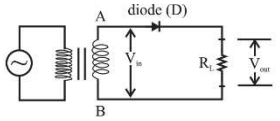
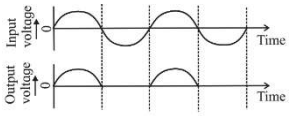
SEMICONDUCTORS PART 1

The conversion of AC Voltage into DC voltage is called *rectification.* An electronic circuit which does that is called a rectifier.
There are two types of rectifiers
- Half wave rectifier
- Full wave rectifier

Half Wave Rectifier

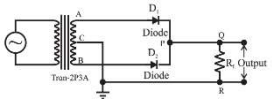


It consists of a transformer (which steps down the AC voltage and also isolates the circuit from the power supply), secondary of which (AB) is attached to a diode and load resistance R_L.
The secondary coil alternates its polarity in each half cycle.
When A is positive w.r.t. B, the diode D is forward biased and conducts, thus producing output across R_L.

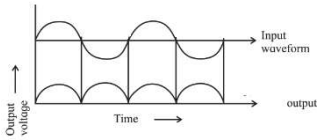


When A is negative w.r.t. B, the diode D is reversed biased and hence OFF and does not allow current to flow though the circuit.
Thus we get output only in alternate half cycles. Thus DC output is produced. But the circuit has a poor efficiency.

Full Wave Rectifier



It consists of a center-tap transformer (which steps down the AC voltage and also isolates the circuit from the power supply), secondary of which (AB) is attached to two diodes (D_1 and D_2) and load resistance R_L.
The secondary coil alternates its polarity in each half cycle.
When A is positive w.r.t. B, the diode D_1 is forward biased and conducts while diode D_2 is reversed biased and hence OFF, thus causing current to flow in APQRC and producing output across R_L.



When A is negative w.r.t. B, the diode D_2 is forward biased and conducts while diode D_1 is reversed biased and hence OFF, thus causing current to flow in BPQRC and producing output across R_L.
Thus we get output current in the same direction in R_L in each half cycle. Thus, producing DC output.

Advantages
- Rectification takes place in both half cycles (thus producing output in both the half cycles)
- Efficiency of a full wave rectifier is higher than that of a half wave rectifier
- The ripples in a full wave rectifier are lesser than that in a half wave rectifier.

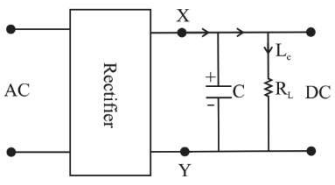
NOTE: Ripples are the fluctuations present in the rectified output. Lesser the ripples better the efficiency.

$$Ripple\ factor = \frac{r.m.s\ value\ of\ AC\ component}{DC\ component}$$

FILTERS

A filter circuit is used to improve the ripple factor (i.e. reduce the amount of ripples in the output of the rectified circuit). An ideal filter would remove all the AC component in the output, in order to produce only DC output.

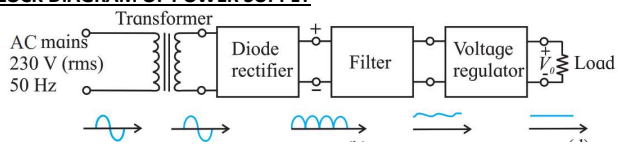
Capacitor Filter



As the output of the rectifier rises the voltage in the capacitor rises, till peak value (V_P as shown in the waveform).
When the rectifier voltage starts to decrease, so does the capacitor voltage. Since the capacitor discharges though the load resistance R_L, the rate of discharge is controlled by it. By the time the capacitor discharges till B, it begins to charge again (since the input voltage of the capacitor is larger). The process repeats and we get a DC output with much less ripples. This type of circuit is preferred for low current applications.

Advantage:
- Low cost
- Small size
- Light weight

BLOCK DIAGRAM OF POWER SUPPLY



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