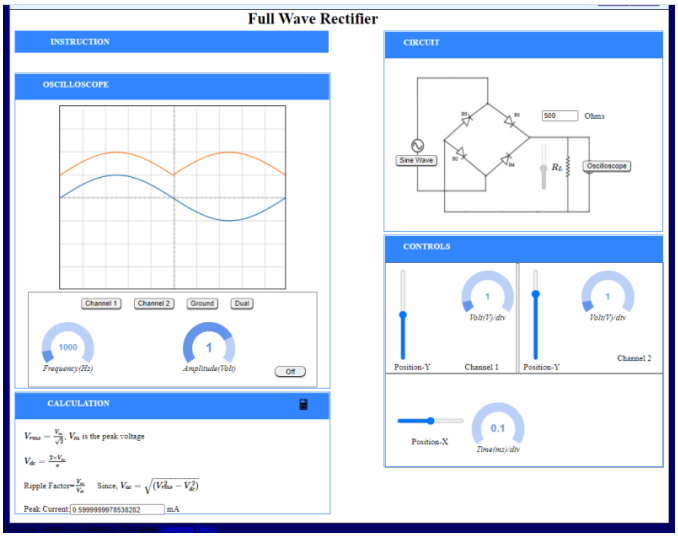
Screenshots:

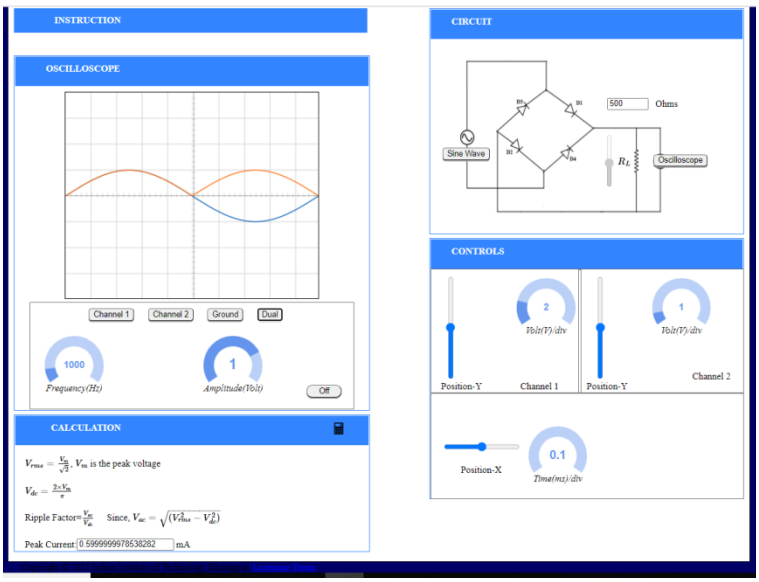


1.Rectifier with transformer.



2.Rectifier with bridges.





4.Experiment with Vm=2volts.

5.Experiment with Vm=1volts.

Observations:

1. **First observation**:

- Frequency=1000Hz
- Vm=1
- Vrms=Vm/√2=0.707
- Vdc= (2*Vm)/π= 0.636
- Vac= √(Vrms²-Vdc²)=0.308
- RF = Vac/Vdc = 0.48

2. Second Observation:

- Frequency=1000Hz
- Vm=1
- Vrms=Vm/√2=0.707
- Vdc= (2*Vm)/π= 0.636
- Vac= √(Vrms²-Vdc²)=0.308
- RF = Vac/Vdc = 0.48

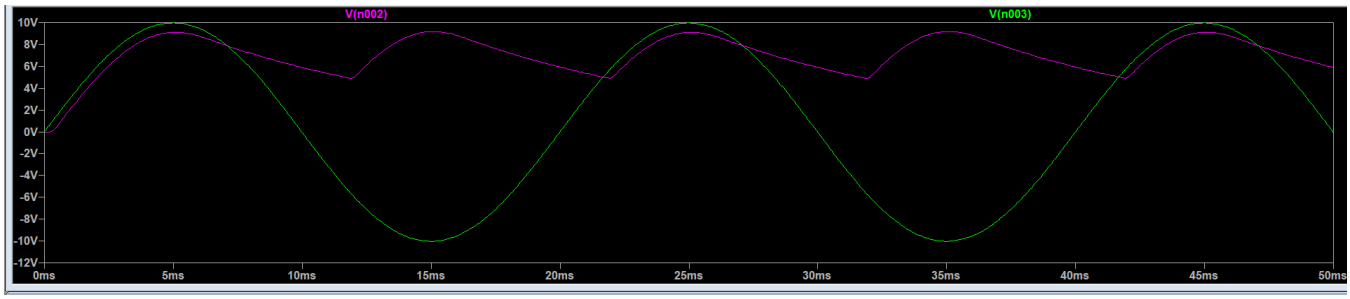
3. Third Observation:

- Frequency=1000Hz
- Vm=1
- Vrms=Vm/√2=0.707
- Vdc= (2*Vm)/π= 0.636
- Vac= √(Vrms²-Vdc²)=0.308
- RF = Vac/Vdc = 0.48

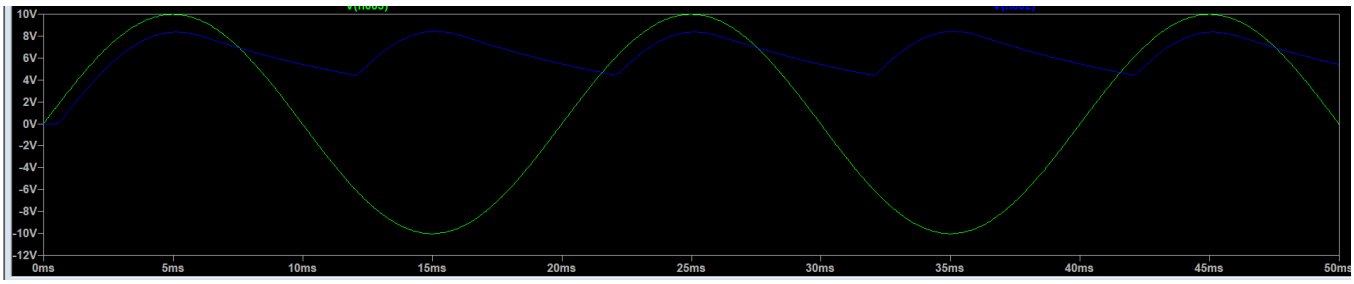
4. Fourth Observation:

- Frequency=1000Hz
- Vm=1
- Vrms=Vm/√2=0.707

- Vdc= (2*Vm)/π= 0.636
- Vac= √(Vrms²-Vdc²)=0.308
- RF = Vac/Vdc = 0.48



1.Rectifier with transformer.



2. Rectifier with bridges.

Observation table:

S.NO.	Frequency(Hz)	Peak Voltage Vm(Volts)	RMS Voltage(Volts)	DC voltage(Volts)	Ripple Factor
1.	1000	1	0.707	0.636	0.48
2.	1000	2	1.414	1.273	0.48
3.	1500	1	0.707	0.636	0.48
4.	1500	2	1.414	1.273	0.48

Conclusion:

The Ripple Factor of Full wave rectifier circuit is 0.48.

Precautions:

In simulation:

1. Internet connectivity should be good .

2. Avoid looking continuously in the monitor to reduce eye strain.

3. In case of drawing the circuit connections should be proper.

4.Make sure to read the instructions carefully.

In real environment:

1. Never removed or inserted a diode into a circuit with voltage applied.

2. When testing a diode, ensure that the test voltage did not exceed the diode's maximum allowable voltage.

3. Ensured a replacement diode into a circuit was in the correct direction.

4. The correct connection of the transformer made sure.