6/23/2022

EXPERIMENT NO.9

EC111

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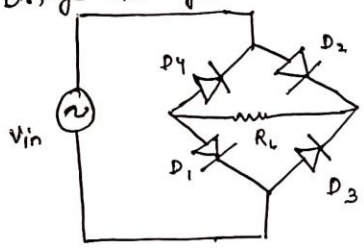
Experiment No. 9

Aim : Bridge rectifier circuit :

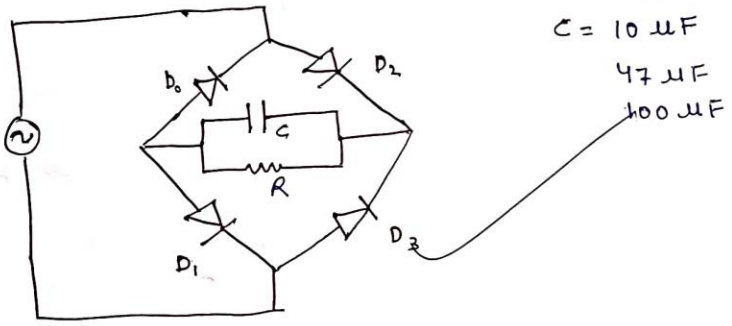
Circuit diagram :

① Bridge Rectifier

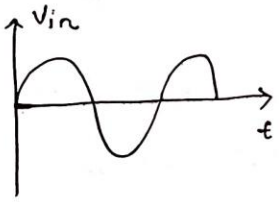


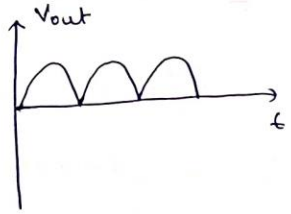
$V_{in} = 10\,V$
$f = 50\,Hz$
$R_L = 1\,K\Omega$

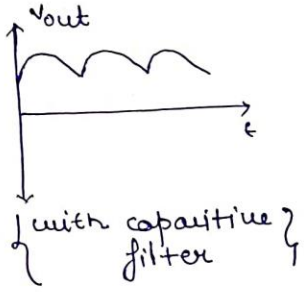
② Bridge Rectifier with capacitive filter :



C = 10 μF
47 μF
100 μF







Calculation :

① ripple factor = for bridge rectifier without capacitive filter

$$= \sqrt{(\text{form factor})^2 - 1}$$

$$= \sqrt{\left(\frac{V_{rms}}{V_{avg}}\right)^2 - 1}$$

$$= \sqrt{\left(\frac{5.80}{9.88}\right)^2 - 1} = 0.5468$$

Verified
23/06/2022

② ripple factor for bridge rectifier with capacitive filter

① for 10 μF:

Ripple factor = $\sqrt{\left(\frac{6.35}{6.24}\right)^2 - 1} = 0.188$

② for 100 μF

Ripple factor ≈ 0

EXPERIMENT NO. 9

TITLE: BRIDGE RECTIFIER CIRCUIT.

OBJECTIVE:

- To design and study a bridge rectifier without and with (capacitor) filter and determine the output DC voltage, Ripple factor, and percentage of regulation.

APPARATUS REQUIRED:

- Breadboard
- Connecting wires
- Resister 1kohm
- Power supply
- Capacitor 10microfarad, 47 microfarad, 100 microfarad
- Oscilloscope
- Function generator

THOREY:

RECTIFICATION:

A rectifier is a device that converts alternating current to direct current, a process known as rectification. Rectifiers are essential in two types half-wave and full-wave rectifiers.

Bridge Rectifier:

A full-wave rectifier is the same as the half-wave 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 waveform to one of constant polarity (positive or negative) at its output.

The bridge rectifier uses 4 rectifying diodes connected in a "bridged" configuration to produce the desired output but does not require a special center-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.

Bridge Rectifier – Positive Half Cycle During the positive half cycle of the supply diodes D1 and D2 conduct in series while diodes D3 and D4 are reverse biased (ideally they can be replaced with open circuits) and the current flow through the load.

Bridge Rectifier – Negative Half Cycle During the negative half cycle of the supply, diodes D3 and D4 conduct in series, but diodes D1 and D2 switch off as they are now reverse biased. The current flowing through the load is in the same direction.

CIRCUIT DIAGRAM:

WITHOUT FILTER:

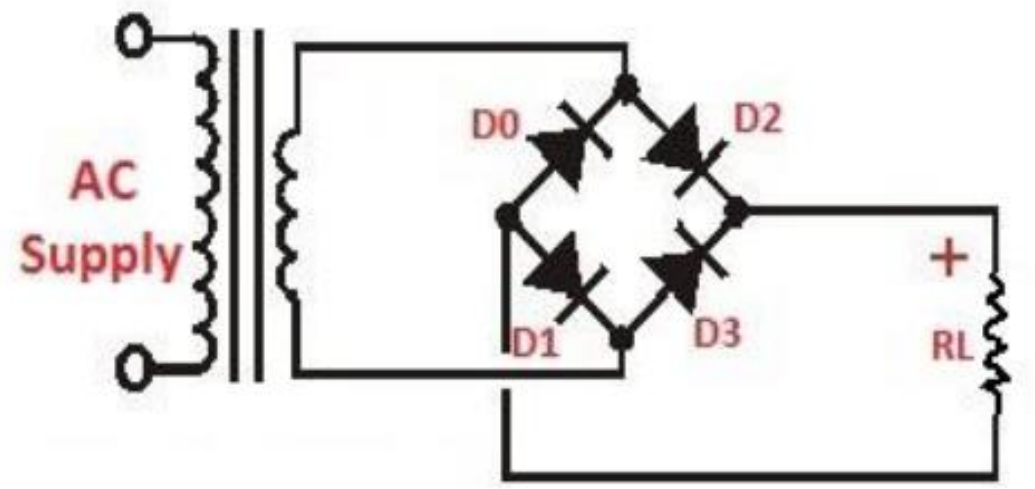


Fig 8.1: Bridge rectifier circuit without filter

WITH FILTER:

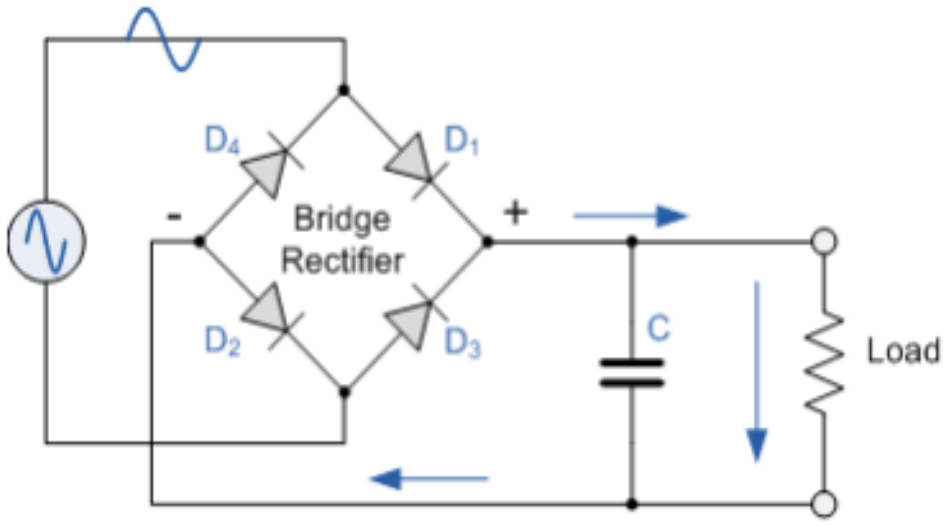
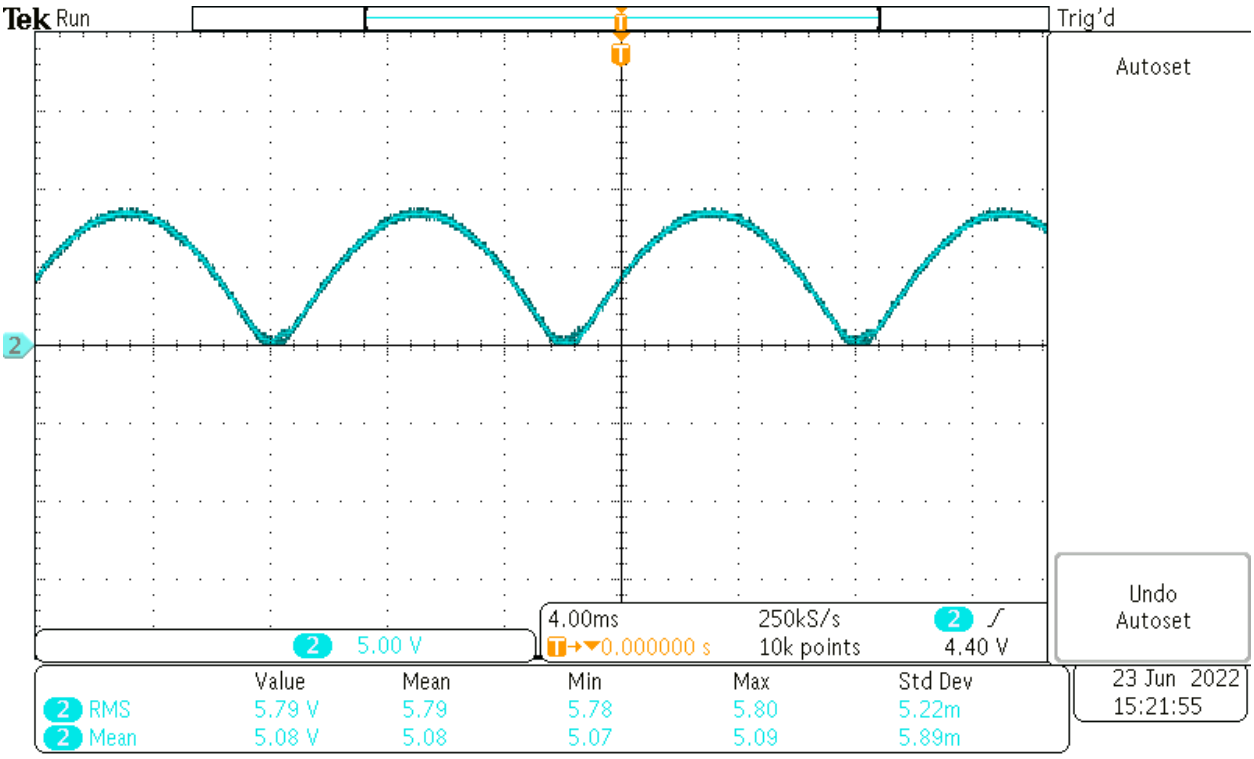
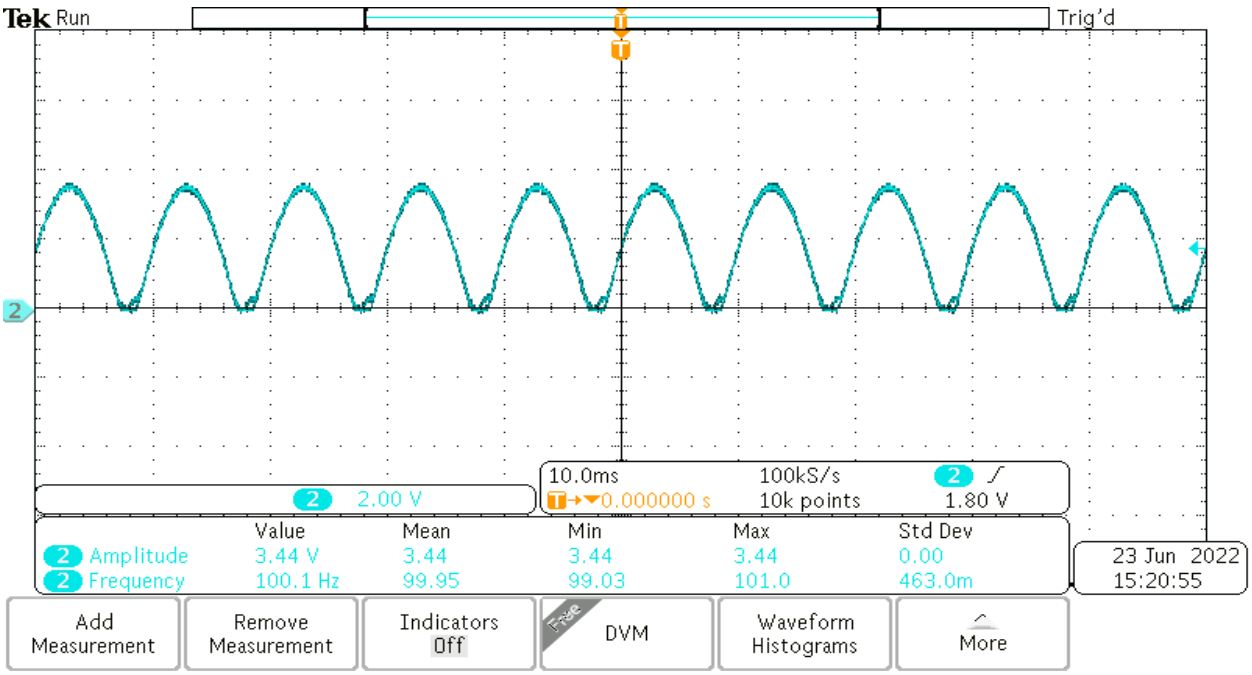


Fig 8.2: Bridge rectifier circuit with filter

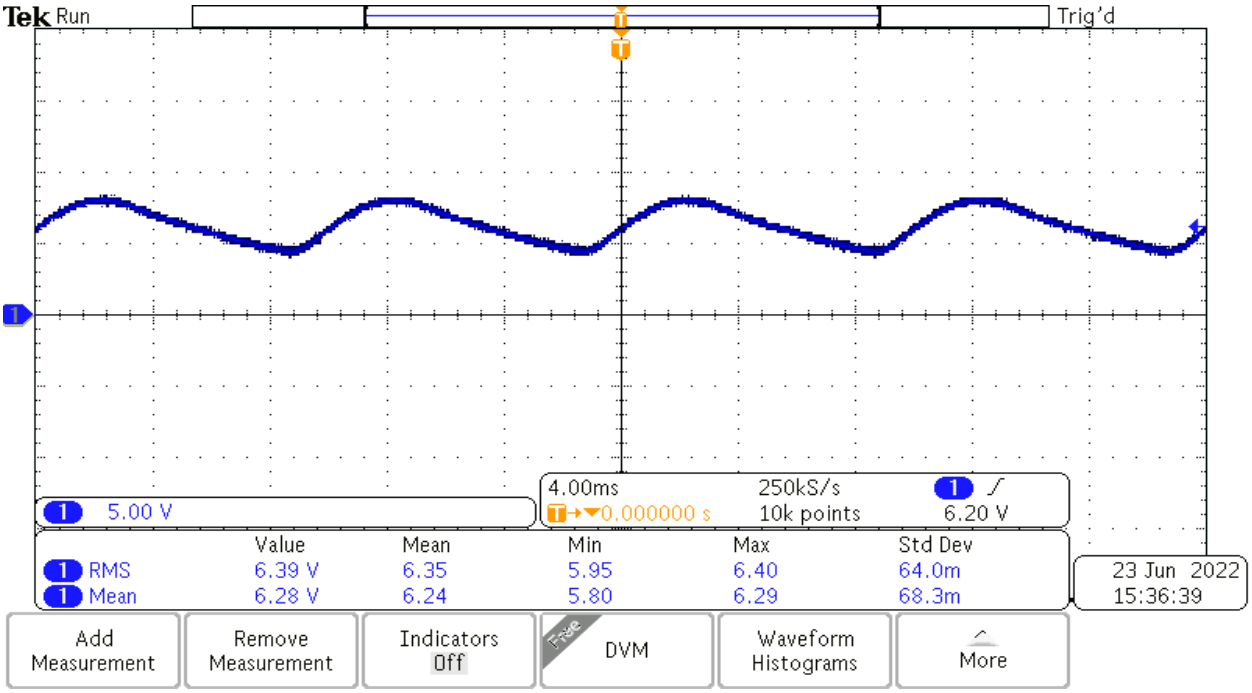
OBSERVATIONS:

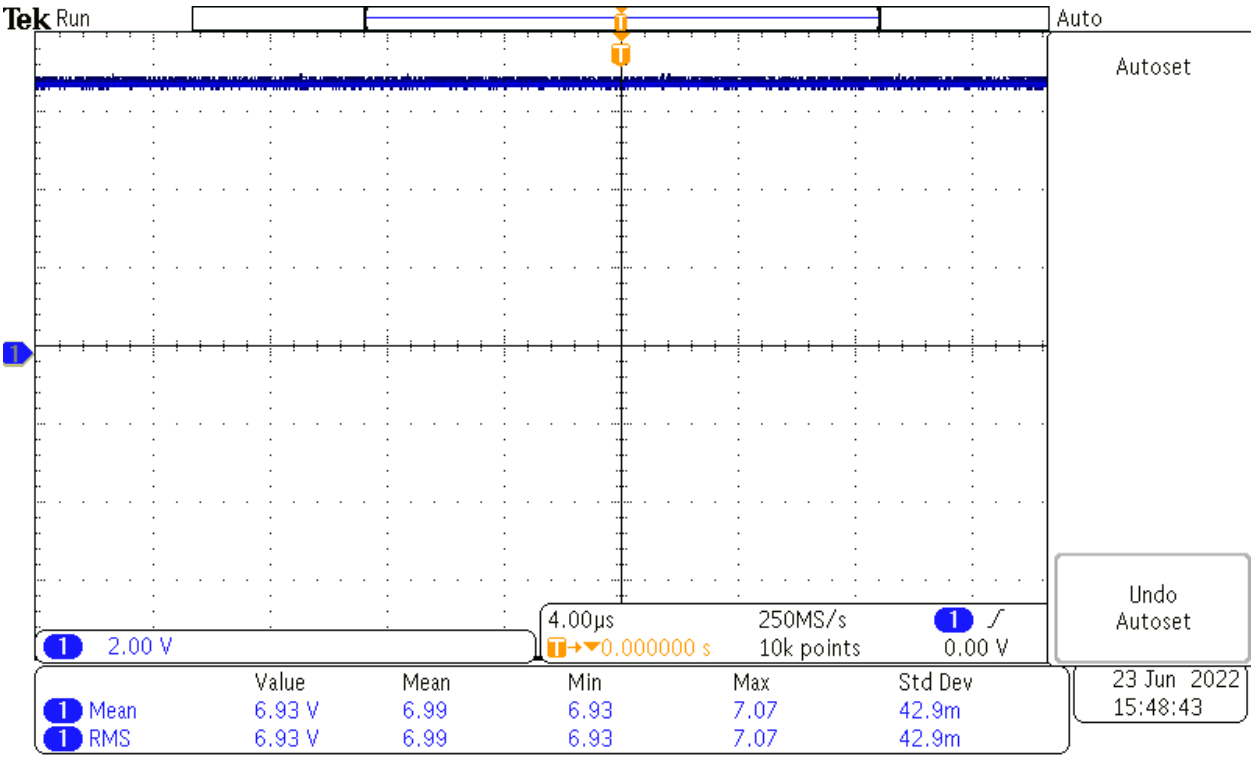
WITHOUT FILTER:





WITH FILTER:


Tek Run
Trig'd
5.00 V
4.00ms
250kS/s
0.000000 s
10k points
6.20 V
Value
Mean
Min
Max
Std Dev
RMS
6.39 V
6.35
5.95
6.40
64.0m
Mean
6.28 V
6.24
5.80
6.29
68.3m
23 Jun 2022
15:36:39
Add Measurement
Remove Measurement
Indicators Off
Free
DVM
Waveform Histograms
More


Tek Run
Auto
Autoset
2.00 V
4.00µs
250MS/s
0.000000 s
10k points
0.00 V
Undo Autoset
Value
Mean
Min
Max
Std Dev
Mean
6.93 V
6.99
6.93
7.07
42.9m
RMS
6.93 V
6.99
6.93
7.07
42.9m
23 Jun 2022
15:48:43

CALCULATIONS:

WITHOUT FILTER:

V_{rms} =5.80v

V_{avg}=5.08v

Ripple factor = 0.5468

WITH FILTER:

V_{rms} =6.35v

V_{avg}=6.24v

Ripple factor = 0.188

For high capacitance value: Ripple factor = 0

RESULT:

- Successfully design a bridge rectifier circuit without and with (capacitor) filter.

PRECAUTIONS:

- Connections should be made accordingly to the circuit diagram only.
- Do not be on the DC power supply for a long time otherwise diode may be burned.
- Wires should be tight and no short-circuiting should be there.
- Do not cross the maximum power rating.