Experiment :

Date 10/9/24
Page No. 13

Experiment - 3
Full Wave Rectification

Aim- To study full wave rectification

Apparatus- Oscilloscope, resistor (R_L), connecting wires

Theory-

Rectification - Device that convert AC to DC. It's of 2 types- a half wave and a full wave rectifier

① Full Wave Rectifier

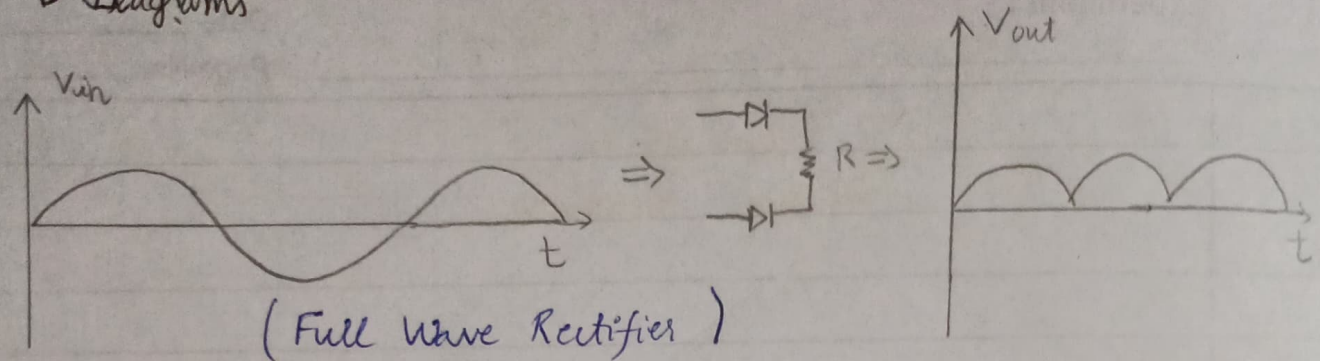
It's exactly the same as half-wave but allows unidirectional current through the load during entire sinusoidal cycle. It converts the whole of the input waveform to one of constant polarity (positive or negative) at its input

② Centre Tapped Transformer

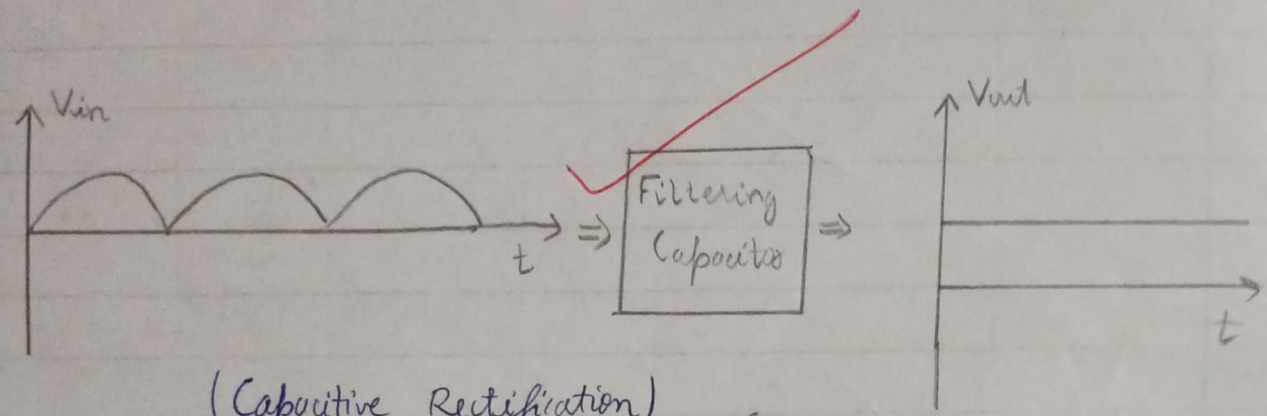
A full wave rectifier can be constructed using centre Tapped transformer. Gives us two shifted sinusoids so exactly one of the waveform is positive at one time. Allows for conduction through load.

CLASSTIME

→ Diagrams

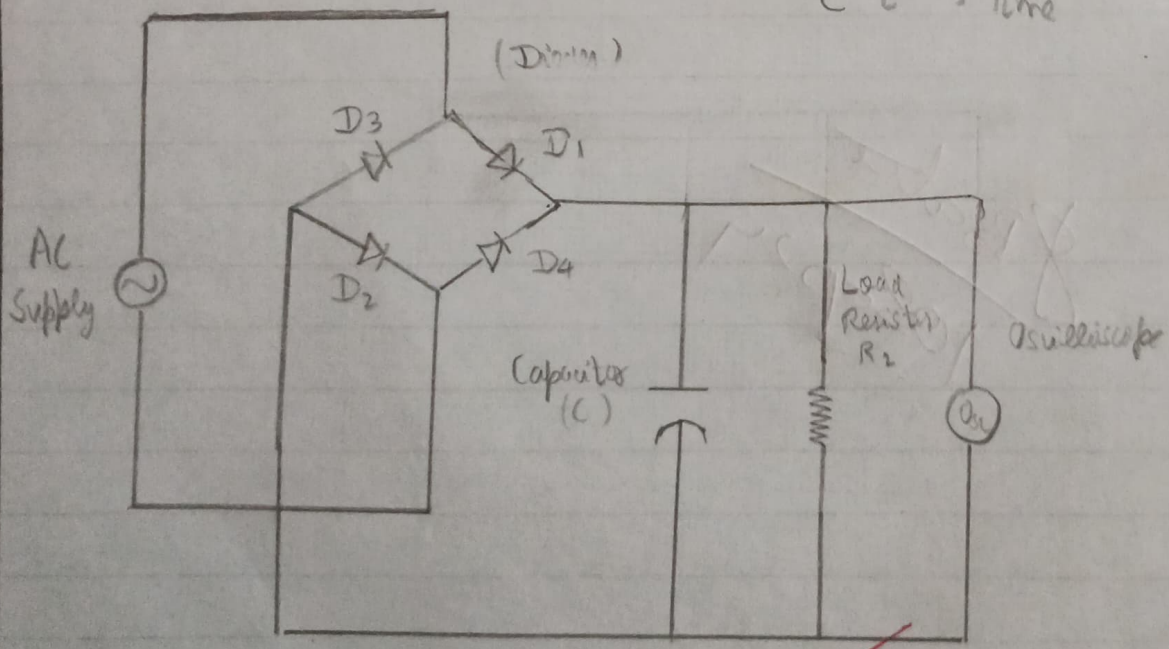


(Full Wave Rectifier)



(Capacitive Rectification)

{ Vin → Vinput (Input voltage)
Vout → Voutput (output voltage)
t → Time }



Ckt diagram for full wave rectifier with filtering

Experiment :

Date

Page No. 15

(B) Bridge Rectifier

It uses 4 rectifying diodes connected in a bridged config. to produce desired output that doesn't require special tapped transformer thereby reducing reducing cost and size.

Avg DC Load Voltage = $V_{DC} = \frac{2V_m}{\pi}$

Avg. Load Current = $\frac{2 \times I_m}{R}$

RMS Load Current = $\frac{I_m}{\sqrt{2}}$ RMS Load Voltage = $\frac{V_m}{\sqrt{2}}$

Form factor = $\frac{\pi}{2\sqrt{2}} = 1.11 \rightarrow \frac{V_m/\sqrt{2}}{2V_m/\pi}$

(2) Capacitive Rectification

↳ Capacitive Rectification - A full wave rectifier converts the whole of input waveform to one of constant polarity at its output. But what is really desired to convert pulsating output of rectifier to a constant dc supply, thus filter input signal

↳ The simplest kind of filter that can perform filtering taste is a capacitor. When connected, the AC components will have a low impedance path to ground and not appear in output.

CLASSTIME

→ Observation Table

Amp → Amplitude / mV

1. Full Wave Rectifier

(a) Set 1
freq = 1000Hz
R_L = 500Ω

(b) Set 2
freq = 1000Hz
R_L = 400Ω

(C) Set 3
freq = 1000Hz
R_L = 300Ω

(A)

S.No	Amp(V)	Peak current (mA)
1	0	-1.4
2	0.5	-0.400
3	1	0.799
4	1.5	1.599
5	2	2.59

(B)

S.No	Amp(V)	Peak Current (mA)
1	0	-1.74
2	0.5	0.71
3	1	0.74
4	1.5	1.749
5	2	2.749

(C)

S.No	Amp(V)	Peak Current (mA)
1	0	-2.33
2	0.5	-0.66
3	1	0.91
4	1.5	2.33
5	2	4.33

Experiment :

Date

Page No. 17

Ripple Voltage and Ripple Factor

A new charging pulse occurs every half cycle the capacitor charges and discharges very quickly The variable portion is known as ripple Further ratio of ripple voltage to avg. voltage is ripple factor.

↳ Precaution

1) Check the capacitor polarity
2) Monitor ripple voltage voltage across load.
3) Ensure proper Oscilliscope probing
4) Check diode Orientation and connection

↳ Conclusion

↳ In this experiment, using a bridge rectifier with 4 diodes, both halves of AC waveform into pulsating DC output. Bridge rectifier provides a more efficient rectification proves by utilizing entire AC cycle. The inclusion of capacitor reduced ripple in rectified output resulting in a constant DC voltage.

Badri

23/9/24

CLASSTIME

(2) Capacitive Rectification

$V_{pp_1} = 1V$
Position Y-axis = 0.1
Phas = 0 deg
Freq = 1000Hz

$V_{pp_2} = 1V$
Position X-axis = 0.1
Phase = 0 deg
freq = 1000Hz

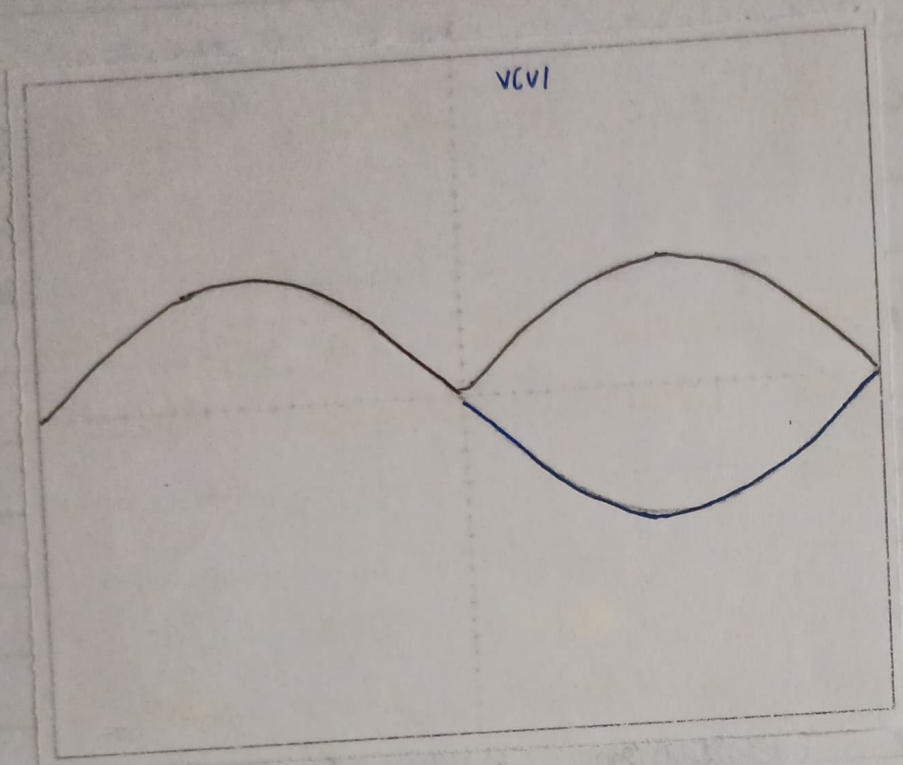
Oscilloscope Least Count = 0.01 (for Voltage)
1 ms (for time)

→ Calculations

Form factor = $\frac{V_{rms}}{V_{avg}} \Rightarrow \frac{V_m/\sqrt{2}}{2V_m/\pi} \Rightarrow \frac{\pi}{2\sqrt{2}} = 1.11$

Ripple Factor $\Rightarrow \gamma \Rightarrow \sqrt{(\text{Form factor})^2 - 1)} \times 100\%$
↳ 48.1 %

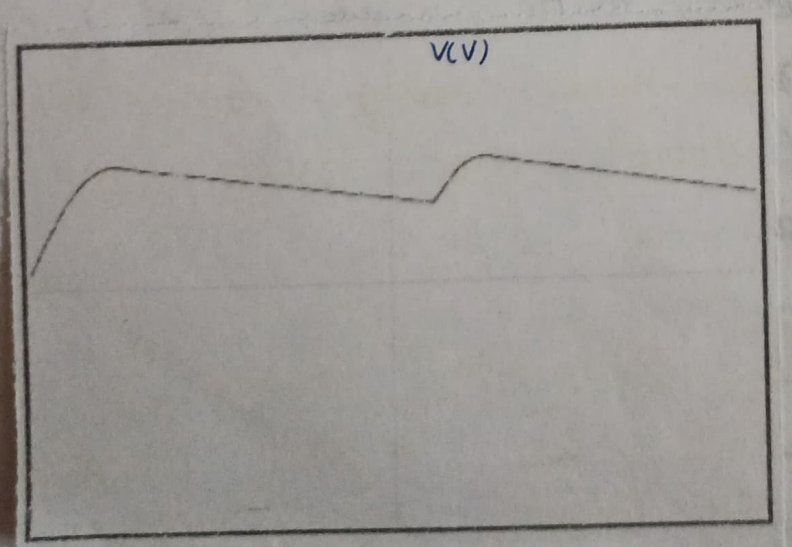
(a) Full Wave Rectifier



Black line represents rectified output DC and blue line represents input AC

frequency = 1000 Hz
Amplitude = 1 V
R_L = 500 Ω
(Load resistance)

(b) Capacitive Rectification



Rectified Output DC

frequency = 1000 Hz