SNS COLLEGE OF TECHNOLOGY
Coimbatore-35
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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

23ECB101 – CIRCUIT ANALYSIS AND DEVICES

I YEAR/ II SEMESTER

UNIT 4 – SEMICONDUCTOR DIODES AND THEIR APPLICATIONS

TOPIC - Rectifiers

RECTIFIERS

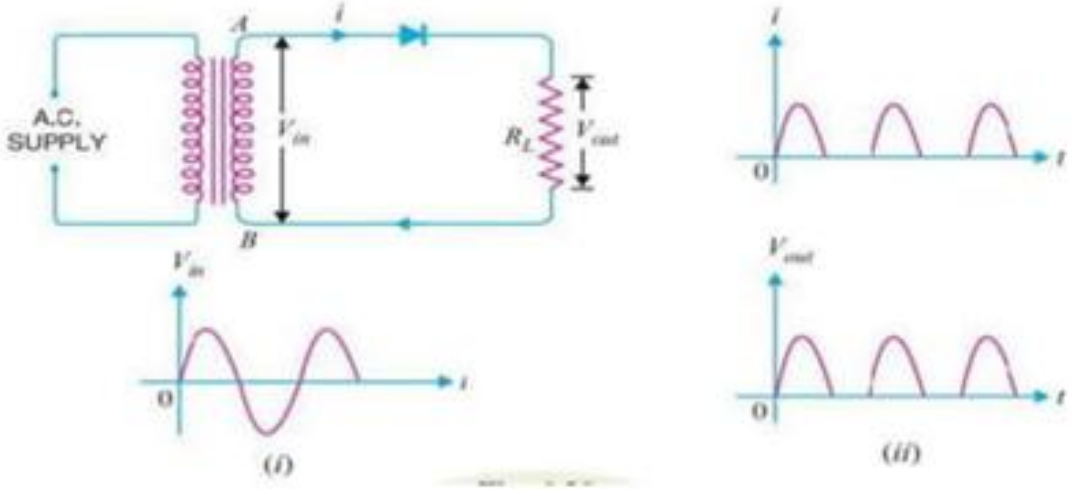
- Rectifier: Rectifier is that circuit, that converts ac to dc.

- The following two types of rectifier circuit can be used:

I. Half wave rectifier
II. Full wave rectifier

HALF WAVE RECTIFIER

- The process of removing one-half the input signal to establish a dc level is called *half-wave rectification*.
- In Half wave rectification, the rectifier conducts current during positive half cycle of input ac signal only.
- Negative half cycle is suppressed or clipped.



HALF WAVE RECTIFIER

- AC voltage across secondary terminals AB changes its polarity after each half cycle.
- During negative half cycle terminal A is negative so diode reversed biased and conduct no current.so current flows through diode during positive half cycle only.
- In this way current flows through load RL in one direction

HALF WAVE RECTIFIER

Disadvantage of Half wave rectifier:

- Since, power is delivered only during one half of the cycle of the input alternating voltage, therefore, its power output and rectification frequency is low.
- Transformer utilization factor is also low.
- The DC output power produced from the half wave rectifier is not satisfactory to make a general power supply.

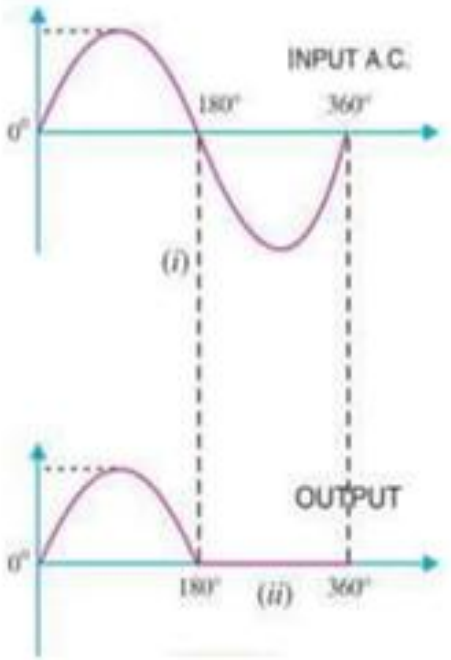
HALF WAVE RECTIFIER

- Output frequency of HWR:

➢Output frequency of HWR is equal to input frequency.

➢This means when input ac completes one cycle, rectified wave also completes one cycle.

$$f_{out} = f_{in}$$

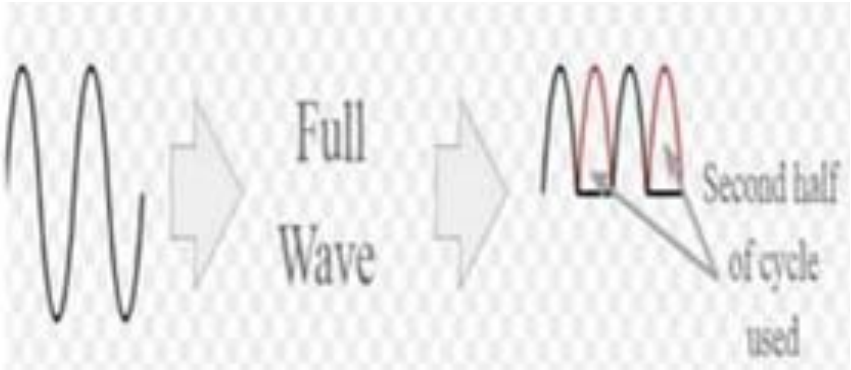


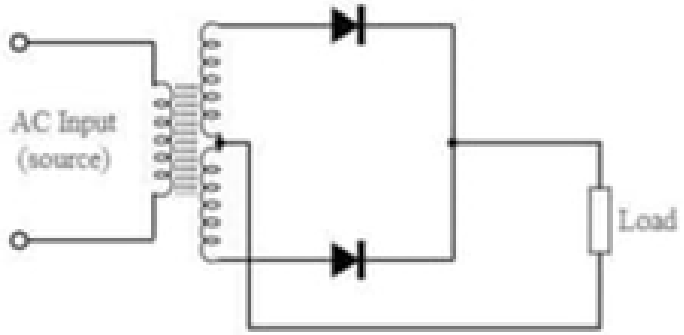
FULL WAVE RECTIFIER

In Full wave rectification current flow through the load in same direction for both half cycle of input ac.

This can be achieved with two diodes working alternatively.

For one half cycle one diode supplies current to load and for next half cycle another diode works.





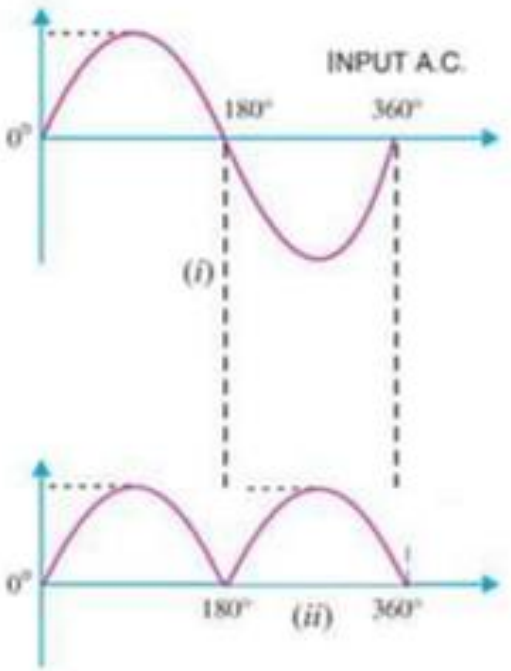
FULL WAVE RECTIFIER

- Output frequency of FWR:

➢Output frequency of FWR is equal to double of input frequency.

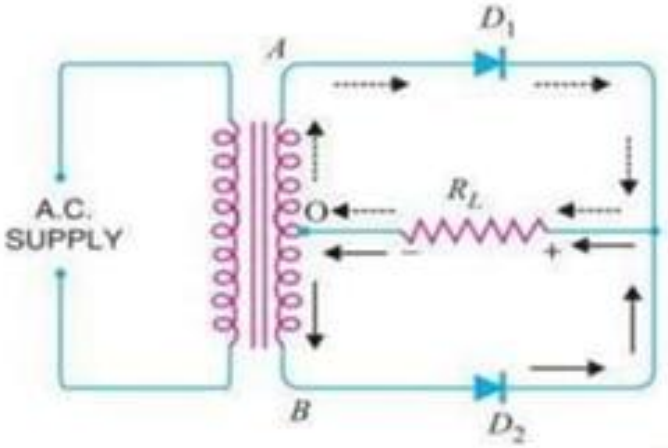
➢This means when input ac completes one cycle, rectified wave completes two cycles

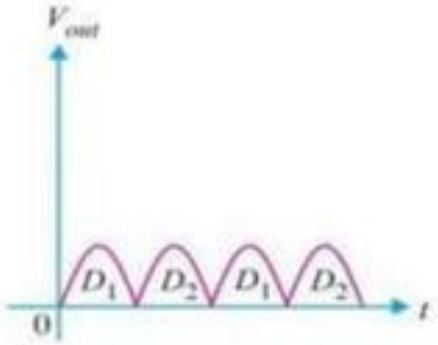
$$f_{out} = 2 f_{in}$$



FULL WAVE RECTIFIER

Centre Tap Full Wave Rectifier

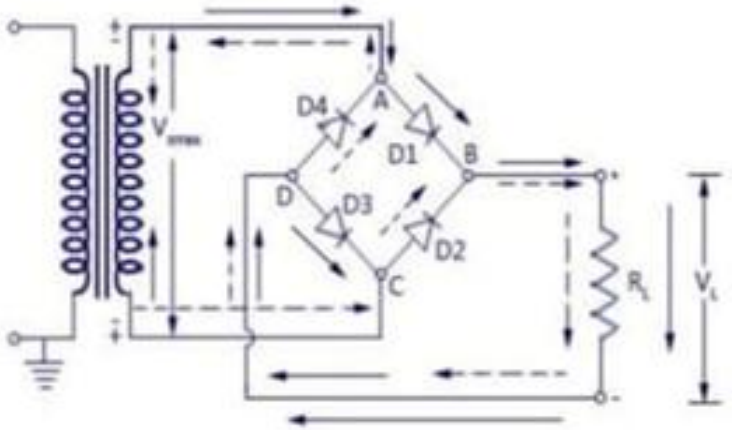


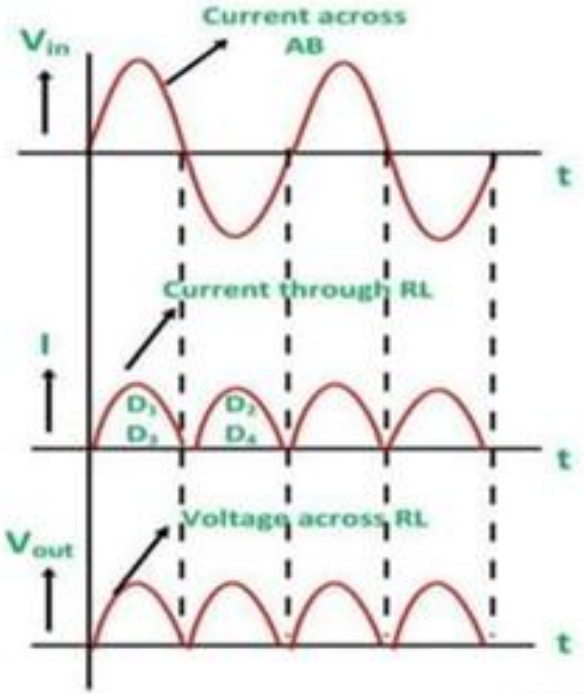


- Circuit has two diodes D1 , D2 and a centre tap transformer.
- During positive half cycle Diode D1conducts and during negative half cycle Diode D2 conducts.
- It can be seen that current through load RL is in the same direction for both cycle.

FULL WAVE RECTIFIER

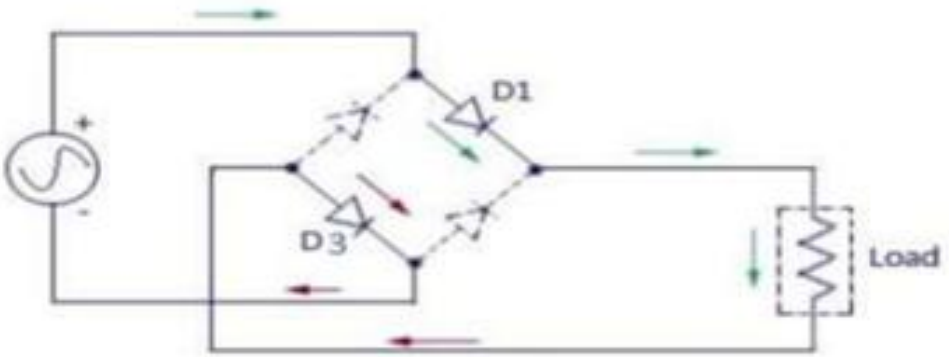
Full Wave Bridge Rectifier

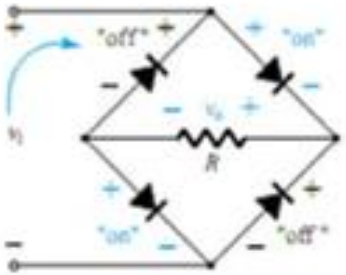




- Consists of 4 diodes instead of 2.

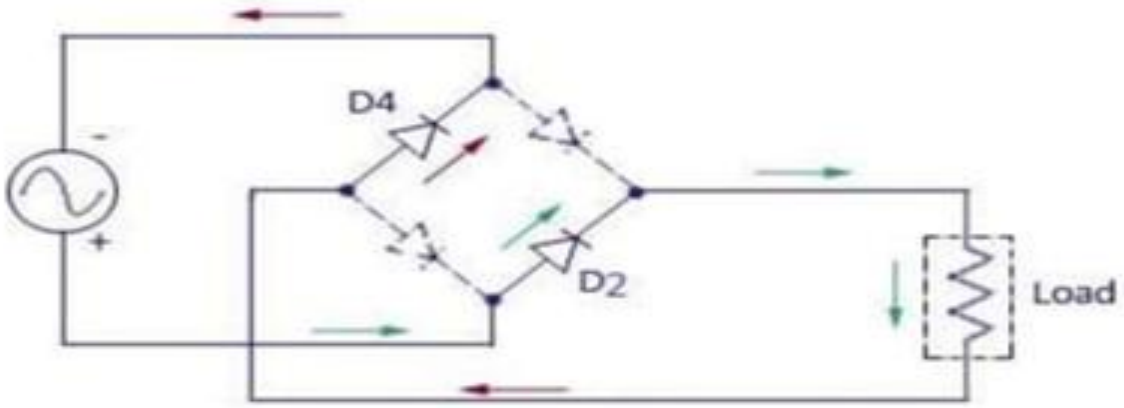
Full Wave Bridge Rectifier





- During first half cycle D1 and D3 are conducting while D2 and D4 are in the "off" state.

Full Wave Bridge Rectifier



- During 2nd half cycle D2 and D4 are conducting while D1 and D3 are in the "off" state.

Full Wave Bridge Rectifier

Advantage:

I. Need for centre tap trnsformer is eliminated.
II. Output is twice than that of centre tap circuit.

Disadvantage

I. Requires 4 diodes.
II. Internal resistance voltage drop is twice than that of Centre Tap Circuit.

Assessment Questions

1. For a half wave or full wave rectifier the Peak Inverse Voltage of the rectifier is always
a) Greater than the input voltage
b) Smaller than the input voltage
c) Equal to the input voltage
d) Greater than the input voltage for full wave rectifier and smaller for the half wave rectifier

2. Bridge rectifier is an alternative for
a) Full wave rectifier
b) Peak rectifier
c) Half wave rectifier
d) None of the mentioned


THANK YOU