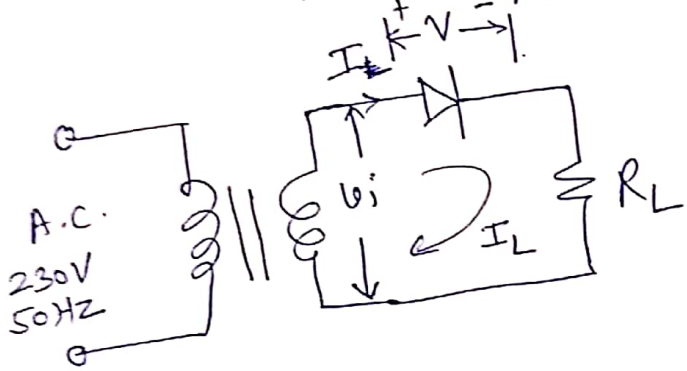
Rectifiers

→ Used in D.C. Power Supply

A.C. to D.C.

H.W. Rectifier

Rectifier → Device giving low resistance to current in one direction but a high resistance to current in opposite direction.

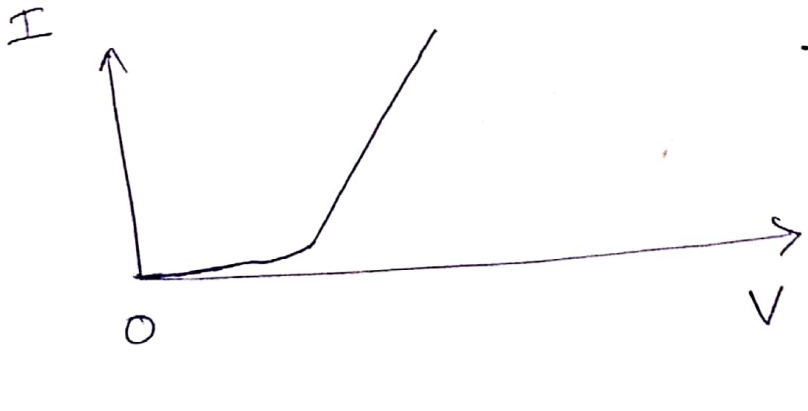


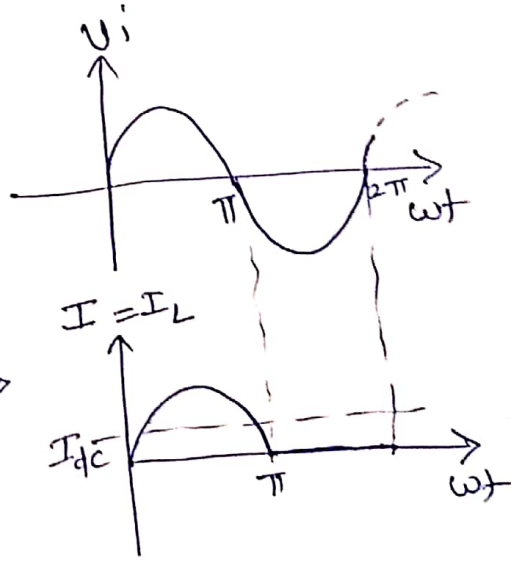
current through diode,

$$I = I_0 \left(e^{\frac{V}{\eta V_T}} - 1 \right)$$

where $\eta = 1$ for Ge & 2 for Si.

$$V_T = \frac{T}{11,600}$$





(1) Reading of d.c. Ammeter

$$I_{d.c.} = \frac{I_m}{\pi}$$

(2) Reading of A.C. Ammeter.

$$I_{rms} = \frac{I_m}{2}$$

(3) $V_{d.c.} = \frac{I_m}{\pi} . R_L$

(4) ripple factor = measure of fluctuating current.

$$\gamma = \frac{\text{rms. Value of A.C. componant of wave}}{\text{Average value.}}$$

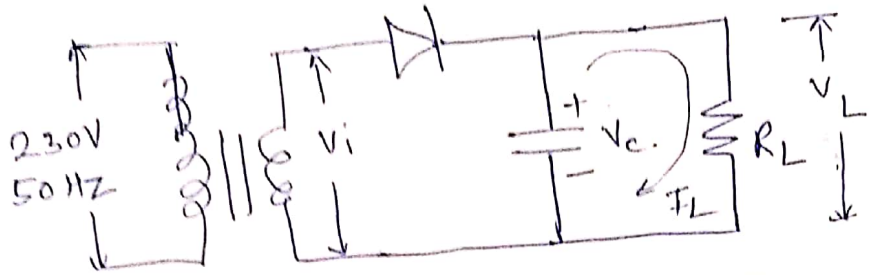
$$\gamma = \sqrt{\left(\frac{I_{rms}}{I_{dc}}\right)^2 - 1}.$$

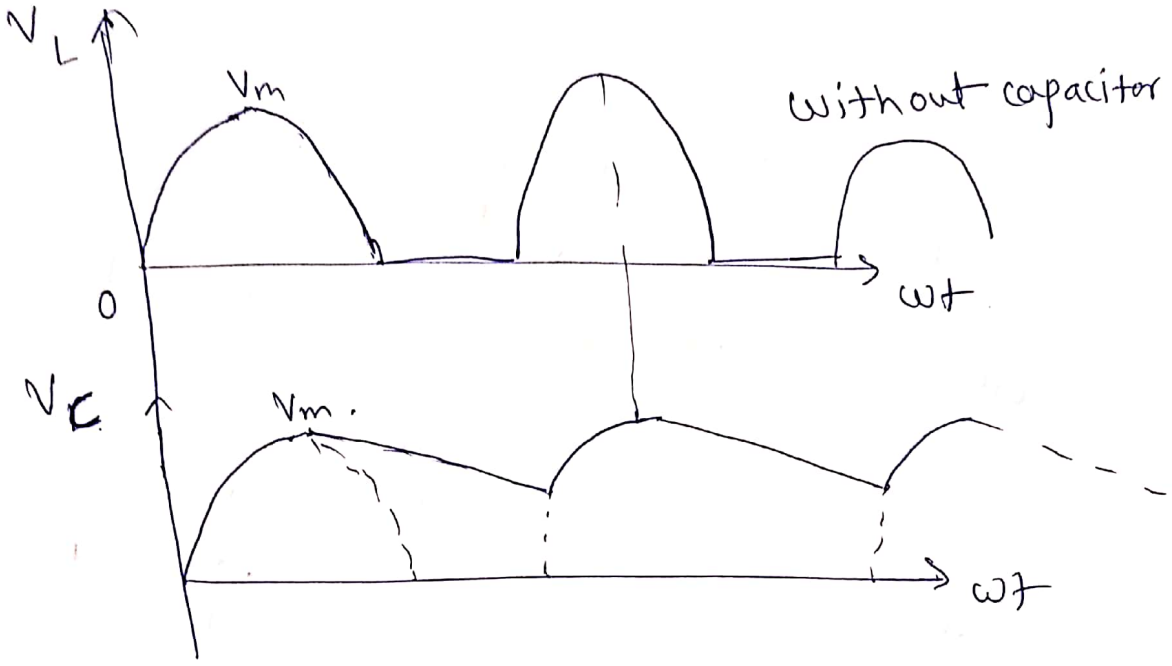
$$\gamma = \sqrt{\left(\frac{I_m/2}{I_m/\pi}\right)^2 - 1} = 1.21$$

Meaning – A.C. componant is more than D.C. componant.

→ poor Rectifier.

H.W. with capacitor.

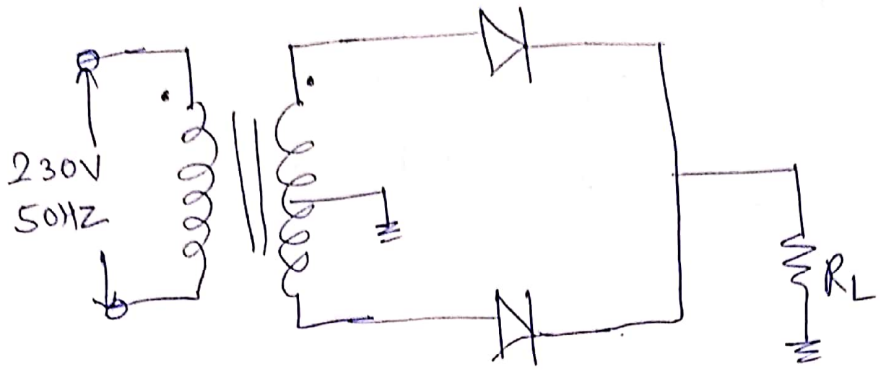


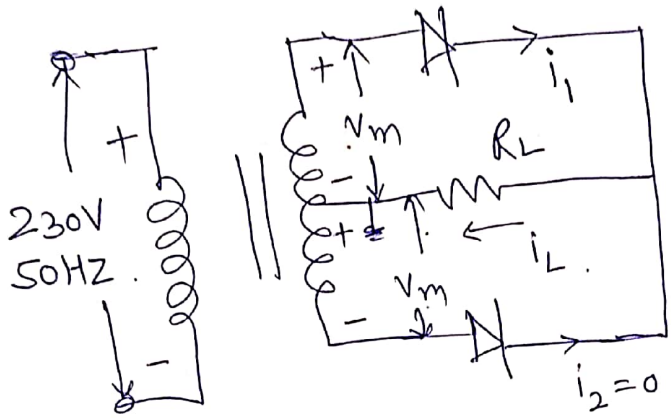


I_L flows when $V_c \geq V_m$.

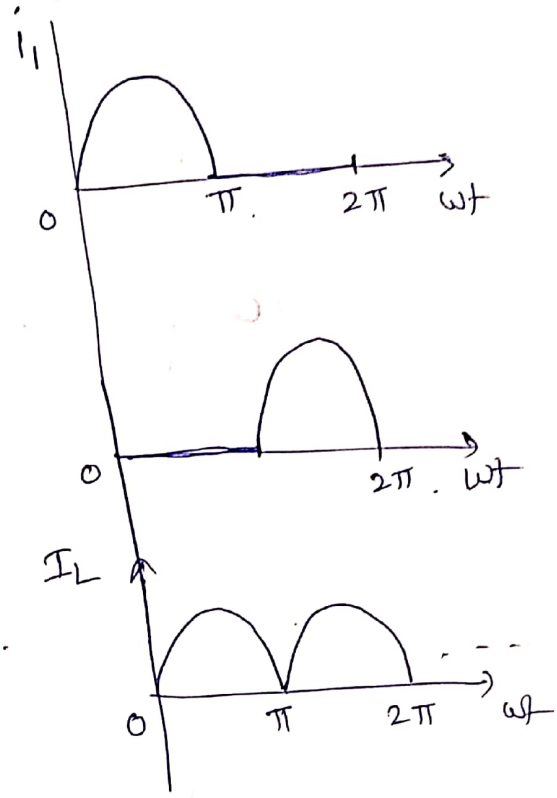
Ripple factor $r = \dfrac{2}{2fR_LC - 1}$.

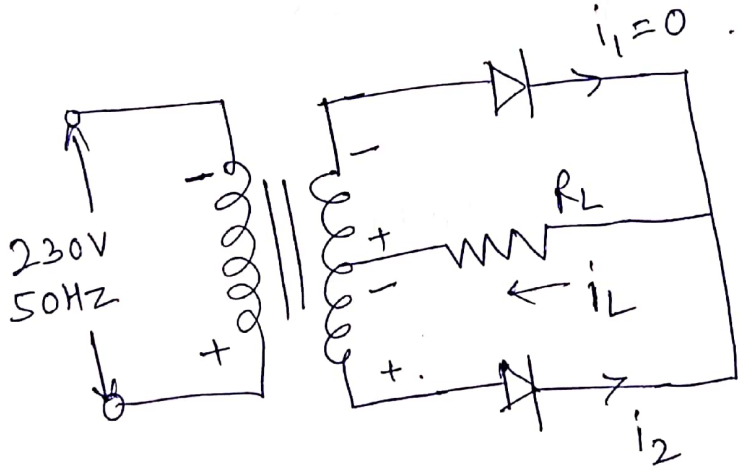
F.W. with resistive Load.





+ve cycle (Half).





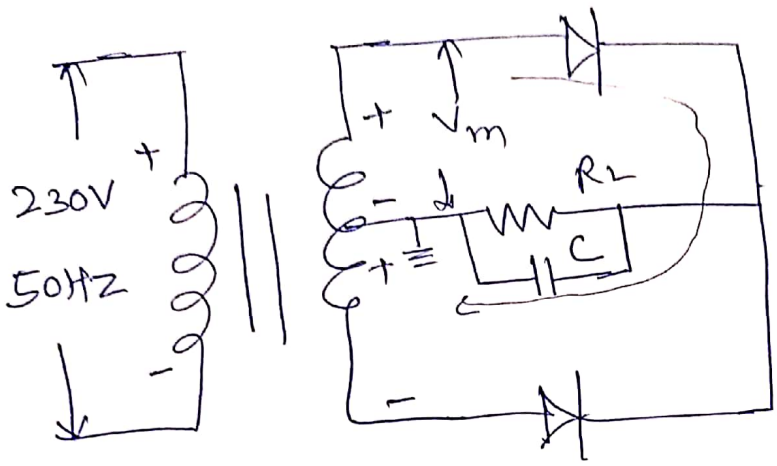
(1) $I_{dc} = \frac{2I_m}{\pi}$.

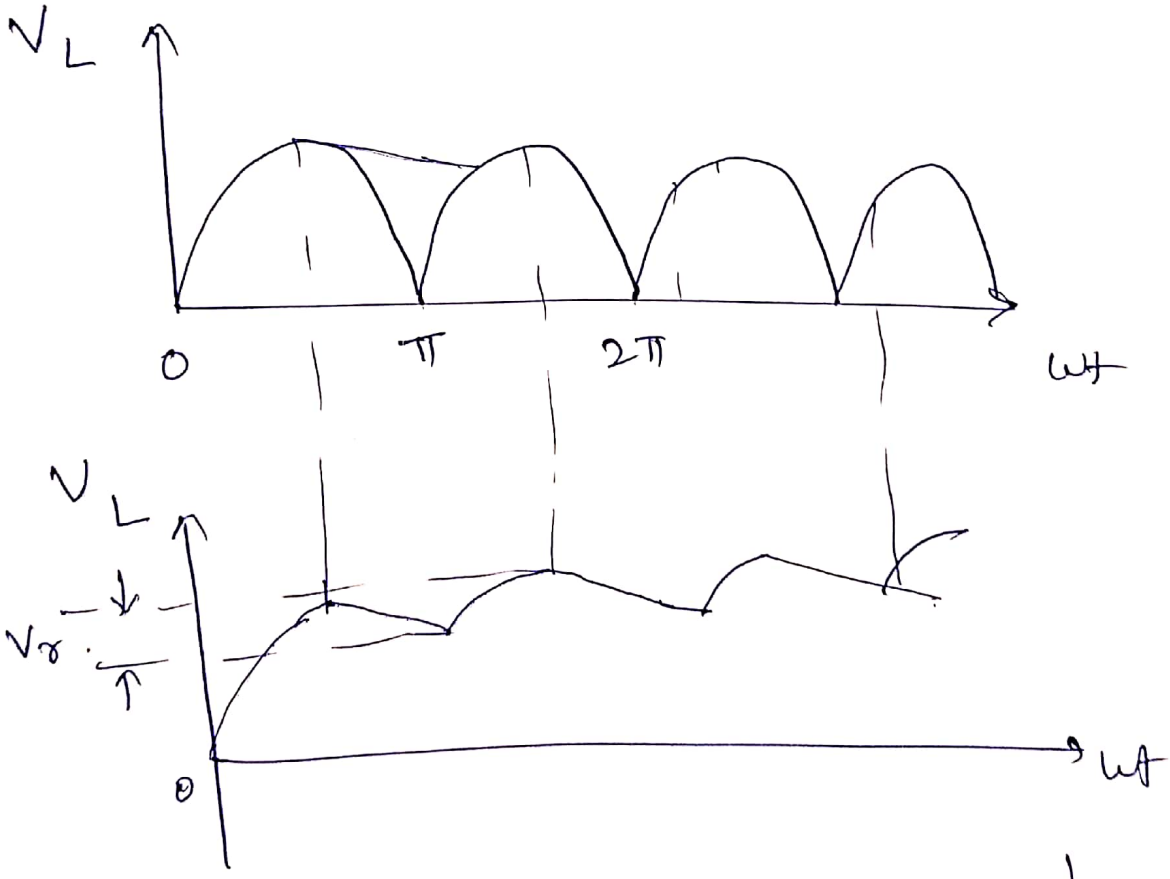
(2) $I_{rms} = \frac{I_m}{\sqrt{2}}$

(3) ripple factor $r = \frac{I_{rms}}{I_{dc}} = \frac{I_m/\sqrt{2}}{2I_m/\pi}$

$= 1.11$.

Full wave rectifier with capacitor filter.





$$r = \frac{1}{4\sqrt{3}\, f C R_L} \quad \therefore r \propto \frac{1}{R_L} \text{ and } r \propto \frac{1}{C}.$$

Useful for light load.