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ELECTRONICS : RECTIFIER

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D-1 (Sub)

• Rectifier :- The process of converting an alternating current into a direct current is called rectification and the device used for this process is called rectifier

• Principle of a rectifier :- When a p-n junction diode is forward biased, it offers a low resistance and when it is reverse biased, it has a high resistance i.e, it conducts current well only in one direction. This unidirectional property of a diode enables it to be used as a rectifier. When a.c. signal is fed to a diode, the diode is forward biased during the positive half cycle and a current flows through it. During the negative half-cycle, the diode is reverse biased and it does not conduct. Thus the signal gets rectified.

• Junction diode as a half-wave rectifier :-

The primary coil of the transformer is connected to a.c mains and the secondary coil is connected in series with the junction diode D and load resistance R_L.

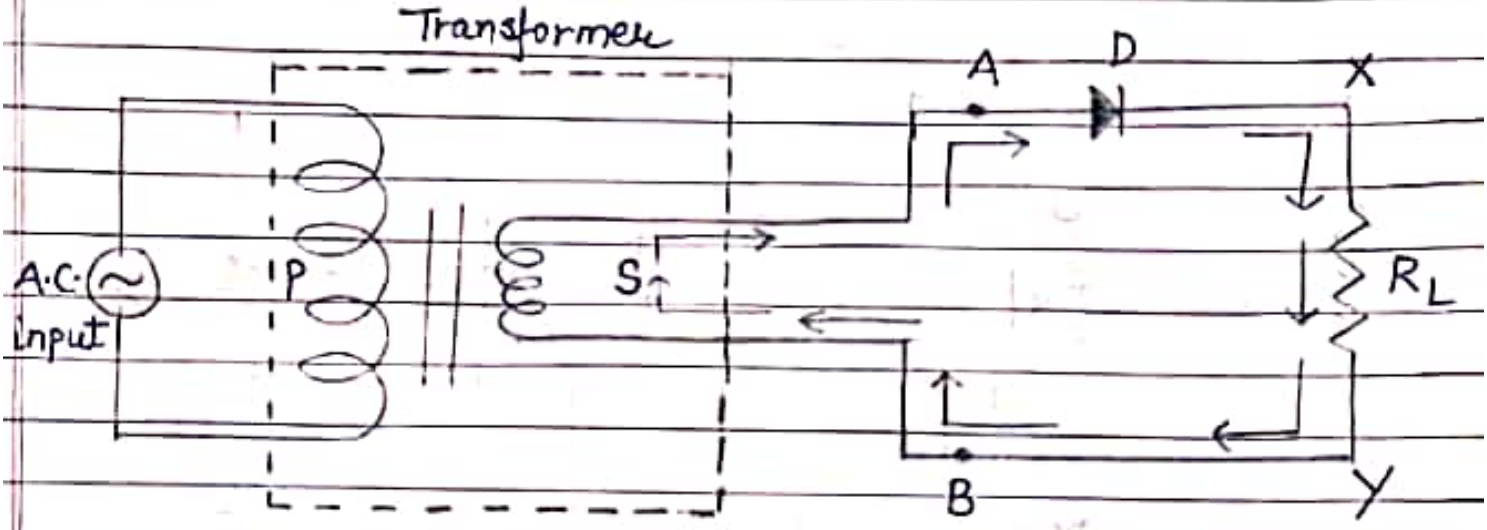

Fig: Half-wave rectifier circuit

Working: When a.c. is supplied to the primary, the secondary of the transformer supplies desired alternating voltage across A and B. During the positive half cycle of a.c., the end A is positive and the end B is negative. The diode D is forward biased and a current I flows through R_L. As the input voltage increases or decreases, the current I also increases or decreases and so does output voltage ($=IR_L$) across the load R_L. Output voltage across R_L is of same waveform as the positive half wave of the input. During the negative half cycle, the end A becomes negative and B positive. The diode is reverse biased and no current flows. No voltage appears across R_L. So only the half wave is rectified, as shown in fig. This process is called half-wave

rectification and the arrangement used is called a half-wave rectifier.

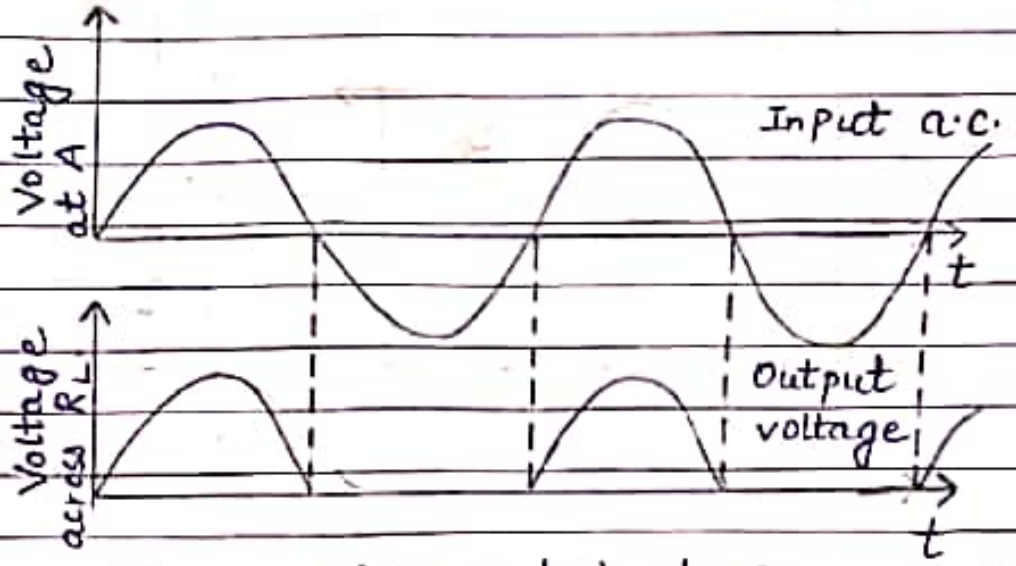

Fig.: Waveforms of input a.c and output voltage obtained from a half-wave rectifier

- Junction diode as a full wave rectifier :-

The input a.c. signal is fed to the primary coil P of the transformer. The two ends A and B of the secondary S are connected to the p-ends of diodes D_1 and D_2. The secondary is tapped at its central point T which is connected to the n-ends of the two diodes through the load resistance R_L, as shown in given fig.

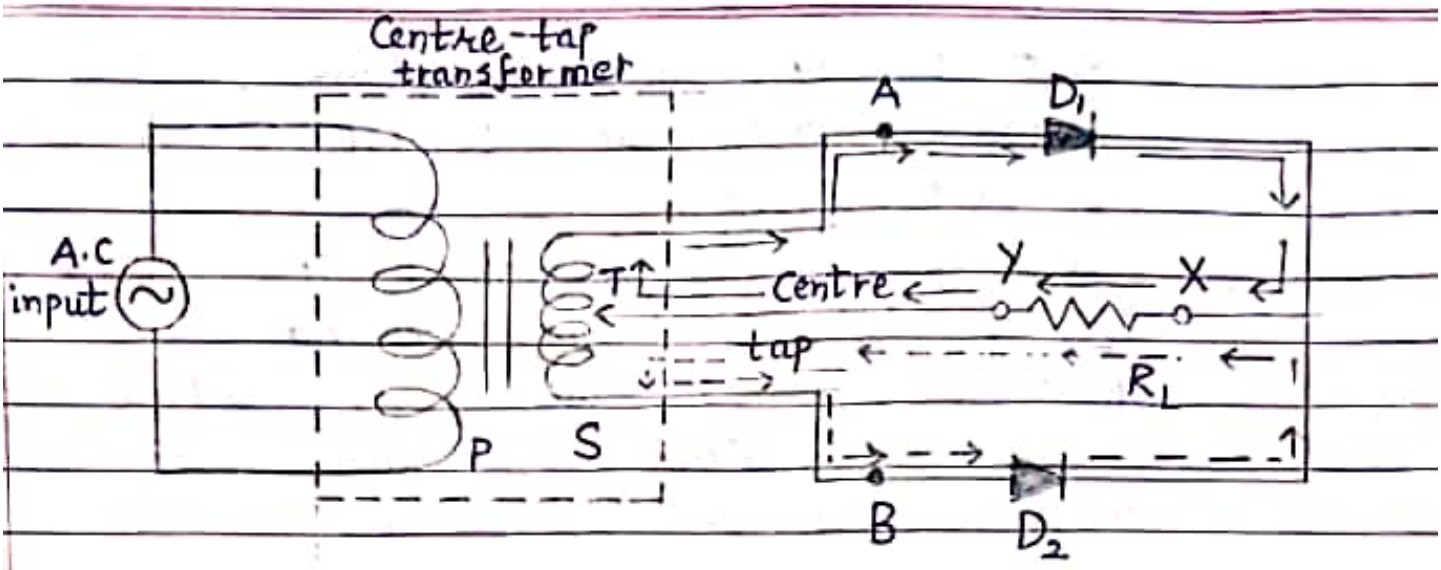

Fig. : Full wave rectifier circuit

• Working :- At any instant, the voltages at the end A (input of D_1) and end B (input of D_2) of the secondary with respect to the centre tap T will be out of phase with each other. Suppose during the positive half cycle of a.c. input, the end A is positive and the end B is negative with respect to the centre tap T. Then the diode D_1 gets forward biased and conducts current along the path AD_1XYTA, as indicated by the solid arrows. The diode D_2 is reverse biased and cycle does not conduct. During the negative half-cycle, the end A becomes negative and the end B becomes positive with respect to the centre tap T. The diode D_1 gets reverse biased and does not conduct. The diode D_2 conducts current along the path BD_2XYTB, as indicated by broken arrows. As during both half-cycles of input a.c. the

current through load R_L flows in the same direction (X → Y), so we get a pulsating d.c. voltage across R_L, as shown in fig. Since output voltage across the load resistance R_L is obtained for both half-cycles of input a.c., this process is called full wave rectification and the arrangement used is called full-wave rectifier.

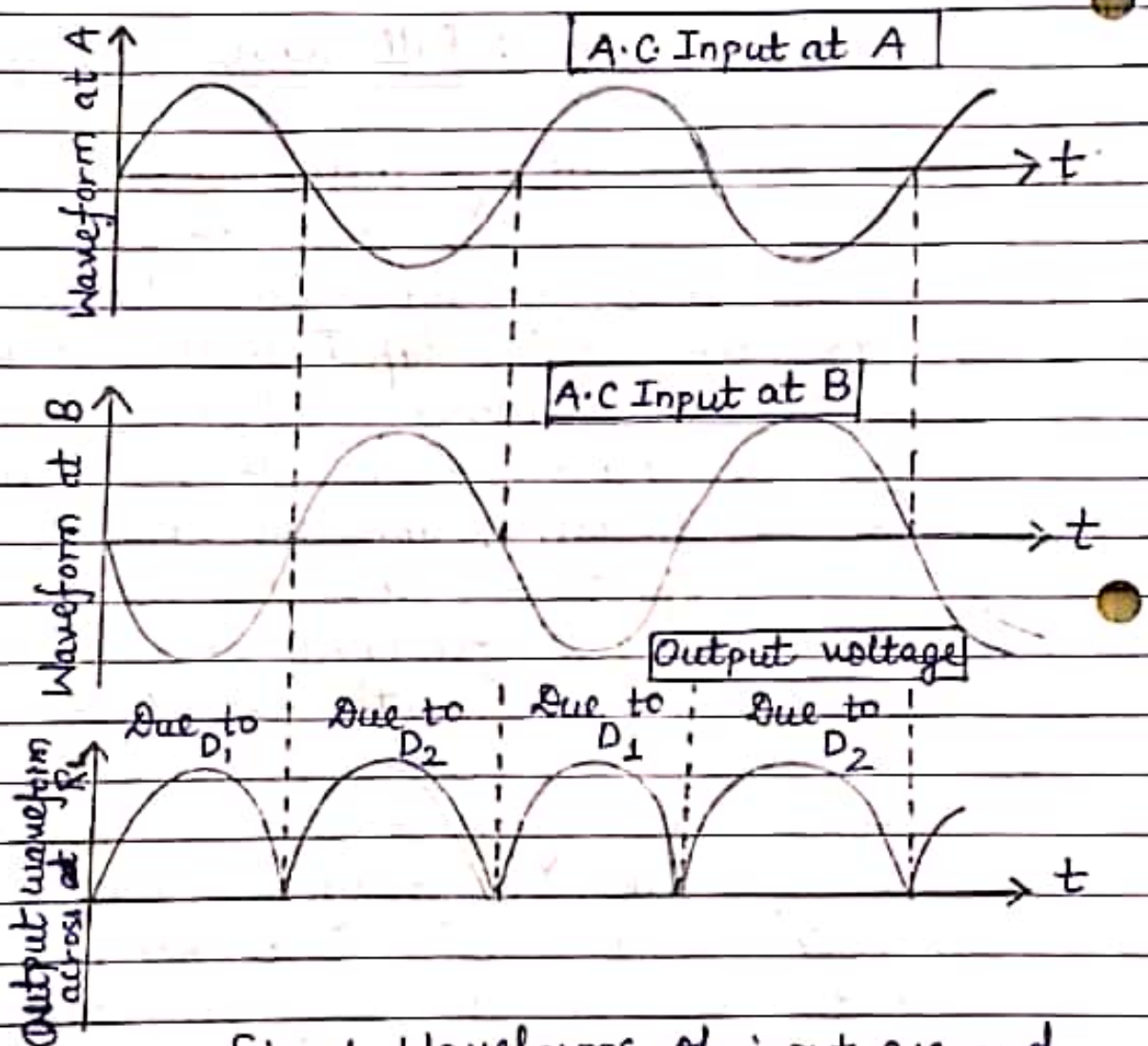

Fig. : Waveforms of input a.c and output voltage obtained from a full wave rectifier.