Exp No.	Title	Date
S4	**Design of single phase half wave and full wave rectifiers**	**25 Sept 2019**

Objective:

- To design a single half wave rectifier and full wave rectifier

Apparatus/Tool required:

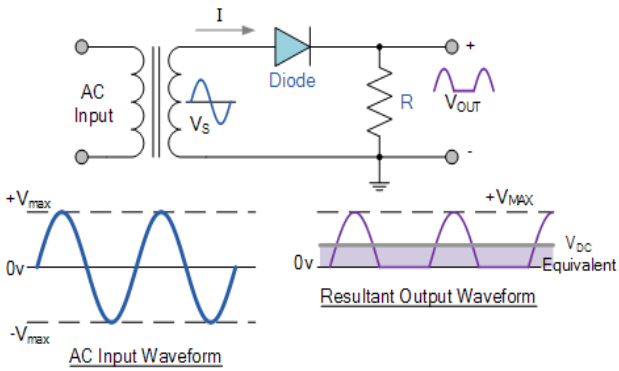
ORCAD / Capture CIS → Analog Library – R,
Source Library – VSIN
DIODE Library – D1N4002, D1N4007
Ground (GND) – 0 (zero)

Simulation Settings:

Analysis Type - Time Domain (Transient)
Run to time: 40ms

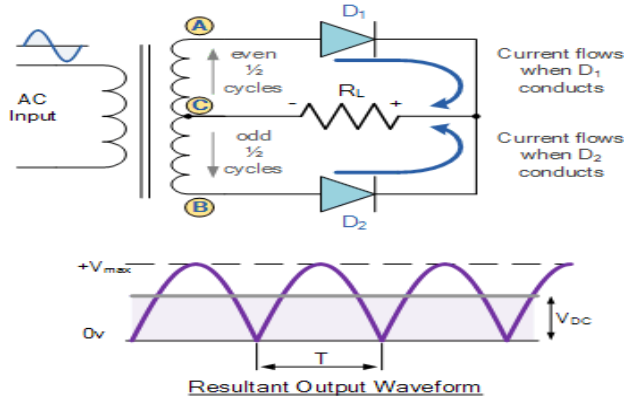
Theory:

A Half Wave Rectifier is a circuit, which converts an ac voltage into a pulsating dc voltage using only positive cycle of the applied ac voltage.



During each "positive" half cycle of the AC sine wave, the diode is *forward biased* as the anode is positive with respect to the cathode resulting in current flowing through the diode.
During each "negative" half cycle of the AC sinusoidal input waveform, the diode is *reverse biased* as the anode is negative with respect to the cathode.
Therefore, NO current flows through the diode or circuit. Then in the negative half cycle of the supply, no current flows in the load resistor as no voltage appears across it so therefore, $V_{out} = 0$.

A Full Wave Rectifier is a circuit, which converts an ac voltage into a pulsating dc voltage using both half cycles of the applied ac voltage.



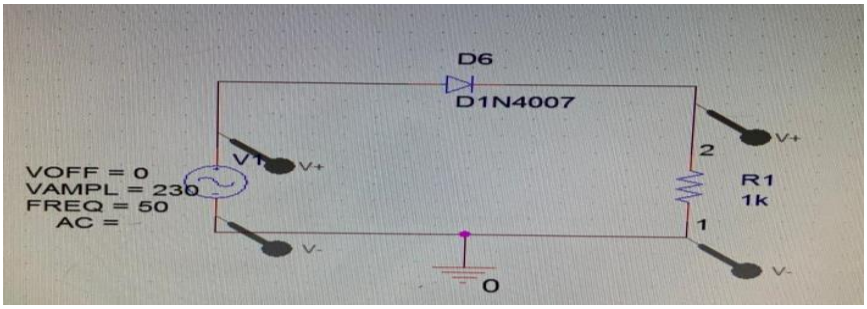
In a Full Wave Rectifier circuit two diodes are now used, one for each half of the cycle. A multiple winding transformer is used whose secondary winding is split equally into two halves with a common centre tapped connection, (C).

This configuration results in each diode conducting in turn when its anode terminal is positive with respect to the transformer centre point C producing an output during both half-cycles, twice that for the half wave rectifier so it is 100% efficient as shown below.

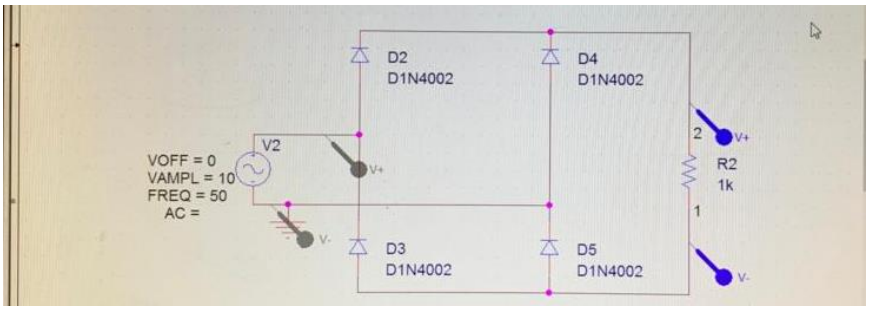
When point A of the transformer is positive with respect to point C, diode D_1 conducts in the forward direction as indicated by the arrows.

When point B is positive (in the negative half of the cycle) with respect to point C, diode D_2 conducts in the forward direction and the current flowing through resistor R is in the same direction for both half-cycles.

Circuit Diagram:



Half Wave Rectifier

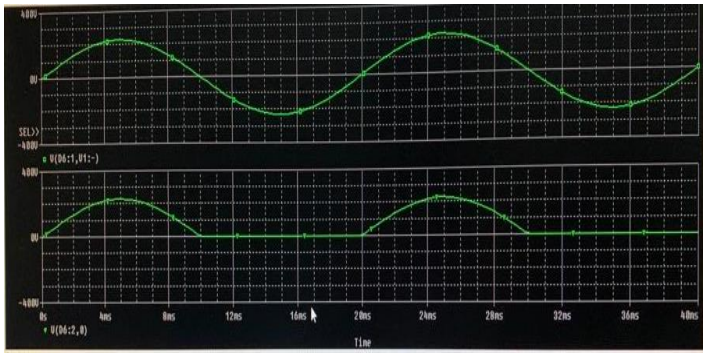


Full Wave Rectifier

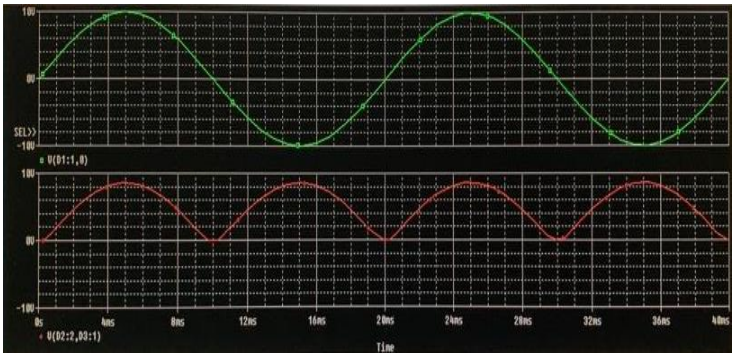
Procedure:

1. Create the given circuit diagram in new project file using the general procedure.
2. Replace the default component value and source value as per given circuit diagram.
3. Create the New simulation profile and set analysis type as Time Domain.
4. Run the simulation and observe the output obtained.

Simulation Results:



Half Wave Rectifier



Full Wave Rectifier

Conclusion & Inference:

As observed from the simulation results, it can be concluded that Half Wave Rectifier converts an AC input to a pulsating DC output but for only one half of the input, while, the Full Wave rectifier converts an AC input to a pulsating DC output for both halves of the input, making it more efficient to the former.

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