Practical No.8: Build and Test the full wave rectifier Using two diodes

I Practical Significance

Electric power is usually transmitted in AC form. However certain application needs DC power supply such as electronic appliances. A rectifier is an electronic device that converts an alternating current into a direct current by using one or more P-N junction diodes. Hence, AC mains need to be rectified using rectifier when DC power is required.

II Industry / Employer Expected Outcome

This practical is expected to develop the following skill: **'Use electronic components and circuits in electrical equipment and systems'.**

III Course Level Learning Outcome

Use semiconductor diodes in different rectifier and filter.

IV Laboratory Learning Outcomes

Test full wave rectifier using wo diodes on Breadboard:

1. Build the circuit for Full Wave Centre Tapped Rectifier using PN junction Diode.
2. Observe and draw input-output waveforms for sinusoidal wave.

V Relevant Affective Domain related Outcomes

1. Handle components and equipment carefully.
2. Follow all safety precautions

VI Minimum Theoretical Background

Rectifier is an electronic device used for converting AC into pulsating DC and this process is known as Rectification. Like the half wave circuit, a full wave rectifier circuit produces an output voltage or current which is pulsating DC Full wave rectifier utilizes both the cycle of input AC voltage. Two diodes are used in full wave center tapped rectifier. A center-tapped full wave rectifier circuit consists of a center-tapped transformer, two diodes, and a resistive load. The center-tapped transformer has a wire connected at the center of its secondary winding, which divides the input AC voltage into two halves. The diodes are connected in parallel to each other, with the load connected at the center tap of the transformer. During the positive half of the input cycle, one diode conducts (forward bias) while the other diode is non-conducting (reverse bias).

This allows current to flow through the load. In the negative part of th cycle, the diodes change their job. The one that was allowing electricity t flow now stops, and the one that was blocking it begins to allow through. This is unlike a half-wave rectifier that uses only one part of th cycle. Using both parts in a full wave rectifier improves its performanc and ensures more efficient conversion of the wavy input into a smoot output.

VII Practical setup in Laboratory

(a) Sample

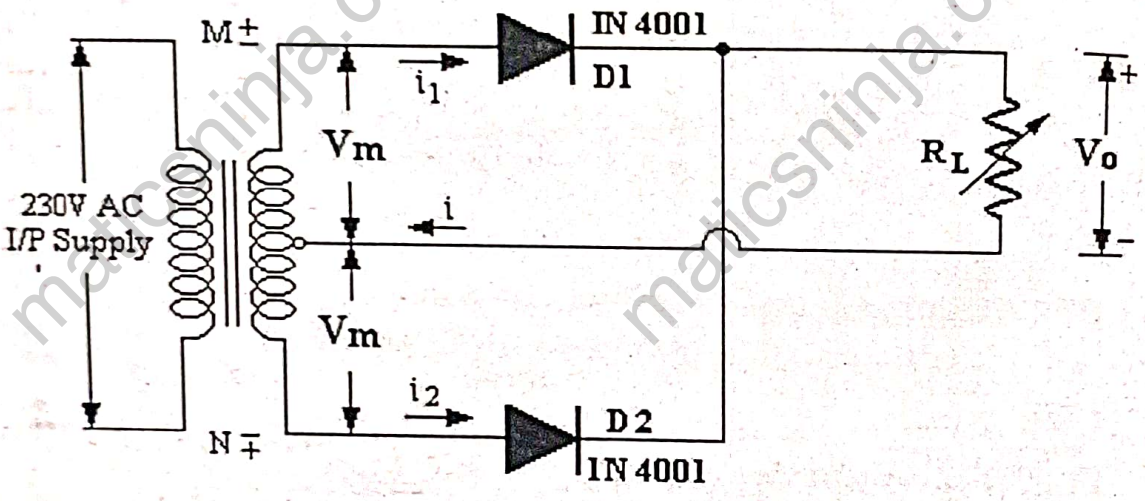
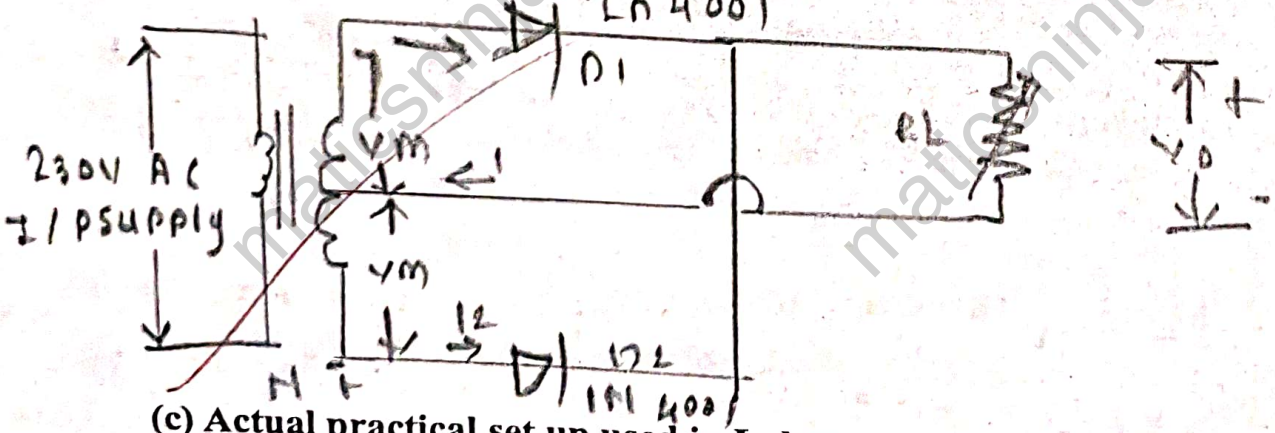


Figure 8.1: Full wave rectifier (FWR) without filter

(b) Actual Circuit Diagram used in Laboratory



(c) Actual practical set up used in Laboratory

VIII Required Resources/apparatus/equipment with specifications

Sr. No	Instruments/Components	Specification	Quantity
1	Transformer	12-0-12V AC, 500 mA	1
2.	Multimeter	3 ½-digit display with AC and DC voltage measurement and Current measurement facility and Diode testing facility.	1
3.	C.R.O.	25MHz, Dual trace, 15MΩ input impedance	1
4.	Resistor	10KΩ, 0.5 Watt.	1
5.	Diode	Silicon 1N4007	1
6.	Bread board	5.5 CM X 17CM	1
7.	Connecting wires	Single strand Teflon coating (0.6 mm diameter)	As per requirement

IX Precautions to be followed

1. Do not switch ON the power supply unless you have checked the circuit connections as per the circuit diagram.
2. While doing the practical do not exceed the input voltage of the diode beyond the rated voltage of diode as given in datasheet. This may lead to damaging of the diode.

X Procedure

1. Connect the circuit for Center Tapped Full wave rectifier on breadboard as shown in Figure 8.1
2. Connect the primary side of the transformer to AC mains. Connect the CRO probe across the secondary and measure the Vs_{p-p} appearing across diode.
3. Measure the peak value of output voltage (V_m) across the resistance.
4. Draw input and output waveforms of full wave rectifier.
5. Calculate the average or dc value of output voltage.
6. Using DMM measure the DC voltage at the load resistance R_L.
7. Compare the value calculated instep5with the value measured in step 6.
8. Tabulate the readings in Table1.

XI Observation Table

Table 1

Type of rectifier	Rectifier Output On CRO(V_m)	V_{dc} Calculated (using Formula $V_{dc}=(2V_m/\pi)$	V_{dc} Measured (using DMM)	Comr
FWR	35.65	35.96	35.8	VDS u CRO

Calculations:

$V_{dc}=2V_m/\pi$

$= 2 \times 56.5 / 3.14$

$= 35.96 V$

XII Results

1. V_{dc} calculated= 35.65 V

XIII Interpretation of results

By performing this experiment of full wave rectifier on breadboard we determine the values of output DC voltage using CRO and DMM.

XIV Conclusions and Recommendation

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XV Practical related Questions

1. Calculate frequency of waveform obtained at the output of full wave rectifier
2. Compare half wave and Full wave rectifier based on output waveforms obtained in Laboratory.
3. State need of rectifier

[Space for answers]

1) - - - - - ?

→ A Full wave rectifire both the half cycle of the DC voltage Ex:- it conduct

voice during a cycle output frequency is double two that of input frequency the output frequency of a full wave rectifire is ~~to m~~ 2 X 50 = 100 Hz

2) - - - - - - ?

→ A half wave rectifire is an electronic circuit which converts only one half of the AC cycle into pulsating DC with only half of AC cycle for the conversion process on the other and full wave rectifire is an electronic circuit which convert in time cycle of AC into pulsating DC.

XVI References / Suggestions for further Reading

1. http://nptel.ac.in/courses/
2. www.electronics-tutorials.ws › Diodes

XVII Assessment Scheme

Performance Indicators		Weightage
Process related (15 Marks)		**60%**
1	Proper connection of electrical circuit	20%
2	Handling of instrument	10%
3	Taking proper readings	20%
4	Working in team.	10%
Product related (10 Marks)		**40%**
1	Calculation of theoretical value	10%
2	Interpretation of Result	05%
3	Conclusions	05%
4	Practical related questions	15%
5	Completion and submission of experiment in time	05%
	Total (25 Marks)	**100%**