LAB SESSION 04

FULL WAVE RECTIFIER

Name of Student: ……………………………………………………

Roll No.: …………………………………Section: …………………

Date of Experiment: ……………………………………………….

Report submitted on: ………………………………………………

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Instructor's Signature: ……………………………...

DEPARTMENT OF MECHANICAL ENGINEERING
UNIVERSITY COLLEGE OF ENGINEERING AND TECHNOLOGY

FULL - WAVE RECTIFICATION
OBJECTIVES:

1. Ability to recognize a full-wave rectified waveform,
2. Understand the working of diode bridge circuit as a full-wave rectifier and its advantage over half – wave rectification.
3. Awareness of the two – diode method of obtaining full – wave rectifications.

EQUIPMENT REQUIRED:

Qty	Apparatus
1	Electricity & Electronics Constructor EEC470
1	Basic Electronic Kit EEC472
	Power supply unit. A.c. supply; 20V rms; 50 or 60Hz
1	Multimeter or
1	Voltmeter 50V d.c.
1	Oscilloscope.

INTRODUCTION:

At the end of Assignment 3 we discussed ways of reducing the ripple or voltage variation on a rectified direct voltage. One of these was to use every half – cycle of the input voltage instead of every other half – cycle.

A circuit which allows us to do this is shown in fig 4.1, and is known as the **DIODE BRIDGE**.

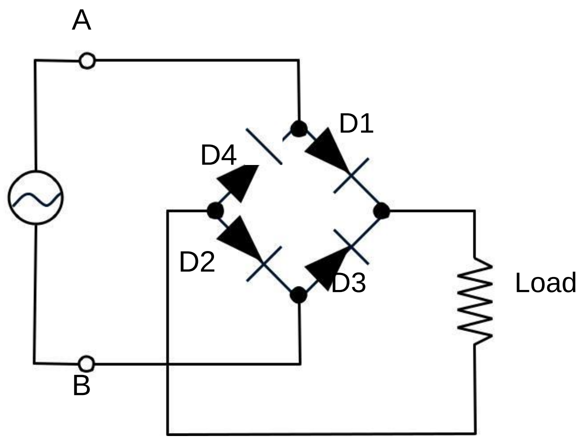

Fig 4.1 A Diode Bridge Rectifier

During the positive half – cycle of the supply “A” is more positive than “B”. Diodes D1 and D2 therefore conduct while diodes D3 and D4 are reverse – biased. The current flows as shown in fig 4.2.

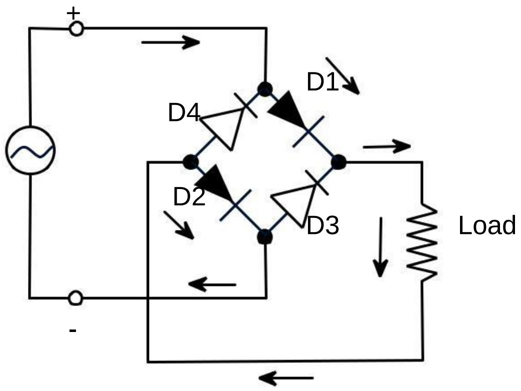

Fig 4.2 Positive Half – Cycle

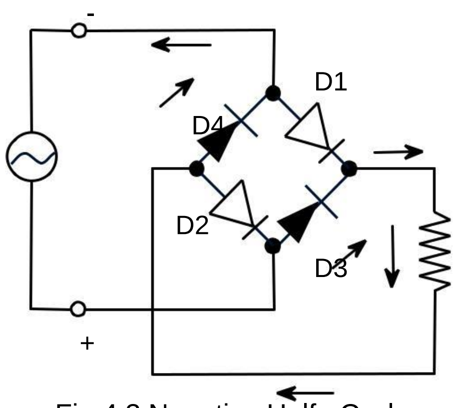

Fig 4.3 Negative Half –Cycle

During the negative half – cycle the current flow is as represented by fig 4.3. ın each case the current in the load is in the same direction.

EXPERIMENTAL PROCEDURE:

A Bridge Rectifier with Resistive Load:

Select the Bridge Rectifier from the component kit. It appears as in fig 4.4a and fig 4.4b in the circuit, showing the rectifier terminals are labeled.

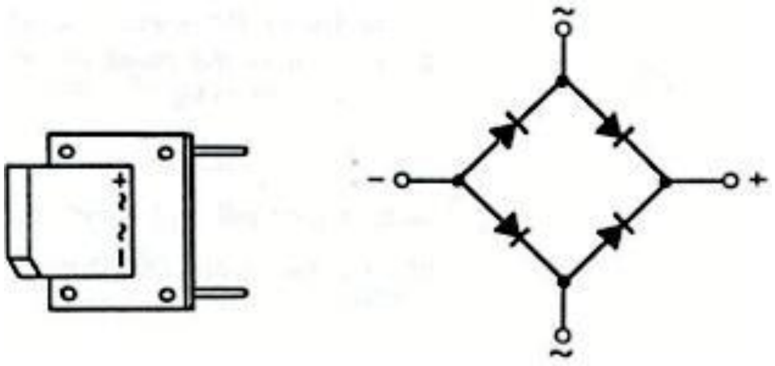

Fig 4.4 Bridge Rectifier

The terminals labeled + and – are so called because these are the polarities that will exist across the load.
Construct the circuit of fig 4.5.

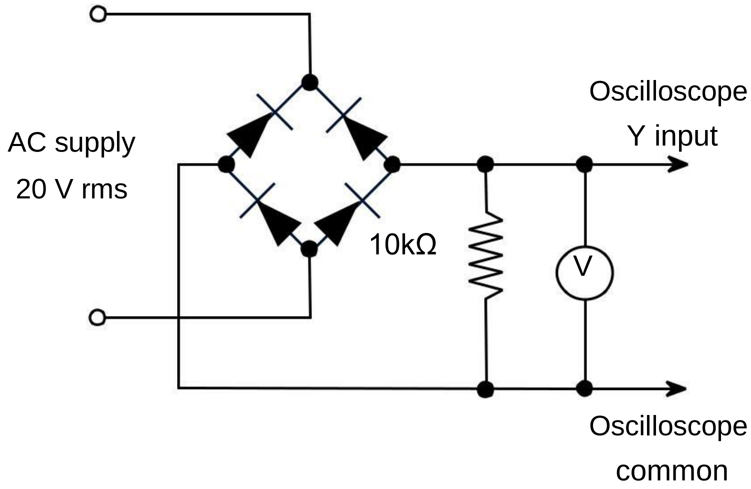
AC supply
20 V rms
10kΩ
V
Oscilloscope
Y input
Oscilloscope
common

Fig 4.5 Test Circuit

With the oscilloscope d.c. coupled, adjust the controls to obtain a steady trace of about 4cm vertical and 5ms/cm horizontal. You should observe a waveform as in fig 4.6. time “T” will be 10ms for 50Hz supply, and 8.5ms for 60Hz.

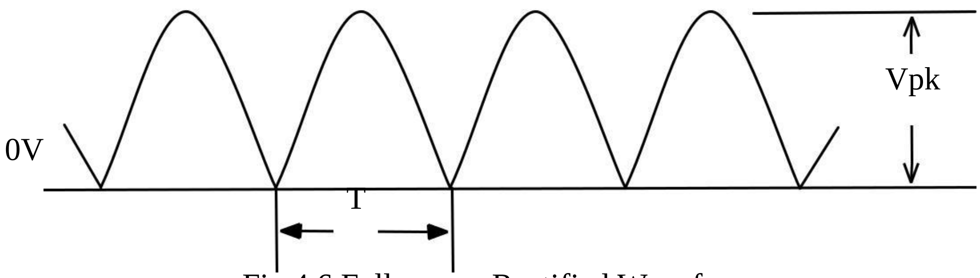

Fig 4.6 Full –wave Rectified Waveform

Note the value of Vpk and also the mean value of output voltage indicated on the

v

PRACTICAL CONSIDERATIONS AND APPLICATIONS:

The alternating input voltage to a rectifier is usually obtained from the main supply trough a transformer, for two reasons:

1. To obtain the desired voltage by choice of the transformer ratio.
2. To provide isolation from the main supply for safety reasons.

Fig 4.7 shows such an arrangement with a bridge rectifier.

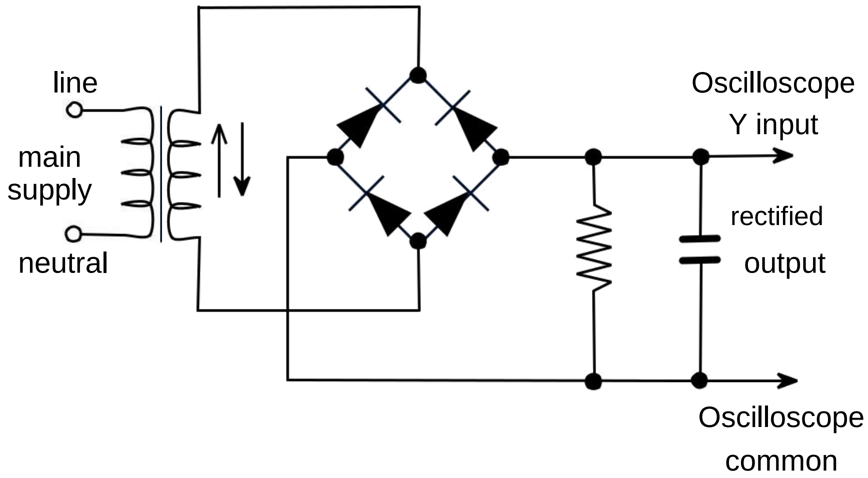

Fig 4.7 Transformer – fed Bridge Rectifier

In this figure, although the load current is always in one direction, the current in the transformer secondary is alternating.

Fig 4.8 shows another method of full –wave rectification, using a centre – tapped transformer winding and two diodes.

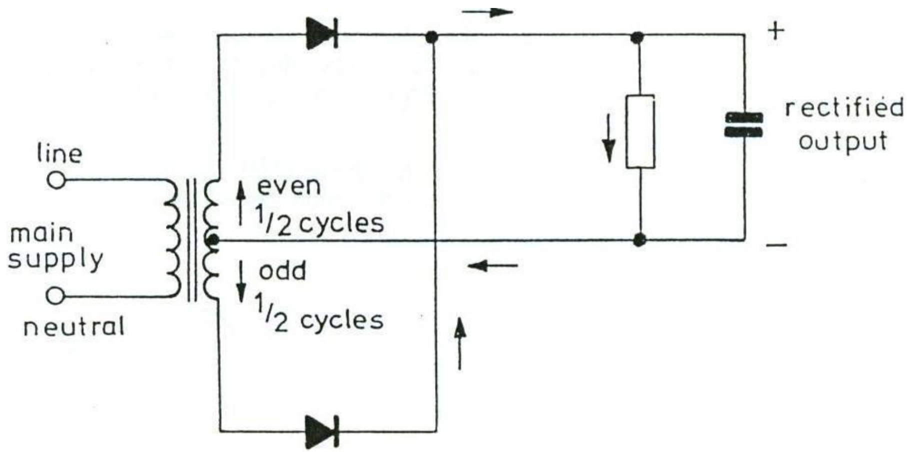

Fig 4.8 Full – wave Rectifier using Two Diodes

The arrow show how current flows on alternate half – cycles. The value of the output waveform is exactly the same as that for a bridge circuit provided each half of the transformer windings has the same rms voltage as the whole of the winding in fig 4.7.

The circuit saves two diodes, but increases the cost of the transformer. In fig 4.8 each half – secondary winding must have the same voltage rating as the single secondary of fig 4.7. Suppose the half – secondaries were wound with wire of half the cross – sectional area, so as to fit the two into the same space as the one secondary of fig 4.7, and use the same amount of copper. Each half – secondary would then have twice the resistance.

The current flows in each half – secondary only on alternative half – cycles, but would generate twice the I^2R loss in the active cycle.

Each half – secondary would thus develop as much heat as the single secondary of fig 4.7, i.e. twice as much for both. A larger transformer would therefore be required to avoid excessive heating. Its greater cost would usually outweigh the cost of the two diodes saved.
In full – wave rectification the basic repetition rate of the ripple is twice that of the supply (e.g. 100Hz for a 50Hz supply). In half – wave the frequency is the same as the supply frequency. This is often useful as an indication that one half of a bridge or full –wave rectifier is faulty.

SUMMARY:

In this assignment you have learnt that:

1. A bridge full – wave rectifier gives a greater mean value and fewer ripples for a given load and reservoir capacitor than a half wave rectifier.
2. The alternative full – wave circuit using a centre – tapped transformer and two diodes is less efficient than the bridge circuit because it requires a bigger transformer for a given output power.