Exp no: 5	Title:
Date: 12-11-2021	Half wave rectifier and full wave rectifier

Aim:

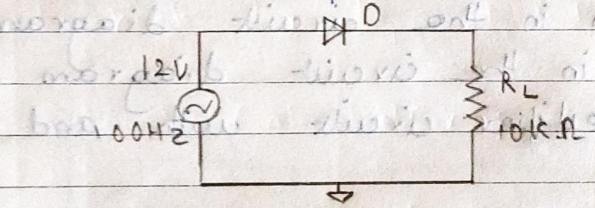
1) To setup a half wave rectifier and to find the dc value of rectified voltage.
2) To setup a full wave rectifier and to find the dc value of rectified voltage.

Apparatus:

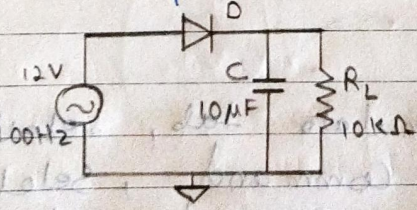
LT spice software tool

Circuit Diagram:

Half wave rectifier



Half wave rectifier with capacitor filter



Full wave rectifier

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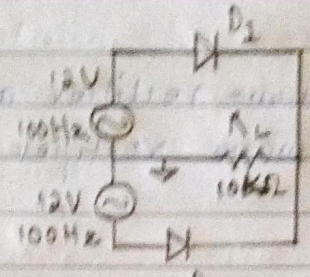
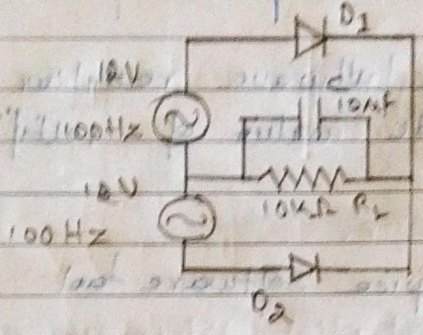


Full wave rectifier with capacitor filter



Procedure :

1) Draw the circuit in LT spice schematic as shown in the circuit diagram as shown in the circuit diagram for each rectifier circuit with and without filters.

2) Apply values to all the elements in the circuit.

3) Go to Simulate tab, select tab edit simulation command, select transient analysis since we have to observe the waveforms with respect to time.

4) Select the step time according to the

frequency of input waveform.

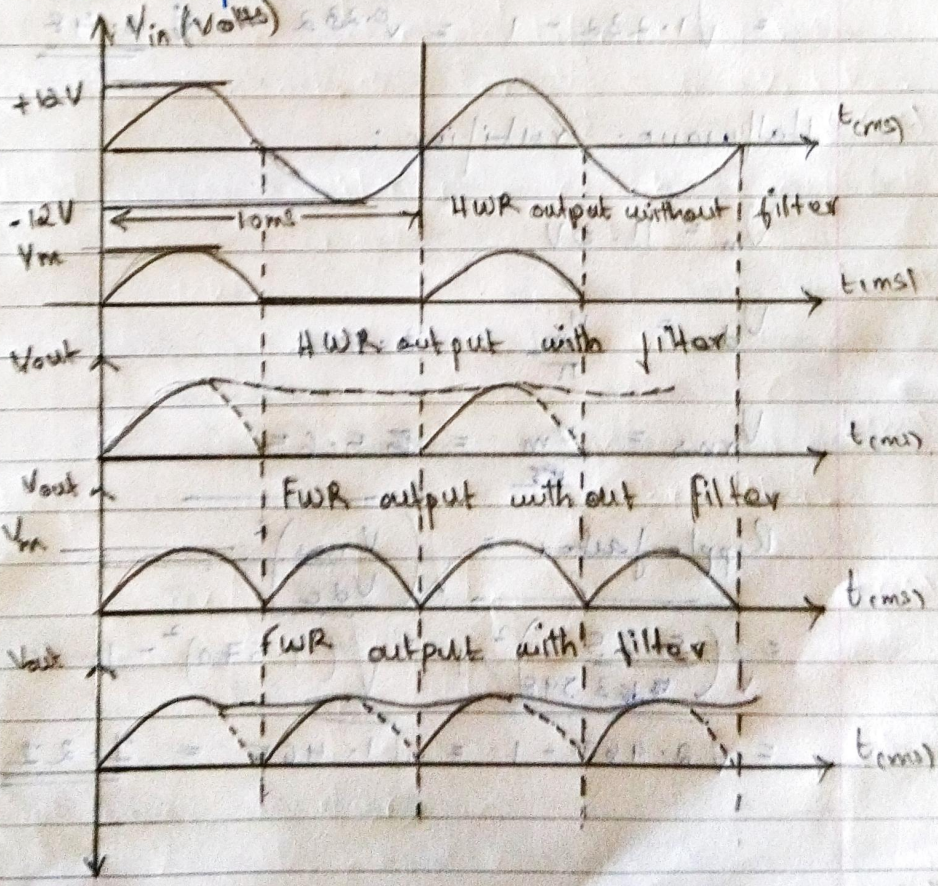
5) Run the simulation

6) Observe the input and output waveforms

7) Calculate the V_m value by attaching the cursor to output waveform.

8) Calculate the V_{dc}, V_{rms}, ripple factor for Half wave and full wave rectifier.

Model Graph:



Calculations:

Full wave rectifier:

$V_m = 11.3\,V$

$$V_{dc} = \frac{2V_m}{\pi} = \frac{2(11.3)}{3.14} = 7.197$$

$$V_{rms} = \frac{V_m}{\sqrt{2}} = \frac{11.3}{\sqrt{2}} = 7.990$$

$$\text{Ripple factor} = \sqrt{\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1}$$

$$= \sqrt{\left(\frac{7.990}{7.197}\right)^2 - 1} = \sqrt{(1.110)^2 - 1}$$

$$= \sqrt{1.232 - 1} = \sqrt{0.232} = 0.48$$

Half wave rectifier:

$V_m = 11.3\,V$

$$V_{dc} = \frac{V_m}{\pi} = 3.598$$

$$V_{rms} = \frac{V_m}{\sqrt{2}} = 5.65$$

$$\text{Ripple factor} = \sqrt{\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1}$$

$$= \sqrt{\left(\frac{5.65}{3.598}\right)^2 - 1} = \sqrt{(1.570)^2 - 1}$$

$$= \sqrt{2.465 - 1} = \sqrt{1.465} = 1.21$$

Comparison of theoretical with simulated values:

Ripple factor	Theoretical value	Simulated value
HWR	1.21	1.21
FWR	0.48	0.48

Result:

The half wave and full wave rectified outputs are simulated successfully

inferences:

1) the theoretical value of ripple factor for half-wave rectifier is same as simulated value.
2) The theoretical value of ripple factor for full wave rectifier is same as simulated value.
3) the amplitude of the rectified output is reduced when the capacitor is connected to the resistor. Hence the ripple factor can be reduced.

Inference:

The theoretical value of is the same as the simulated value and hence verified successfully.

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