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Unit $\rightarrow$ 1
Analogy electric circuit

(i) P-N junction diode:-

A P-N junction diode is a semiconductor device formed by joining P-type and N-type semiconductors together. It allows current to flow in only one direction - from the P-side to the N-side and blocks it in the reverse direction.

P type $\rightarrow$ majority carrier holes
 $\rightarrow$ minority carrier ~~holes~~ electron

N type $\rightarrow$ majority carrier electron
minority carrier holes

Biasing two types

Forward bias

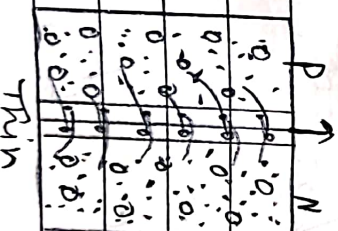
+

junction

-

reverse bias

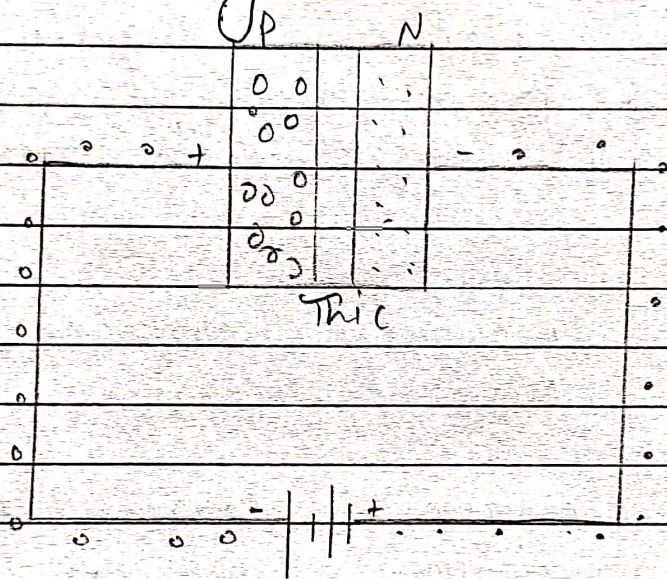
Forward bias



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The diagram shown a pn junction diode in forward bias. p type terminal connect to positive terminal. n type connect to negative terminal. This condition is forward bias. The depletion layer then in forward bias.

(ii) Reverse biasing



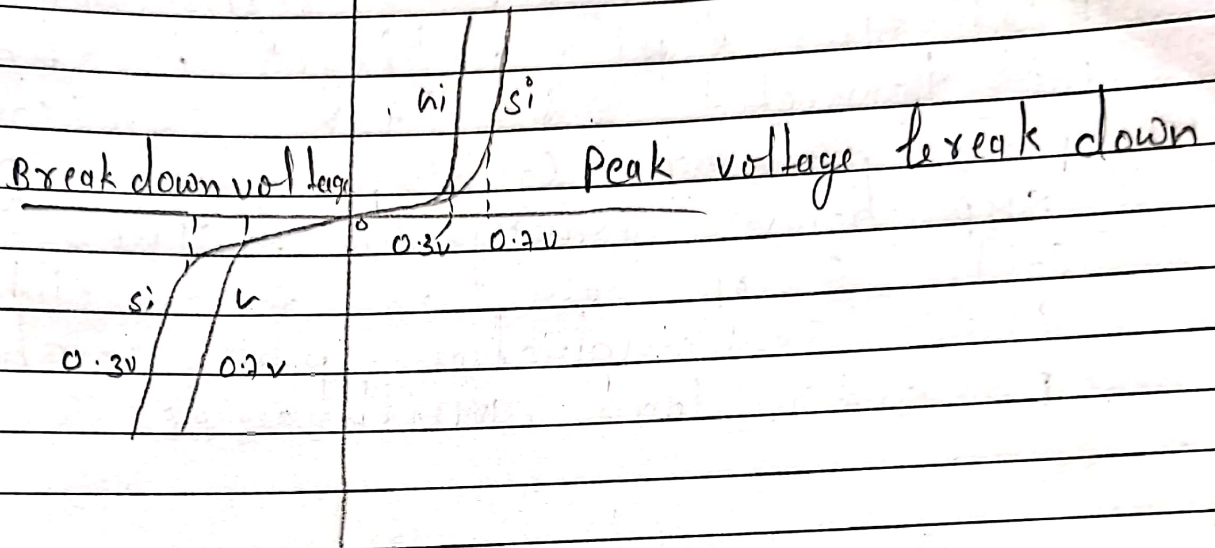
A p-n junction diode with p type side (positive type semiconductor has holes as majority carrier). n side (negative type semiconductor has electron as majority carriers).

Battery The p type connect to negative terminal. The n type connect to positive terminal.

The n type connect to positive terminal.

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V-I characteristic of p-n junction diode



Topic

what is rectifier?

A rectifier is a device which converts an alternating AC input voltage into a direct DC output voltage. An electrical device which has a high resistance to current in one direction and low resistance to current in opposite direction, process the ability to convert AC current into DC current.

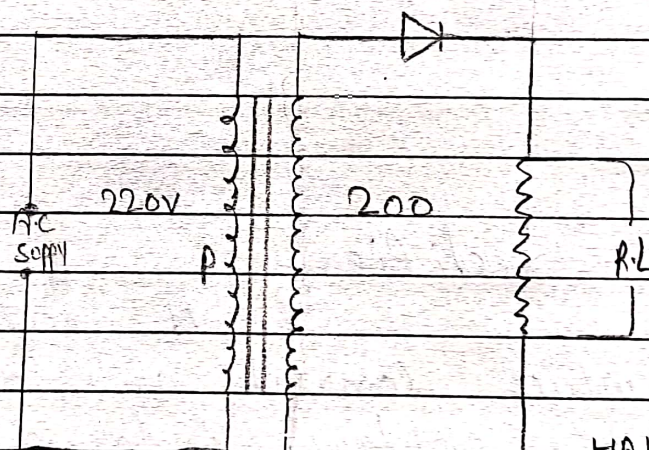
Principle: A p-n junction offers very low resistance in forward bias and external high resistance in reverse bias. Do this property a p-n junction allow to flow current.

Teacher's Sign.....

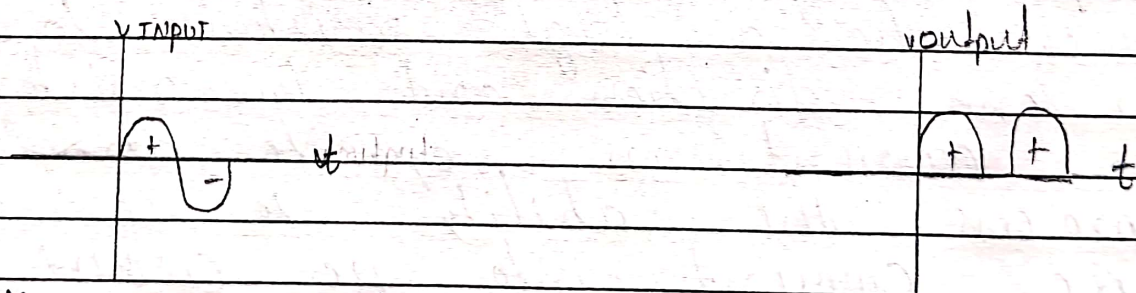
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in one direction

construction:- The arrangement for a half wave rectifier is shown in Fig. The AC voltage is fed across the primary coil P of a suitable step down transformer. The secondary coil S of the transformer is connected to the semiconductor p-n junction diode D and load Resistance R_L .



HAIF WAVE RECTIFIER



Working method:-

Let during first half wave rectifier is shown in fig. The AC output voltage is

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working method

let during the first half of AC input voltage cycle the end of secondary S of transformer be at positive potential and let B at the negative potential. In this suitable the diode is forward bias and current flow in the circuit

formula

① Ripple factor $\sqrt{\frac{(V_{rms})^2}{V_{DC}^2}} \approx 1.21$

② R.M.S value of H.W Recti

$$V.R.M.S = \frac{V_m}{2}$$

③ vdc output voltage $\frac{V_m}{\pi}$

④ efficiency = $\eta = \frac{P_{DC}}{P_{AC}}$ Output supply / input AC supply
 $\eta = 40.8$

⑤ form factor - $\frac{R.M.S \text{ value}}{V_{DC}} = \frac{V_m}{2}$

Advantage

It has a low cost.

we can load to 125%.

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We can easily construct.

Disadvantage

① power loss

② low output voltage

③ They output contain a lot of ripple

full wave rectifier

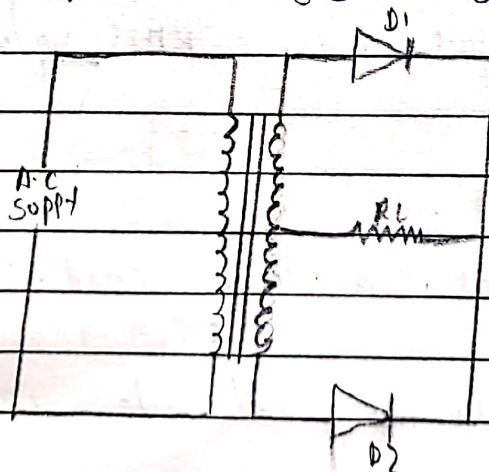
A full wave rectifier is the rectifier which rectifies both halves of each AC input cycle and gives a unidirectional output voltage continuously.

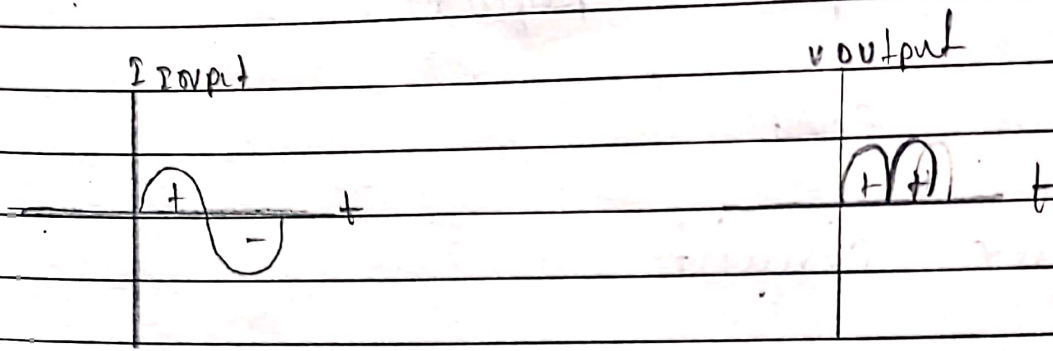
Component uses

① step down transformer

② 2 diode

③ RL Resistance





Formula

$$\textcircled{1} \quad \frac{(V_{rms})^2}{V_{DC}}, \quad \frac{V_{AC}}{V_{DC}} \approx 0.48$$

$$\textcircled{2} \quad \text{RMS value} \quad \frac{V_m}{\sqrt{2}}$$

$$\textcircled{3} \quad V_{DC} = \frac{2 \cdot V_m}{\pi}$$

$$\textcircled{4} \quad \text{Efficiency} \quad \frac{\text{output dc power}}{\text{input ac power}}$$

$$\textcircled{5} \quad \text{Form factor} \quad \frac{R_{ms}}{V_{DC}} = \underline{1.11}$$

Advantage

① Efficiency is higher

② The large D-C output

③ Ripple factor is less

disadvantage

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- ① More components Required
- ② Higher cost
- ③ Complex circuit
- ④ voltage Drop.

Zener diode :-

diode $\rightarrow$ unique direction

Reverse biasing

zener! It is a heavily doped p-n junction diode (silicon - Cr) which works on reverse bias condition or break down region is known as zener diode

Two type of Zener diode :-

- ① Avalanche Break down
- ② Zener Break down

① Avalanche Break down :- It occurs

due to rapid collision of e^- with the other atoms it happens when a high reverse voltage is applied, causing free e^- to move and collide with each other.

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→ It is design to operate to control the sudden pipe of current.

→ This sudden in electric current may permanent destroy the normal diode.

Zener Breakdown :->

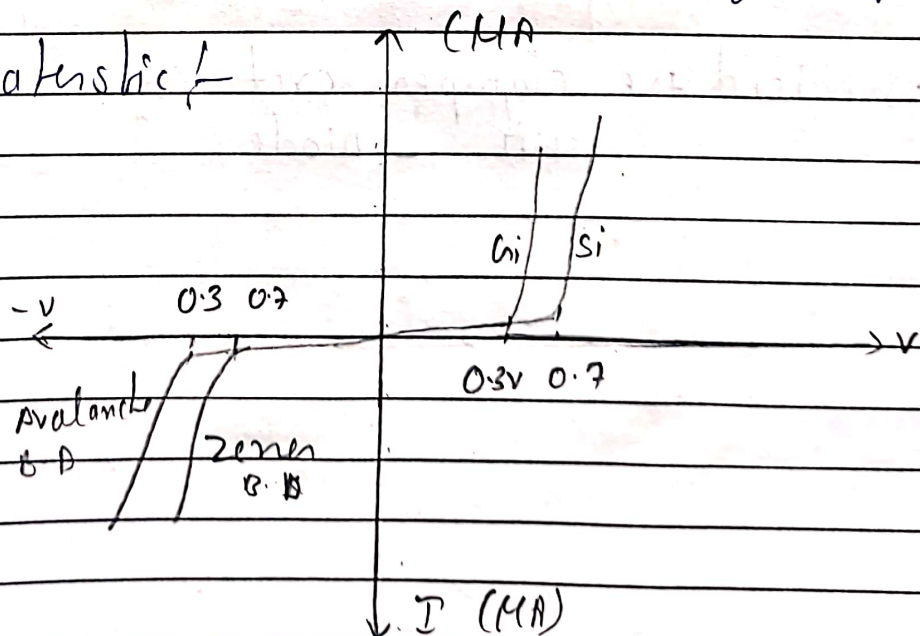
It is type of electrical breakdown the occur in a Reverse Biasing when a strong electric field causes electron to move from valance band to conductive band Reverse current.

Application of zener diode

① It is used to Regulate voltage in ckt providing a stable^{out} voltage

② It is also used a switching application

V-I characteristic



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clamping circuit :- clamping CRKT are the electric CRT that shift the d.c level of the AC signal clamping are also know. as DC voltage restorer or level shifter.

clamping circuit

↓ shift ↓ wave from

Type

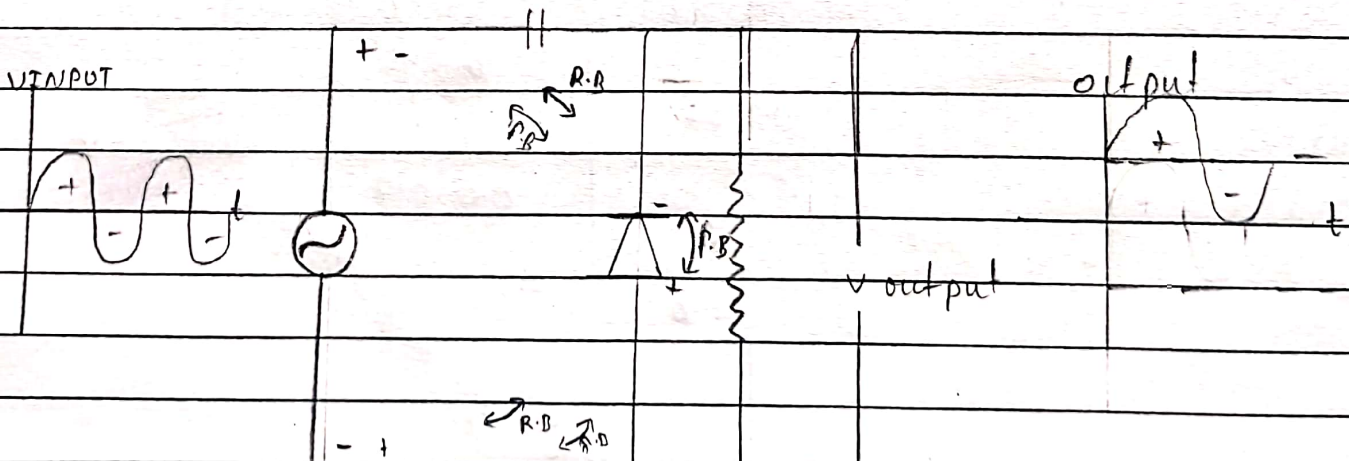
Unbiased Battery

+ve -ve

Baised

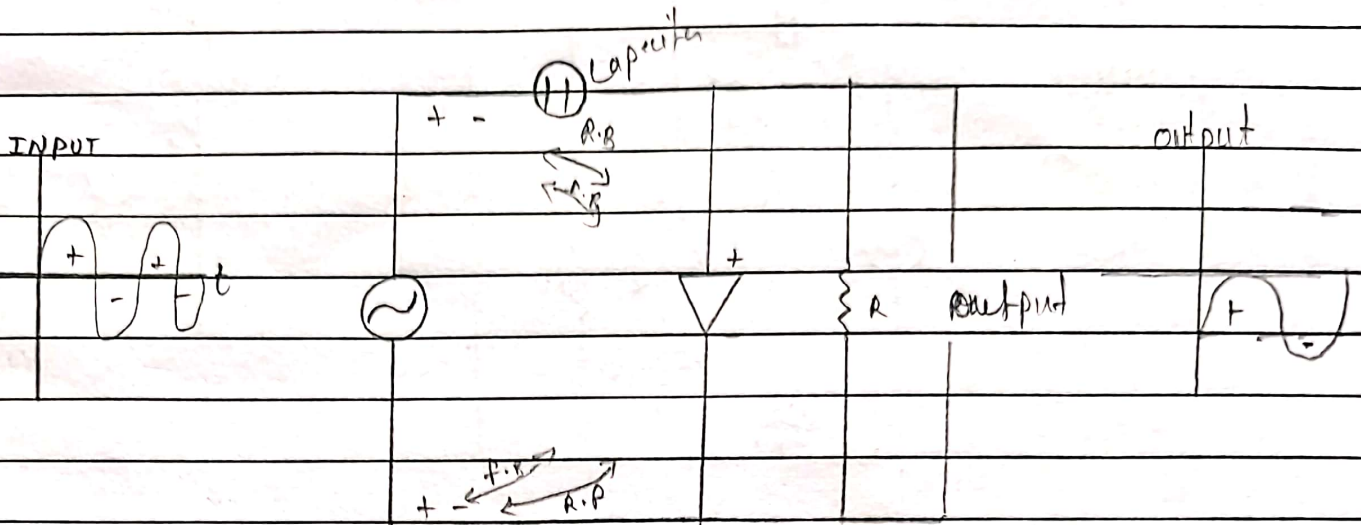
+ve -ve +ve -ve

⊕ unbiased +ve clamping CRT
shift diode

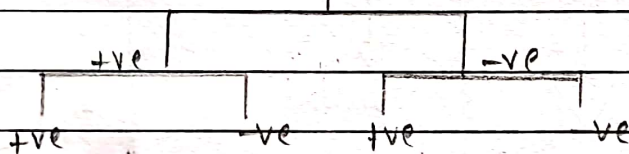


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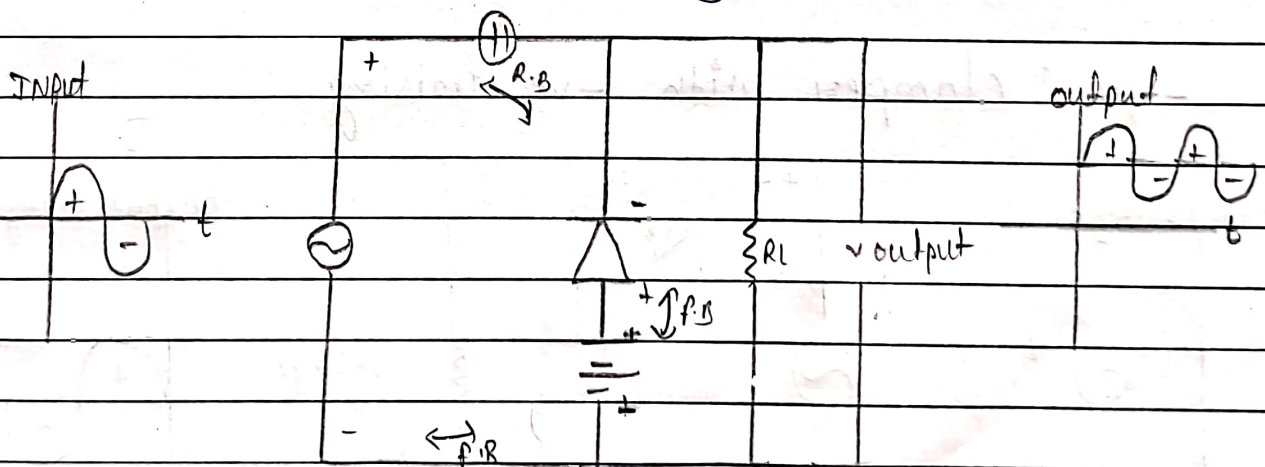
① un biased clamper ckt +ve diode



② Biasing

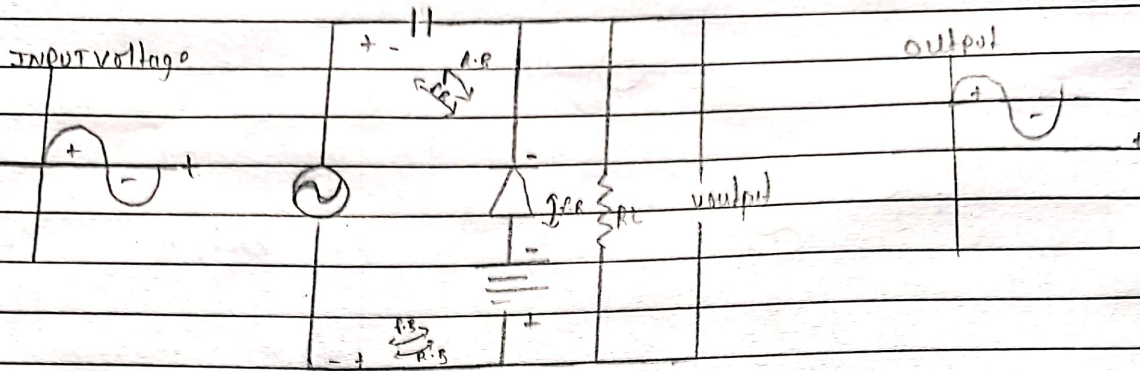


+ve clamper +ve biasing

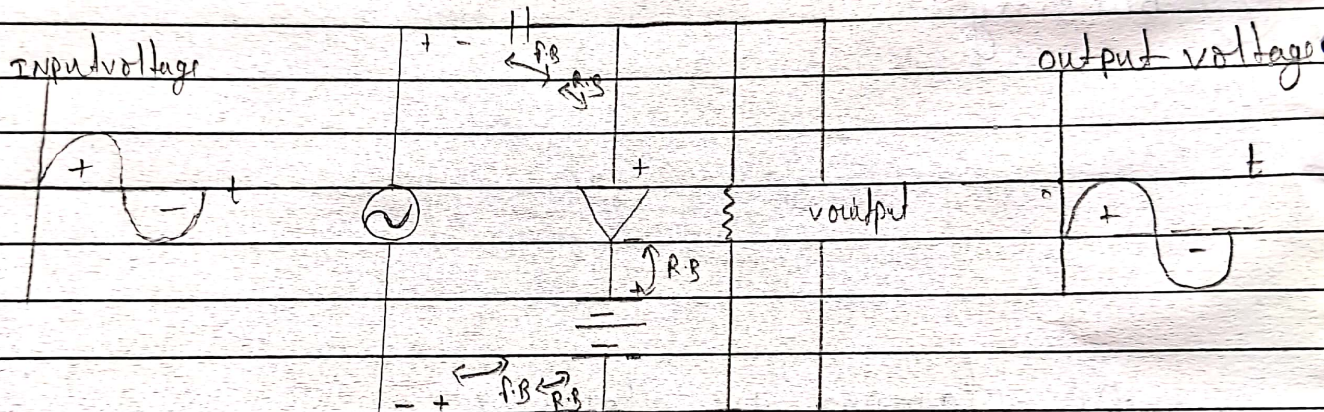


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+ve clamper with -ve ~~ext~~ Biasing



-ve clamper with +ve Biasing



-ve clamper with -ve biasing

