FULL WAVE RECTIFIER (CENTER TAP) STUDY OF RIPPLE FACTOR AND LOAD REGULATION WITH AND WITHOUT FILTER CIRCUIT

A full-wave rectifier with a centre tap, also known as a centre-tapped full-wave rectifier, is a type of rectifier circuit used to convert alternating current (AC) into direct current (DC). It utilizes a centre-tapped transformer and two diodes to achieve the rectification process.

Aim

To construct a full wave rectifier and study its ripple factor and load regulation with and without filter circuit.

Components and Equipments required

Sl. No.	Component/Equipment	Specification	Quantity
1	Diodes	IN 4007	2 Nos
2	Capacitor	100μF	1 No
3	Resistors	1kΩ	1 No
4	Centre tapped step down Transformer	6 – 0 – 6V	1 No
5	Voltmeter	DC and AC	Each 1
6	CRO		
7	Bread board		

Theory

Rectifier is a circuit which converts the ac voltages into de voltage. In full wave rectification, current flows through the load in the same directions for both half cycles of input ac voltage. The output of a rectifier consists of de component and ac component. The ratio of rms value of ac component to the de component in the rectifier output is known as ripple factor.

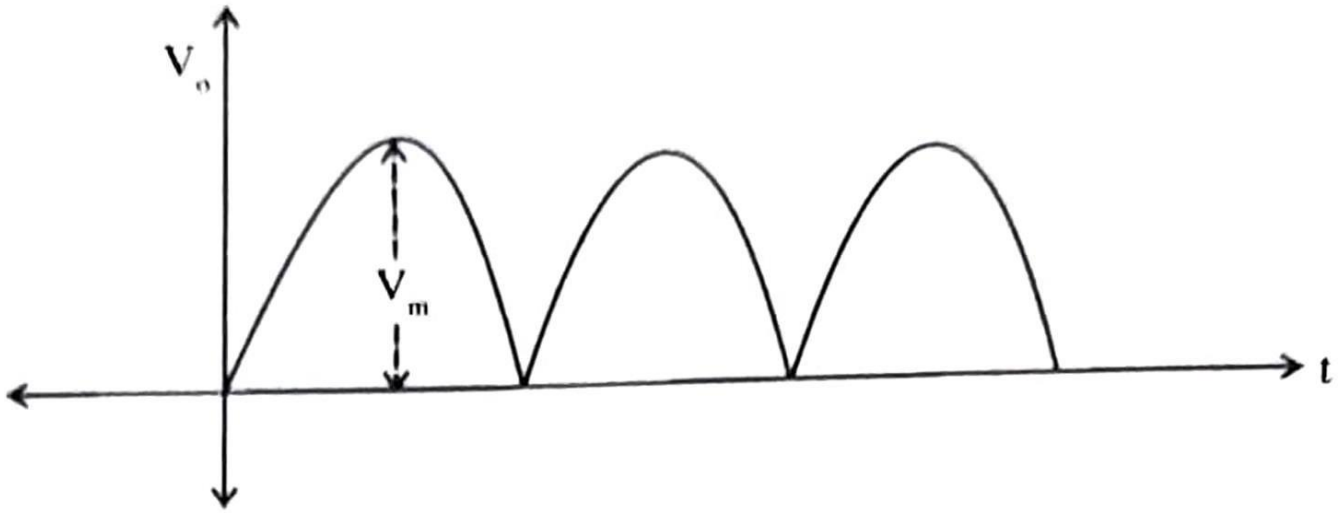
$$\text{Ripple factor} = \frac{r.m.s\ value\ of\ ac\ component}{value\ dc\ component} = \frac{V_{rms}}{V_{dc}}$$

Thus ripple factor decides the effectiveness of a rectifier. The smaller the ripple factor the more effective is the rectifier.

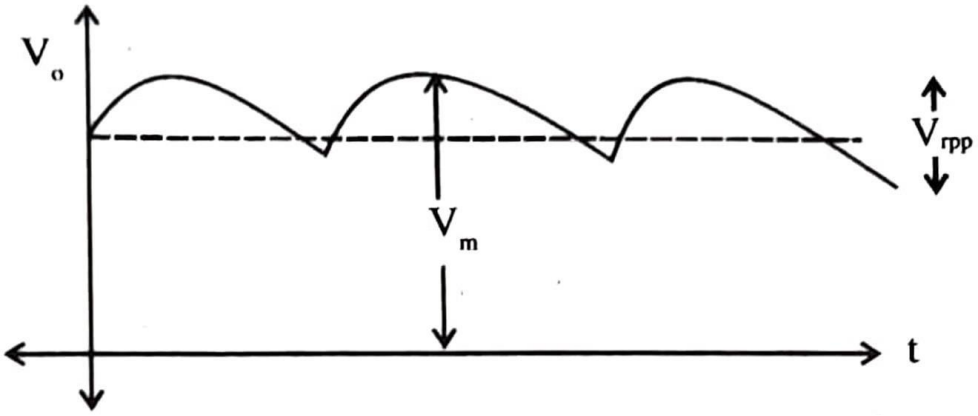
Observations and tabulations

Using CRO

Without filter



With filter



	V_{dc} (= V_{FL}) (volt)	V_{NL} (volt)	V_{rms} (volt)	Percentage of regulation $\frac{V_{NL}-V_{FL}}{V_{FL}}\times 100\%$	Ripple factor $\gamma=\frac{V_{rms}}{V_{dc}}$
Without filter					
With filter					

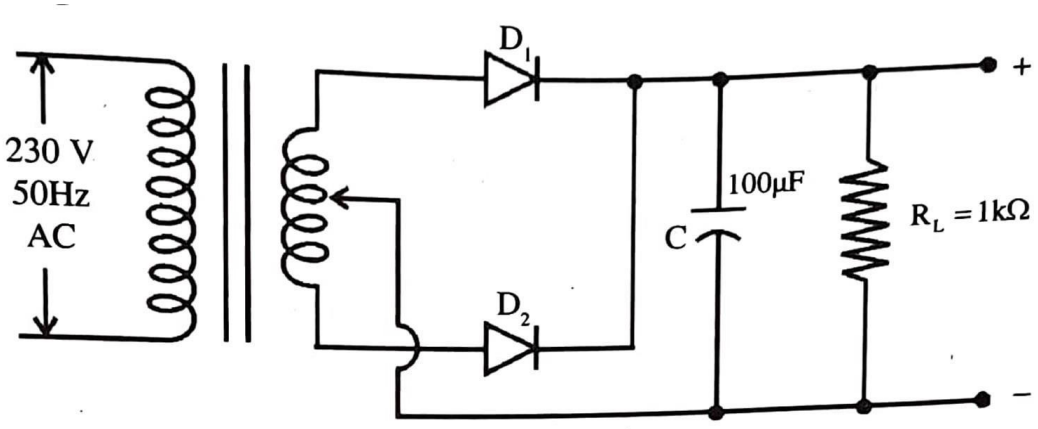
Percentage of Regulation It is a measure of the variation of DC output voltage for variations in the load.

$$\text{Percentage of regulation} = \frac{VNL-VPL}{V_{PL}} \times 100\%$$

V_{NL} = DC voltage across load resistance, when minimum current flows through it (without connecting the load)

V_{FL} = DC voltage across load resistance, when maximum current flows through (with load connected).

Circuit diagram



Procedure

1. Connections are made as shown in the circuit diagram without capacitor.
2. Switch ON the AC power supply.
3. Observe the transformer secondary voltage wave form and output voltage waveform across the load resistor on a CRO screen.
4. Measure Vm from CRO and calculate $V_{rms} = \frac{V_m}{\sqrt{2}}$, $V_{dc} = \frac{2V_m}{\pi}$

5 .Verify the results by measuring V using ac voltmeter and V using de voltmeter.

ripple factor = $\frac{Vrms}{V_{dc}}$

(Digital Multimeter can be used to measure true RMS ac voltage)

6. Connect a capacitor and observe the wave form.

7. Ripple factor can be calculated from the filtered wave form. Measure V_m and V_{rpp} using CRO.

$$V_{rms} = \frac{V_{rpp}}{2\sqrt{3}}$$

$$V_{dc} = V_m - (\frac{V_{rpp}}{2})$$

So Ripple factor = $\frac{Vrms}{V_{dc}}$

Result

Constructed a full wave rectifier and measured its ripple factor and percentage of regulation with and without filter

1. Ripple factor without filter = …….
2. Ripple factor with filter = …….
3. Percentage of regulation with filter = ……
4. Percentage of regulation without filter = ……

References

- Experimental Physics – I, For First, Second, Third and Fourth Semester, BSc Degree Programme, Dr.P.Sethumadhavan, Prof. K.C. Abraham, Prof .Sunil John, **Manjusha Publications**
- https://youtu.be/qvcT2iC1N6k?si=7IjzK6EkCTR5tE5W

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