20/11/2019

Physics

BASIC ELECTRONICS

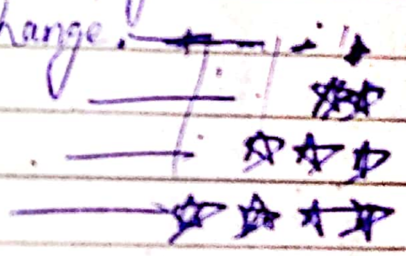
Zero Ref level, Chassis Ground, Ohm's Law

Q: What do you mean by Chasiss ground?
Q: What is zero referenced level? What is its application?
Q: How can you obtain zero reference level in case of conducting metal sheet & in case of non-conducting plastic board? (Book page 3)

Ohm's Law:-

∵ George Simen Ohm3 → 1826
∵ ohm's law is valid for metallic conductor

Current in a circuit is directly proportional to applied voltage across two ends of the circuit provided the physical conditions of conductor doesn't change.



y = 3 OR

x = 3 y = 5

The ratio b/w Voltage & Current is constant.

$$V \propto I$$
$$\Rightarrow V = IR$$
$$\Rightarrow R = \frac{V}{I}$$

Q: What are the preconditions for the validity of ohm's law?
Ans: Physical state (Temp, density, elasticity) of conductors doesn't change.

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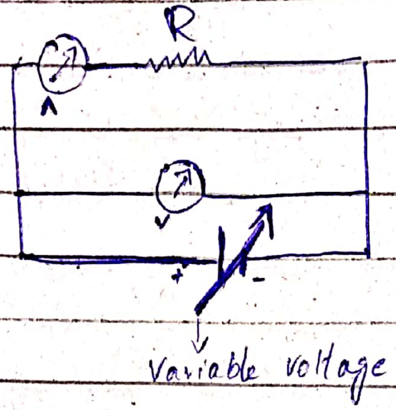
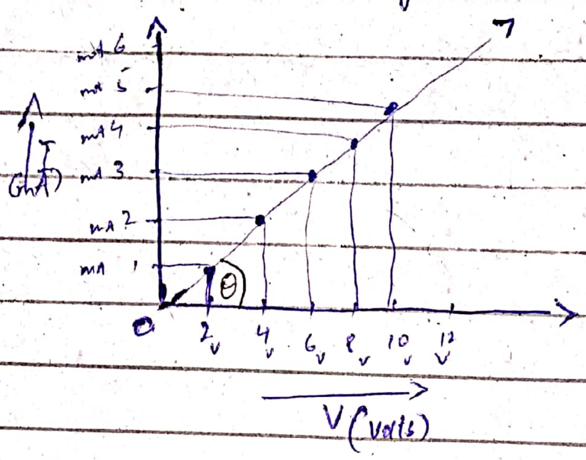
GRAPHICAL Representation.





Q: What is the graphical representation of Ohm's law?

=> If Slope $\frac{R=0}{\text{Horizontal}}$

=> " "

R = max | vertical

∞

=> To find resistance (θ = Resistance)

$\tan\theta$ = Slope of I-V graph

$\tan\theta = \frac{\text{Prep}}{\text{Base}}$

$$\Rightarrow \tan\theta = \frac{\Delta I}{\Delta V} = \sigma \qquad \because R = \frac{\Delta V}{\Delta I}$$

$$\because \frac{1}{R} = \frac{\Delta I}{\Delta V}$$

$$\Rightarrow \tan\theta = \frac{\Delta V}{\Delta I} = R$$

$$\because \sigma = \frac{\Delta I}{\Delta V} \text{ (conductance)}$$

Unit

$R \rightarrow \Omega \rightarrow$ ohm

$C \rightarrow \mho \rightarrow$ mho / $(\text{ohm})^{-1}$

$\Rightarrow$ Resistance & Conductance Represents the electrical behaviour of a substance

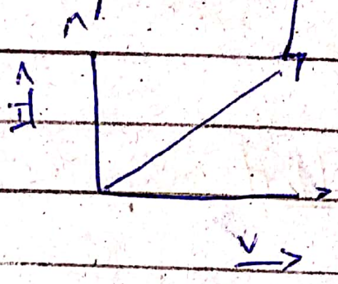
25/11/2019

Physics

Ohmic & Non-Ohmic Substances

Ohmic Substance:

The substances that strickly obeys ohm's law provided Temp, elastic limit doesn't change



e.g

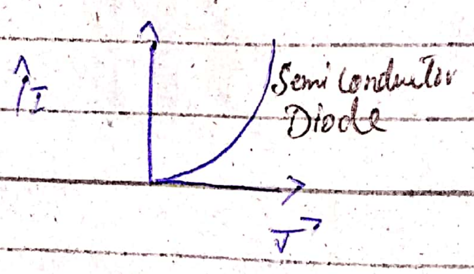
copper, silver, gold.

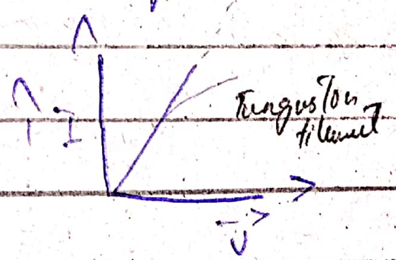
Non-Ohmic Substance:

The substance that donot obey ohm's law under all condition of Temprature.

e.g

semiconductor, Tungeston filament





Q: Diff b/w resistance & conductance?

Q: Diff b/w ohmic & non-ohmic substance?

Q: How resistance & conductance can be found by using graph?

Linear & Non-Linear Resistor (Book)

Linear-Resistors

Those resistors are called who can obey ohm's law whoes VI graphicall representation is a straight line & current varies directly to potential difference.

Non-linear Resistors

Those resistor that dont obey's ohm law & graphicall repn is curve.

26/11/2019

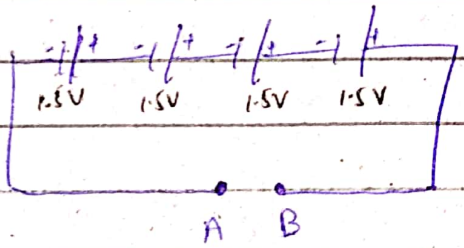
Physics

Cell in Series & Parallel, Resistive Circuit

Only single path is avaliable for flow of current in series combination.

More than one path is avaliable for flow of current in parallel combination.

Series combination



output

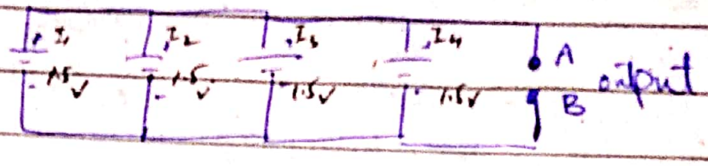
$V = 6V = V_1 + V_2 + V_3 + V_4$

$I = I_1 = I_2 = I_3 = I$

$\Rightarrow$ If batteries of diff. V are used then current of a battery having minimum value V is used.

∴ Series combination is used when max V & min I is required.

Parallel combination



$$I = I_1 + I_2 + I_3 + I_4$$

$$V = V_1 = V_2 = V_3 = \dots$$

∵ If batteries of different V are given then ~~voltages~~ Battery having minimum value of voltage is used.

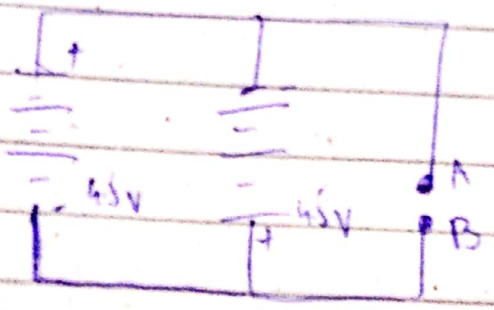
$V = V_1 = V_2 = \dots$

∵ Parallel combination is used when min V & max I is required.

Series-Parall combination

This series is used when large power is required i.e I_{max} & V_{max}

$$P = IV$$



Q32: Write the cracteristics of Series combination & parallel combination of resistive circuit?

Q34: What is the effect of series combination on equivalent resistance? ($R_{eq} > R_{max}$ in case)

Q35: What is the effect of parallel combination on equivalent resistance? ($R_{eq} < R_{min}$ in case)

Q36: How you can distinguish b/w Series & parallel combn?

Q: Diff b/w A.C & D.C ? Graphical repn

Q37: What is the reason for world wide use of AC?

Q Ans: Bcz it can be easily transfer from one ~~point~~ place to another ~~point~~ place at very low cost. using

Stepdown &
Stepup transformers

∴ Power Dissipation

$P_{loss} = I^2 R$

$P_{loss} = IV$

$$\Rightarrow \frac{V_s}{V_p} = \frac{I_p}{I_s} = \frac{N_s}{N_p}$$

$$\Rightarrow \boxed{V_s \propto \frac{1}{I_s}}$$

∴ 1 unit = 1 Kwh

$$1\,\text{Kwh} = 1000\,\text{w} \times 1\,\text{hr}$$

$$= 1000\,\text{J}/\cancel{s} \times 3600\,\cancel{s}$$

$$= 3600000\,\text{J}$$

$$\Rightarrow 1\,\text{Kwh} = 3.6\,\text{MJ}$$

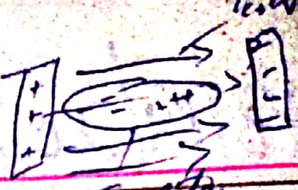
$$\therefore \underset{(\text{unit})}{\text{Kwh}} = \frac{P(\text{watt}) \times t(\text{hrs})}{1000}$$

Q: Diff b/w ionic bond & covalent bond?
Q:
Q: Diff b/w conventional current & electric current?
Q: What is causes of electric current in diff conductors?
Q: What is the reason to use conventional current
(effects to measure current do not depends upon nature of charge)

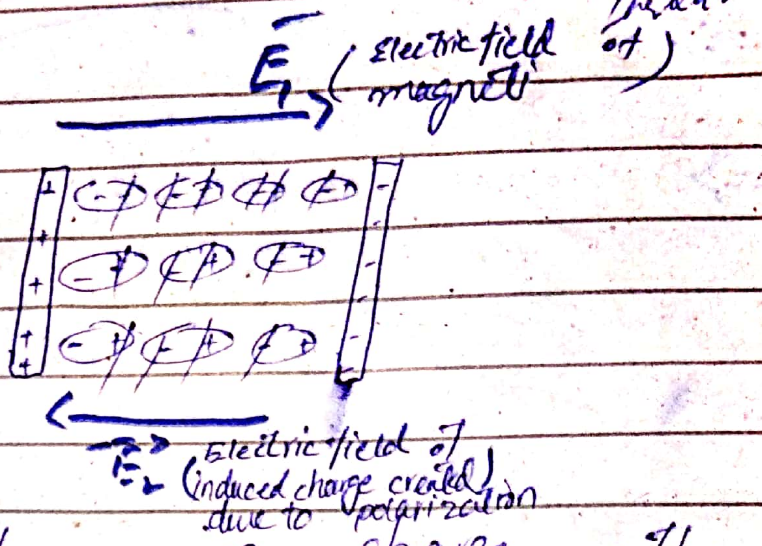
Q: What is zero ref level
Q: What is chassis ground.
Q: What is precondition for validity of Ohm's law?
Q: What is graphical repr of ohm's law?
Q: Diff b/w conduc & resistance
Q: Diff b/w ohmic & non-ohmic substance
Q: How can you find conducta & resistan by graph.
Q: What is

07/01/2020

PHYSICS



Polarization



The process of appearing charge on the faces of magnet is called polarization.

(+ -) ⟶ polar substances

(±) ⟶ non-polar substances

ZAIN
MUGHAL

13/01/2020 # Resistors

=> $V \propto I$

=> 3 basic elements / parameters to form a circuit
=> Capacitor
=> (Resistor)/(conductors)
=> Inductor

used to control the current in circuit.

=> Current & Voltage directly varies with resistance
$V \propto I$

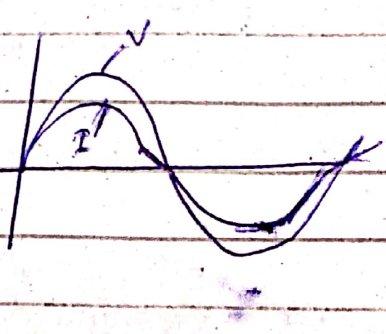
=> $I \propto V$ are entirely Inphase (phase diff 0°)
OR
(directly proportional)

=> due to this Inphase behaviour power decipation is maximum

$P_{dis} = VI = I^2R = \frac{V^2}{R}$ (max)

(used for series) (used for parallel)

=> In phase Graph



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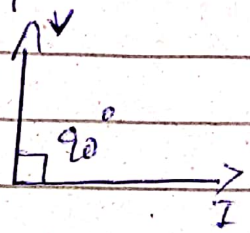
Muhammad - Zain (Mughal)

=> Resistor is basic circuit element for both A.C & D.C circuit

=>

When phase difference is 90°

i.e



no power decipation occur.

=>

Power decipation formula

$$P = VI\cos\theta$$

θ → phase diff

$\cos\theta$ → power factor

=> Power factor = $\cos\theta$

$$\cos\theta = \frac{P\,(\text{applied})}{VI\,(\text{consumed})}$$

=> Capacitors & Inductors have phase differences 90°
no power dicapation occurs
they only store energy

=> Uses:(Book)

Inductor

$V \propto \frac{\Delta I}{\Delta t}$

Capacitor

$I \propto \frac{\Delta V}{\Delta t}$

TYPES OF Resistors

⇒ Wire wound resistors
⇒ Carbon resistors

Q: What is diff b/w short circuit & open circuit?
Ans: Short circuit: $R = 0$, close ckt
Open circuit: $R = \infty$, off ckt
Q: Define Resistor? Write relation for P, due:
Q: What is Power factor? Write its value for resistor.

Classifications

① Fixed resistors

② Variable resistors

14/01/2020

ZAIN

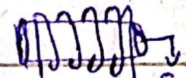
Physics

Types of Resistor

① Wire wound resistor

Long wire of similar cross-section area made up of NiCr (nickel chromium).

Resistance formula



$$R = \rho \frac{L}{A}$$

It's resistance depends upon ρ (resistivity), & Length (L). (A) is same throughout the length of wire.

Range : $1\Omega - 100k\Omega$

Power Rating : 5W — Several hundred watts

Q: Define the Term Power Rating?

Ans: Maxium wattage that a resistor can desipate without excessive heat.

(Power Rating $\propto$ Size & length of Resistor)

Uses

=> There are used where large power desipation is required.

=> Stability & Precision required

Q: What is a wire wound resistor? What are the factors on which its resistance depends?

Q: Write the Power rating & uses of wire wound resistors?

Q: What do you mean by the term Tolerance?

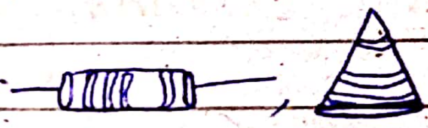
Q: Write the Tolerance of Carbon-Composition & wire wound resistance

Q: What are Variable Resistors? Describe its two types Potentiometer & Rehostate?
<vip>

(2) Carbon Resistors (Book)

Range : 1Ω - 20 MΩ.
Power Rating : Less Than 2 W.

Types / Book)

(i) Carbon-Composition Resistors
(ii) Carbon- Film Resistors -> 
(iii) Cermat - Film Resistors -> Solid Shape

other Type

(iv) Metal Film Resistors.
(use metal oxides)
(Its R depends upon thickness of metal layer deposited on its surface)

Uses (Book)

15/01/2020 Physics

=> Tolerance

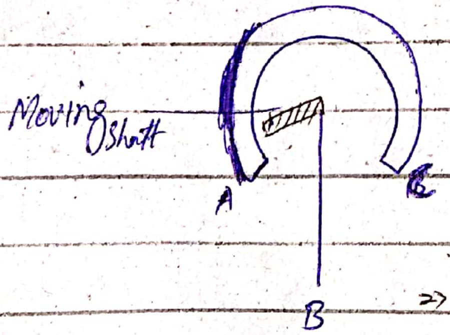
The possible variation of the resistance from the marked value is called Tolerance.

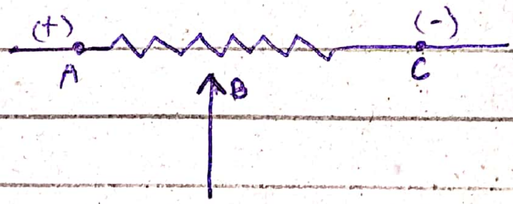
=> Wiree wound Resistors
5% Tolerance

=> Carbon-Composition Resistors
5%, 10%, 20% Tolerance

Variable Resistors (v.ip, long question)

The resistors whose resistance can be changed



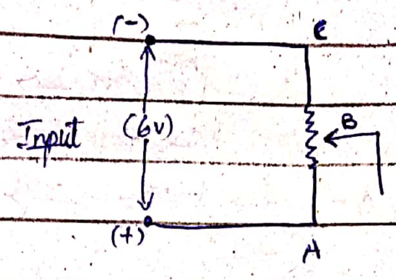


=> when length increase b/w A & B resistance increase
=> when length decrease " " " decrease
=> Used in control systems (ie, volume brightness, echo, bass, balance ---).
=> used in fan regulators & car vipers & irons.
=> Resistance Range: $1K\Omega - 5M\Omega$

=> Power Rating Range: $\frac{1}{2}W - 2W$

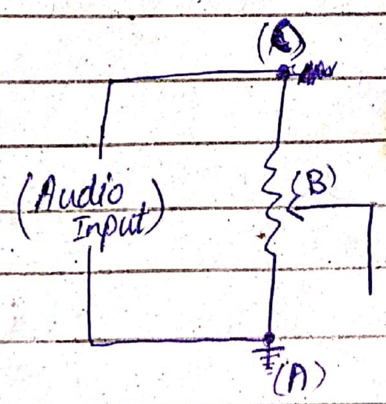
(a) Potentiometer / (b) Rehostate — vip

(i) Potentiometer

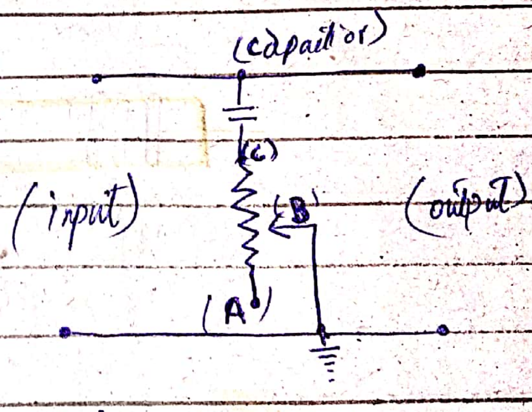


Main Application

Volume Control -> 3 Terminals used
Tone Control -> 2 Terminals used
1 is grounded



(Volume Control)



(Tone Control)

Q: What is a potentiometer? Write its main application

Q: Can a potentiometer can be used as a Rehostate?
(vip) If yes, then write the methods?
Ans: Book (page 52)

20/01/2020

PHYSICS

Colour code of carbon resistors

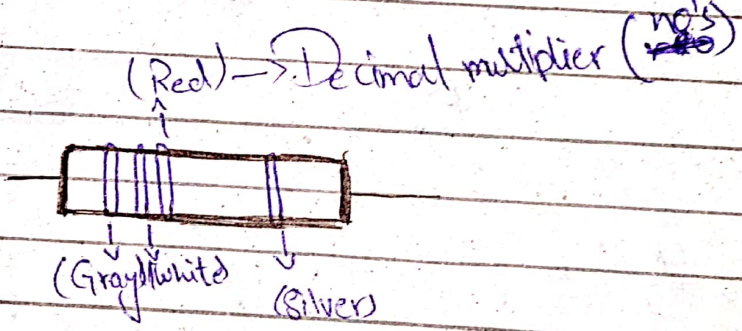
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Gray	8
White	9

Tolerance

Silver → ±10%

Gold → ±5%

No-color/Other → ±20%



8900 ±5%

8345Ω – 8455Ω

$\frac{5 \times 8900}{100} = 445$

8900 − 445

8900 + 445

8345 8455

8900Ω ± 10%

If resistor have 5th colour band then the 5th color band represents reliability rate or failure rate.

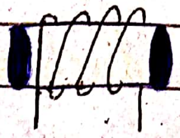
color for reliability rate

Brown	1%
Red	0.1%
Orange	0.01%
Yellow	0.001%

Resistor under 10 Ohms → (Books)

Inductors

Types (Inductor blocks AC & allow DC to pass.)



(Inductor store energy in the form of megnatic field)

1) Air-core Inductor (Non-megnatic core) (↓ self Induction)

2) Iron-core Inductor (megnatic core) (↑ self Induction)

3) Ferrit-core Inductor

(Book) 55

{Ferrit is a solid .... ~~..~~ current loss} {Ans: It an opcude on ↑f}

Questions

Q: What is a ferrit? What is its effect in an inductor? Why it is preffered? VIP

{ferrit-core (Ans: Due to ↑f, ↑ Induction, ↑ relaibility.)}

Q: What is the effect of iron-core on self-induction?

Q: How resistance below 10 ohm can be measured with the help of colour code?

Q: What is the importance/use of fifth color band on the carbon resistor?

Q: How power is lost in an inductor?

Ans: Due to core

(i) eddy loss {Due to changing current, self Emf induced which form induced current in cores body}

(ii) hestresis loss

{Energy loss due to megnatization & demegnatization of core}

Q: How power loss in an inductor can be minimize?

Prevention

eddy loss → Using insulated core & thick leminated sheet.

hystresis loss → Using body core having less hestresis area.

→ Using iron core.

22/01/2020.

Physics

Inductors, Capacitor

air-core inductor | iron-core inductor | ferrit-core inductor

Self Induction

Def (Book)

When current passes, it generates magnetic field. Changing magnetic field produces changing magnetic flux which generates Emf. Due to Emf, inductor generates its own self inducted Emf which opposes applied voltage & Net voltage reduced.

For air-core inductor

(i) $L = \mu_0 n^2 A l$

$\because n = \frac{N}{l}$

(ii) $L = \frac{\mu_0 N^2 A}{L}$

$\because \mu_0 \rightarrow$ permability of air

for other-cores inductors

$\because \mu_r = \frac{\mu}{\mu_0}$

$L = \mu_0 \mu_r n^2 A l$

$\because n = \frac{N}{L}$

$L = \frac{\mu_0 \mu_0 N^2 A}{L}$

Permability

The ability of any medium to allow the magnetic influence to pass through it is called permability.

Q: What is the difference b/w μ, μ_0 & μ_r?

permability perof air relative per

Q: Define the Term permabity? Write it's unit & permability of air? (Henry)

> 1 henry = $\frac{1V}{1A/1s}$

② Self Induction

formule

$$E = -L \frac{\Delta I}{\Delta t}$$

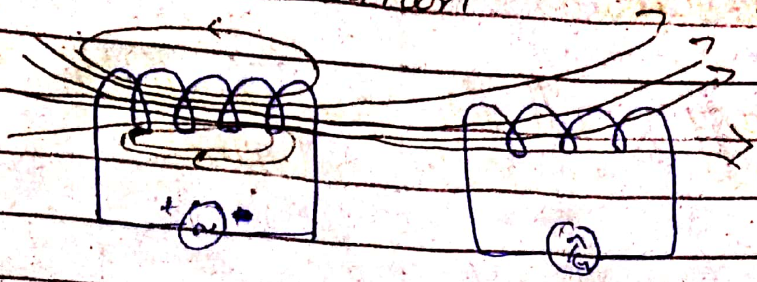
$$\Rightarrow L = \frac{E}{\Delta I / \Delta t}$$

Q: ① What are the factors on which Self Induction Depend

Ans: n, l, A, μ_r(medium)

CGPI
↓
Register

Mutual Induction



$$M = \frac{\mu_0 \mu_r N_1 N_2 A}{l}$$

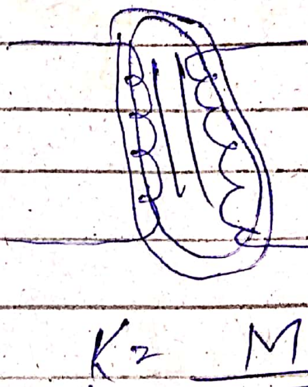
$$M = \frac{\mathcal{E}_s}{\delta I_p / \delta t}$$

Depends

closseness of coil, core of coil, n, A, l, μ_0, μ_r –

Unit

Henry



$$K = \frac{M}{\sqrt{L_1 L_2}}$$ (length)

K ↓ coefficient of coupling ↓ (How much flux of one coil is passing through other coil.)

Variable Inductor

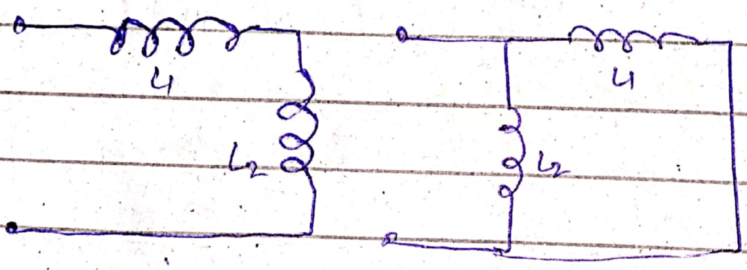
Q: How many methods are available to obtain the variable inductors
(Book)

(i) By using a Tapped coil. (Book)

(ii) By using Sliding Terminal/contact (Book)

(iii) Ferrit slug (Book)

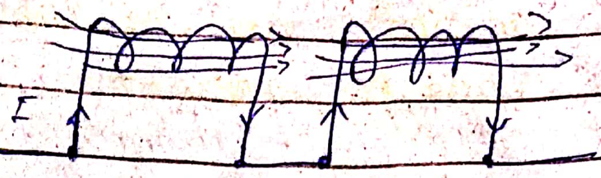
Inductors in Series & Parallel without M



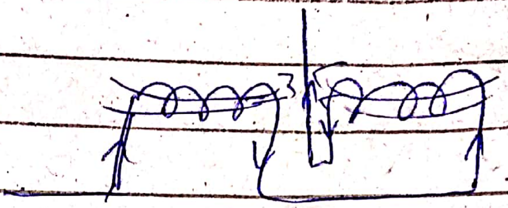
Series → $L = L_1 + L_2$

parallel → $\frac{1}{L} = \frac{1}{L_1} + \frac{1}{L_2}$

Series Combination with M



Series aidding $L_a = L_1 + L_2 + 2M$



Series opposing $L_o = L_1 + L_2 - 2M$

$$\Rightarrow M = \frac{L_a - L_o}{4}$$

27-01-2020

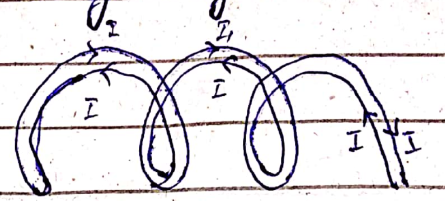
Physics

Q: What is a Stray Inductance? How you can overcome it.

Stray Inductance

The unwanted inductance present in the connected leads and wire wound resistors.

∴ Can be overcome by using non-inductive wires.



(non-inductive winding)

Zalim Mughal

Inductor stores energy in its magnetic field without utilization

$$E = \frac{1}{2} L I^2 \text{ (in terms of induction)}$$

$$\underset{\text{(energy density)}}{U_m} = \frac{1}{2} \frac{B^2}{\mu_0} \text{ (in terms of magnetic field)}$$

for iron core

$$U_m = \frac{1}{2} \frac{B^2}{\mu_0 \mu_r}$$

Q: Why wire of Inductor gets hot?

~~Q: What is troublesome in an inductor & capacitor?~~

Due to DC resistance {cross-sectional area, length}
wire gets hot & power dissipate.

Q: What is diff b/w DC R & AC R

DC-R $\longrightarrow$ $R = \rho \frac{L}{A}$

AC-R $\longrightarrow$ 'L' self inductance.

Q: What is a trouble some in a coil of Inductor & Capacitor ?

Ans: (Book)

Reactance {AC-resistance}

opposition offered by an inductor to flow of AC ~~voltage~~ is called reactance. Inductive Reactance.

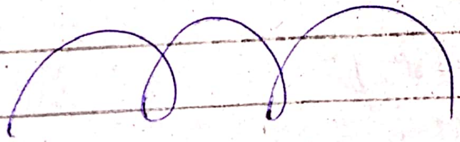
$X_L = 2\pi f L$ ∵ f = frequency of AC

$= \omega L$ L = coil self inductance

ω = angular frequency

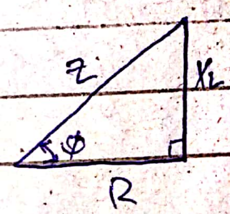
Unit: Ohm

Impedance



X_L & R

(AC Resistance) (DC Resistance)



$Z = \sqrt{X_L^2 + R^2}$

Phase Difference

$$\tan\phi = \frac{X_L}{R}$$

$$\phi = \tan^{-1}\left(\frac{X_L}{R}\right)$$

$$\phi = \tan^{-1}\left(\frac{2\pi f L}{R}\right)$$

Q-Factor
(Quality Factor) (Book)

$$Q = \frac{X_L}{R} = \frac{2\pi f L}{R}$$

$Q\uparrow$ when $\frac{X_L}{R}\downarrow$

$Q\downarrow$ when $\frac{X_L}{R}\uparrow$

Q: What is a Q-factor of a coil & why in a radio-receiver circuit high Q-coil is preffered.

For ~~turning~~ increasing sharpness of Turning

For " its sentivity

03/02/2020 Physics

Capacitor

Capacitor is a device that is used to store electric charge.

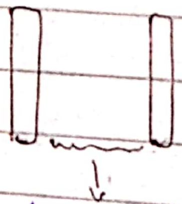
It blocks DC & allow AC to pass.

~~Inductor~~ => Blocks DC
due to presence of dielectric b/w two plates.

=> Allows AC
by charging and discharging of capacitor

=> Stores energy in the form of electric field.

Construction



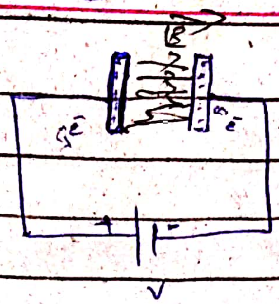
{parallel plate capacitor}

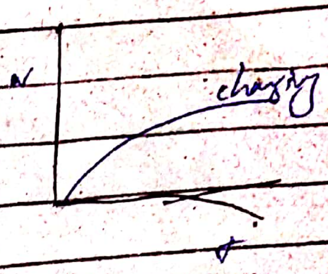
dielectric / vacuum / air

Q: What is a dielectric? Give three examples of dielectric? (Book)

Q: Can a capacitor be 100% charged?
Ans No/Never It will attain only equilibrium (max) of charge.

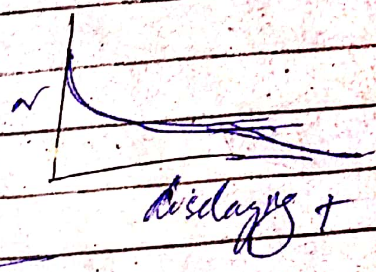
[redacted]





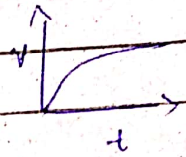
Q: Can a capacitor be charged linearly or uniformly & immediately?

It can only charge exponentially.



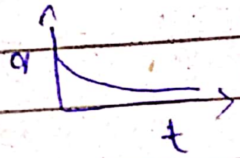
Charging

$q = q_0(1 - e^{-t/RC})$



Discharging

$q = q_0 e^{-t/RC}$



Q: What is a time constant? Show that time constant $t = RC$? or $RC = \tau$?

'τ' time constant is that time in which a capacitor gain or loss 63.2% of the equilibrium value of charge.

Q: What is graphical representation of charging & discharging

$\because t = RC$

$V = IR$ $\quad$ $Q = CV$

$R = \frac{V}{I}$ $\quad$ $C = \frac{Q}{V}$

$RC = \left(\frac{\cancel{V}}{I}\right)\left(\frac{Q}{\cancel{V}}\right)$

$RC = \frac{Q}{I}$, $RC = \frac{It}{I}$, $\boxed{RC = t}$

Mathematically

$$Q \propto V$$

$$Q = CV$$

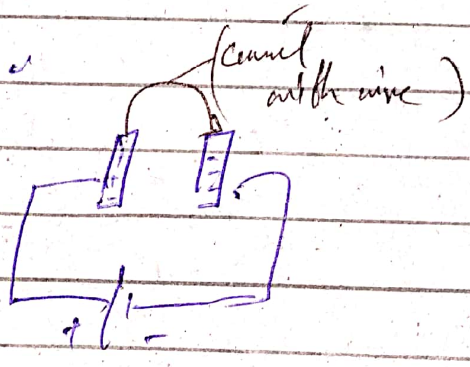
$\because C$ = capacitance {Ability of capacitor to store charge}

$$C = \frac{Q}{V}$$

Unit Farad

$$\left(1F = \frac{1C}{1V}\right)$$

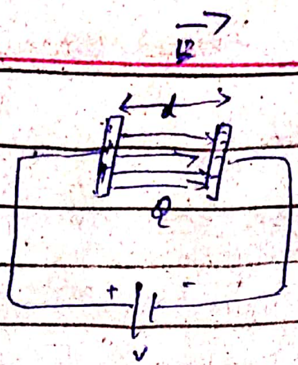
To discharge.



Q: Define the Term Capacitance & its unit?

Factors of Capacitance

(For vacuum)



As $V = Ed$

$$E = \frac{\sigma}{\varepsilon_0}$$

$$E = \frac{Q/A}{\varepsilon_0} \qquad \because \sigma = \frac{Q}{A}$$

$$E = \frac{Q}{A\varepsilon_0}$$

As

$$V = Ed$$

$$V = \frac{Q}{A\varepsilon_0} d$$

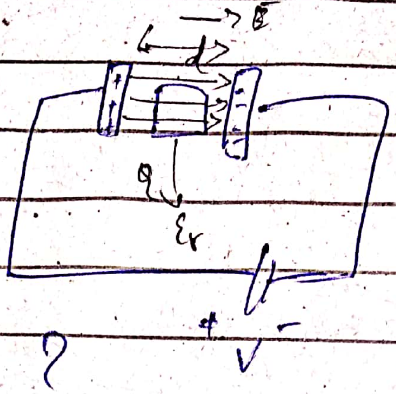
$$C_{vac} = \frac{Q}{V} = \frac{\cancel{Q}}{\cancel{Q}d/A\varepsilon_0}$$

$$C_{vac} = \frac{A\varepsilon_0}{d}$$

Q: What are the factors that controls the capacitance of capacitor?

A, ε_0, d { size, relative permittivity, distance b/w 2 plate }

For dielectric material



$C_{med} = ?$

$$V' = E'd$$

$$E' = \frac{\sigma}{\varepsilon_0 \varepsilon_r} \qquad \because \sigma = Q/A$$

$$E' = \frac{Q}{A\varepsilon_0 \varepsilon_r}$$

$$V' = \frac{Q}{A\varepsilon_0 \varepsilon_r} d$$

$$C_{med} = \frac{Q}{V'}$$

$$= \frac{\cancel{Q}}{\cancel{Q}d/A\varepsilon_0\varepsilon_r}$$

$$C_{med} = \frac{A\varepsilon_0 \varepsilon_r}{d}$$

Relation b/w C_{med} & C_{vac}

$$C_{med} = \left(\frac{A\varepsilon_0}{d}\right)\varepsilon_r$$

$\because \frac{A\varepsilon_0}{d} = C_{vac}$

$$\boxed{C_{med} = C_{vac} \cdot \varepsilon_r}$$

Q: What is the effect of dielectric on the capacitance of a capacitor?

Types of Capacitor → Book

1) Fixed Capacitor
2) Variable Capacitor

(Electrolytic)

Electrolyte used as a negative plate
Aluminium is used as a positive plate

(Non-electrolytic)

(No-polarity required)

Q: What is diff b/w electrolytic & non electrolytic capacitor?

Q: Write atleast two uses of paper, mica & ceramic capacitor

Q: why ceramic capacitors are more better than mica & paper capacitor

Q: Write the characteristics of paper capacitor & ceramic capacitor?

Q: What are the power rating of paper C, mica C & ceramic capacitors?

Q: What are the two disadvantages of electrolytic capacitor

Q: What are the diff b/w rotor & stator in a variable capacitor?

Q What is voltage rating of capacitor

Q: What do you mean by the term stray capacitor?

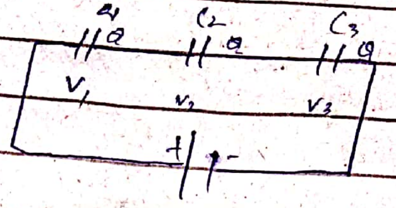
Q: What are the main troubles in a capacitor?

Q: Series & Parallel Combination — capacitor, resistor, inductor

Imp

Capacitor

Series Combination



$Q = CV$

$V = \frac{Q}{C}$

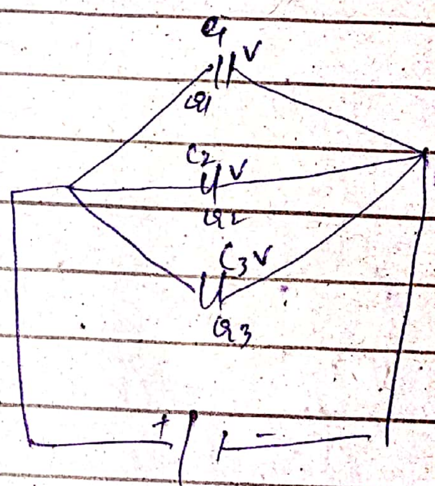
$\Rightarrow Q = Q_1 = Q_2 = Q_3$

$\Rightarrow V = V_1 + V_2 + V_3$

$$\frac{Q}{C} = \frac{Q}{C_1} + \frac{Q}{C_2} + \frac{Q}{C_3}$$

$$\Rightarrow \frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$$

Parallel Combination



$\Rightarrow V = V_1 = V_2 = V_3$

$\Rightarrow Q = Q_1 + Q_2 + Q_3$

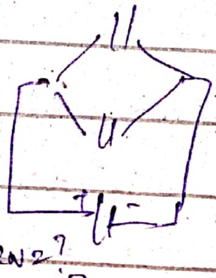
$Q = CV$

$CV = C_1V_1 + C_2V_2 + C_3V_3$

$C\cancel{V} = \cancel{V}(C_1 + C_2 + C_3)$

$\Rightarrow C_{eq} = C_1 + C_2 + C_3$

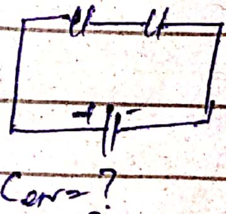
H.W



$C_{eq} = ?$

$Q_1 = ?$

$Q_2 = ?$



$C_{eq} = ?$

$V_1 = ?$

$V_2 = ?$

=> Energy stored in Capacitor (for DC)

$$E = \frac{1}{2} C V^2$$

$\because Q = CV$

$\therefore C = \frac{Q}{V}$

$$E = \frac{1}{2} \left(\frac{Q}{V}\right) V^2$$

$$\boxed{E = \frac{1}{2} QV}$$

$Q = CV$

$V = \frac{Q}{C}$

$$E = \frac{1}{2} C \left(\frac{Q}{C}\right)^2$$

$$= \frac{1}{2} C \frac{Q^2}{C^2}$$

$$\boxed{E = \frac{1}{2} \frac{Q^2}{C}}$$

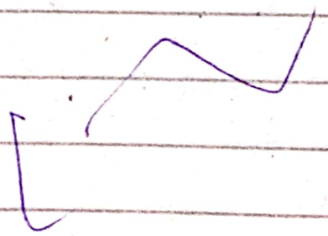
$$E = \frac{1}{2} \varepsilon_0 \varepsilon_r \varepsilon^2$$

Capacitive Reactance	Inductive Reactance
$X_C \propto \frac{1}{C}$	$X_L \propto L$
$X_C \propto \frac{1}{f}$	$X_L \propto f$
$X_C = \frac{1}{fC}$	$X_L \propto Lf$
	$X_L = 2\pi f L$
$X_C = \frac{1}{2\pi f C}$	$\boxed{X_L = \omega L}$
$X_C = \frac{1}{2\pi f C}$	
$\boxed{X_C = \frac{1}{\omega C}}$	

Q: What type of energy by the charged capacitor?

Q: What is the diff b/w resistance & reactance?

Q: What is the behaviour of capacitor & inductor & resistor with frequency of AC?
~~R~~ ("R" doesn't depends upon "f")



11/02/2020

Transformer

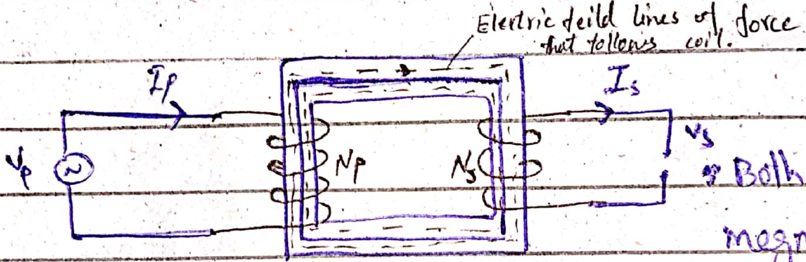
The device that can convert high voltage & ~~high~~ low current into low voltage and high current.

The device that can convert given Alternating emf into larger or smaller alternating emf.

Principal

Mutual induction b/w two coils.

Construction



* Both coils are megnatically connected with each other

Laminated iron core

Q:

Q: Can a Transformer operates on a DC?

Q: What is the practical used transformers?

Methamatically

$$\mathcal{E}_p \propto -\frac{\Delta \phi_B}{\Delta t} \qquad \mathcal{E}_s \propto -\frac{\Delta \phi_B}{\Delta t}$$

$$\mathcal{E}_p = -N_p \frac{\Delta \phi_B}{\Delta t} \qquad \mathcal{E}_s = -N_s \frac{\Delta \phi_B}{\Delta t}$$

If resistance is ignored   If resistance is ignored

$$\mathcal{E}_p = V_p = -N_p \frac{\Delta \phi_B}{\Delta t} \quad \text{(I)} \qquad \mathcal{E}_s = V_s = -N_s \frac{\Delta \phi_B}{\Delta t} \quad \text{(II)}$$

Scanned with CamScanner

Dividing eq (ii) by (i)

$$\frac{V_s}{V_p} = \frac{\cancel{-}N_s \cancel{\frac{\Delta\phi}{\Delta t}}}{\cancel{-}N_p \cancel{\frac{\Delta\phi}{\Delta t}}}$$

$$\frac{V_s}{V_p} = \frac{N_s}{N_p} \quad \text{—— (A)}$$

∴ This equation is also known as ~~transformed~~ transformer equation for voltage and number of turns in coil.

For ideal transformer

$$P_{out} = P_{int}$$

$$P_s = P_p$$

$$\because P = VI$$

$$V_s I_s = V_p I_p$$

$$\frac{V_s}{V_p} = \frac{I_p}{I_s} \quad \text{— (B)}$$

Equation for voltage & current.

Acc. Eq. (A) & (B)

$$\frac{V_s}{V_p} = \frac{N_s}{N_p} = \frac{I_p}{I_s}$$

Types

(1) Step-up Transformers {Output V ↑ than Input V}
(2) Step-down Transformers {output V ↓ than input V}

Q: Differentiate between

Step-up Transformers	Step-down Transformers
=> $N_s > N_p$	$N_s < N_p$
=> $V_s > V_p$	$V_s < V_p$
=> $I_s < I_p$	$I_s > I_p$
=> Thick wire is used for primary coil.	Thick wire is used for Secondary coil.
=> Thin wire is used for secondary coil.	Thin wire is used for primary coil.

Q: How power is loss in a transformer.
Q: What is a Transformer & what is its principal?
Q: How power is transfered from one coil to another coil in an transformer.

Ans: Megnatically connected
By means of changing megnatic flux.

Q: How you can overcome to power loss in transformer?

Power loss

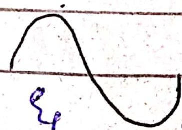
① ~~Eddy loss~~

1- Eddy loss

The current induced in the Solid iron core by mean of changing megnatic flux is called eddy current.
The body of core heats up due to eddy current.
This loss is called eddy loss

Solid iron core should by replaced by leminated iron core.

2- Hysteris Loss



The energy ~~used~~ lost to megnatize & demegnatize the iron core is called hystersis loss.

By using best ferro megnatic material i.e soft iron.
because it can easily megnatized and demegnatized.

Q: How you can improve the efficieny of a transformer.
By reducing
Eddy loss & Hysterisis loss.

Uses / Applications

It can be used to transfore the power from one place to another place at very low cost.

Q: What is difference between core type Transformer and shell type transformer

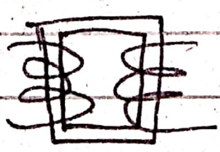
Q: There are How many types of transformers acc to frange?

Q: What is transformer impedance?

$$Z_1 = \sqrt{R_1^2 + X_{L_1}^2}$$

$$Z_2 = \sqrt{(R_2)^2 + (X_{L_2})^2}$$

Core type: The type of transformer in which the winding surrounds the considerable part of core



Shell type: The type of transformer in which the core surrounds the considerable part of winding.

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⇒ Warranty (Repairment)

ZAIN

⇒ Garranty (Replacement)

P-N junction

Electronics

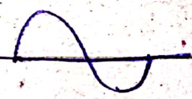
The branch of physics which tells us about the behaviour of an electronic circuit is called electronics.

(OR)

The branch of physics which deals with the motion of electron through resistors, capacitors, inductor, transistors etc.

Analog circuit

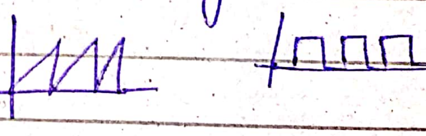
The circuit which operates on sin signals are analog circuits.



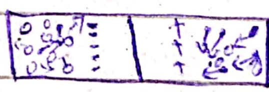
~~are those~~

Digital circuit

The circuits which operates on other signals than sin signals are digital circuits



P-N junction



N-types { pentavalent impurity } Dopped by

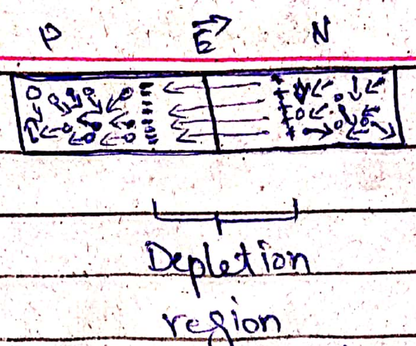
Potential Diff automatically generates between PN-Junction

$Si = 0.7\ V$

$Ge = 0.3\ V$

P-types { trivalent impurity }

This potentiall barrier opposes majority charge carriers.

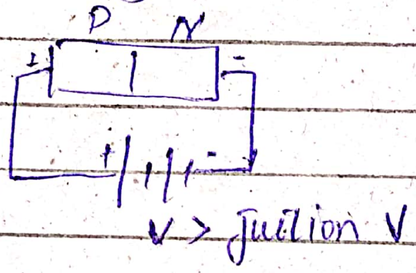


Charge free region is called <u>depletion region</u>.

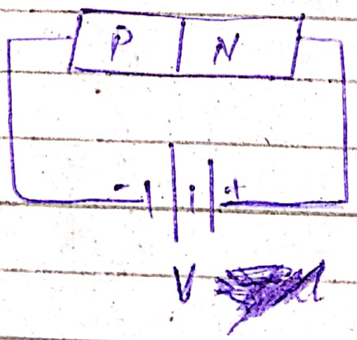
<u>Baising</u>

The application of voltage across the P-N junction is called Baising.

1) Forward Baising



2) Reverse Baising

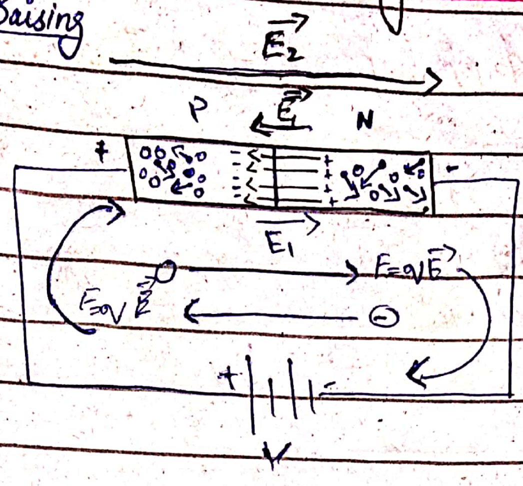


To overcome the potential barrier of PN-junction baising is performed.

12/02/2020

Physics

Forward Baising



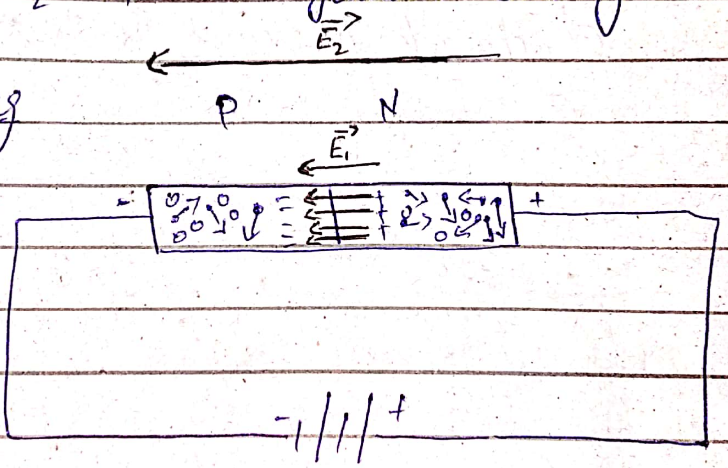
the electric field generated between ($\frac{-}{-}\Sigma\frac{+}{+}$) blocks further movement of electrons from N to P region & movement of hole from P to N region.

$\vec{E_2}$ of Battery $>$ $\vec{E_1}$ of potential barrier

$$\vec{E} = \vec{E_2} - \vec{E_1}$$

∵ Only majority carries flow in forward baising.

Reverse Baising



$$E = E_1 + E_2$$

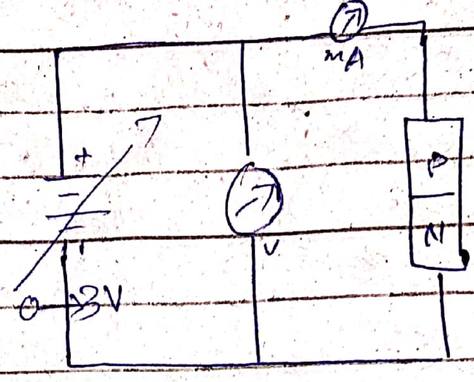
∵ Only minority carries flow in reverse baising.

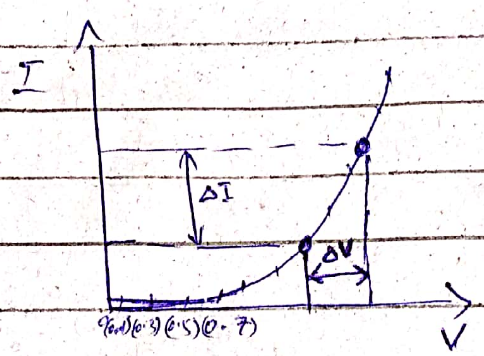
⇒ Leakage current: Current produced due to flow of minority carge carries

⇒ Reverse Baising offeres very large amount of (several MΩ) (~~several resistance~~) resistance.

PN-Junction

To find resistance of forward baised circuit



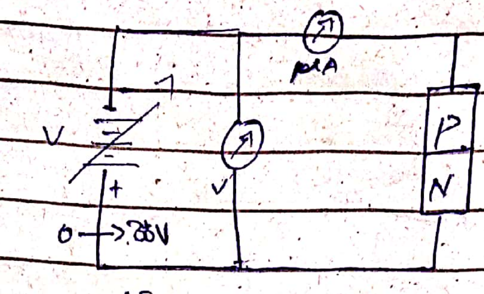


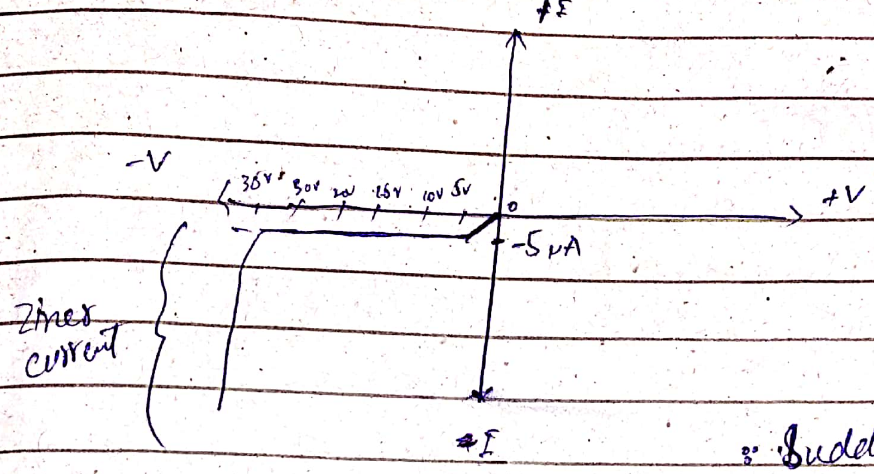
IV-characteristic curve for PN-junction.

$V = IR$

$R_f = \frac{\Delta V_f}{\Delta I_f}$

To find the resistance of reverse baised pn-junction circuit



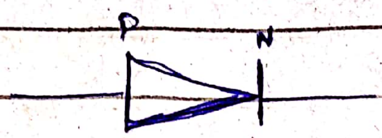


∴ Sudden raise in current is due to breaking of covalent bonding.
∴ Covalent bonding breakage produces minority charge carries
∴ The voltage at which covalent bond break is Break down voltage.

Q: Diff b/w avelunch & ziner current?
Q: What is the effect of Temp on the barrier of P-N junction?

Semiconductor Diode

PN-junction is called Semiconductor diodes.



Applications

Rectification

(19000)

(550×100$)
15000 ✓

Physics

Application

Subjective vip
(i) Rectification
(ii) Transistor
(iii) Operational Amplifier
(iv) Optical Fiber

Rectification (vip)

Rectification is the process by which AC can be converted in DC.

Circuit used for rectification process is called rectifier.

Types
1. Full wave rectification
2. Half wave rectification -

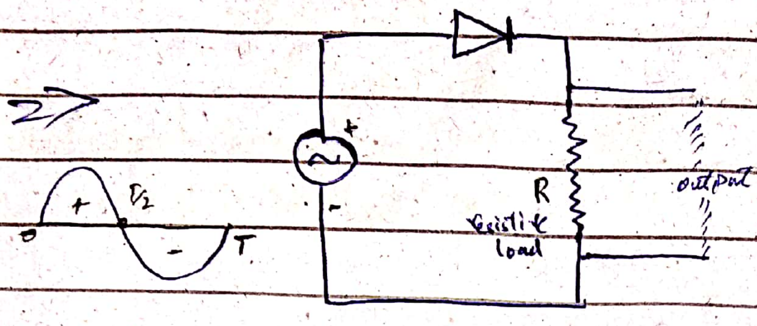
Silicon diodes are for rectification process.

Half wave: one half of input cycle is used to convert AC into DC.

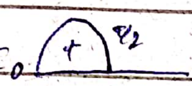
Full wave: in which both half of input cycles are used to convert AC into DC.

Half wave rectification

=>



" Load is a device that consumes energy.

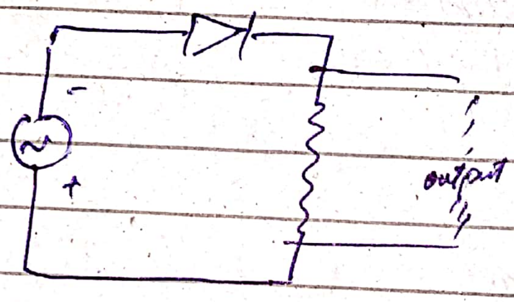
Input = 

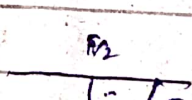
Output = 

" P-N junction is forward baised so current flows due to decrease in potential barrier

After half cycle

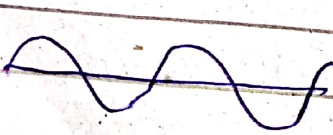
=>

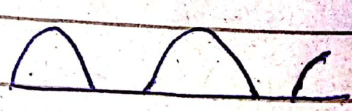


=> Input = 

Output = 

" PN-junction is reverse baised so current doesn't flow due to increase in ~~majority~~ potential barrier

=> Input = 

Output = 

↓

pulsating - DC

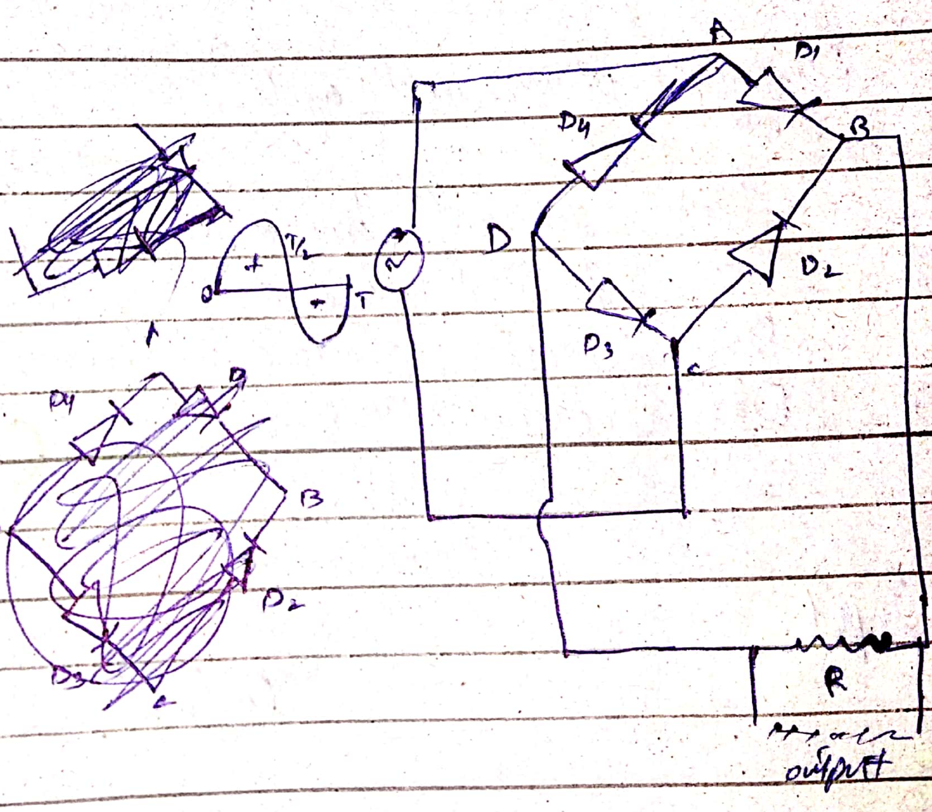
⇒ Pulsating DC is converted into smooth/pure DC by filter circuits.

Full wave Rectification

1) Bridge circuit

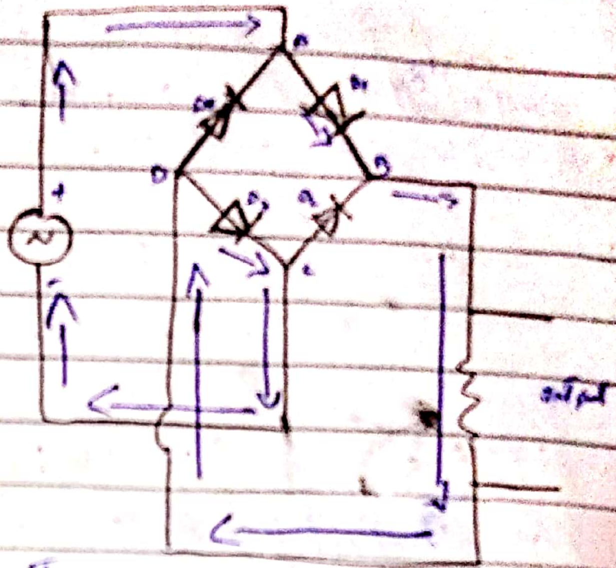
2) Center Tap Transformer (Assignment).

Bridge Circuit

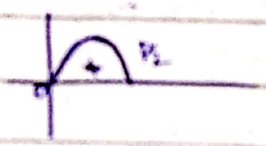


=> During positive half cycle

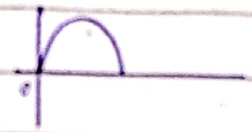
D_1 forward baised
D_3 forward baised
D_2 reverse baised
D_4 reverse baised



Input

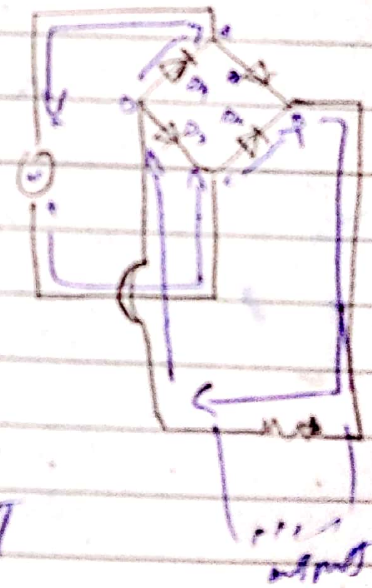


Output

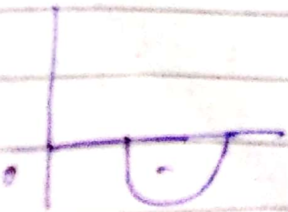


=> During negative half cycle

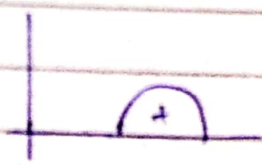
D_2 Forward baised
D_4 Forward baised
D_1 reverse baised
D_3 reverse baised



Input



Output



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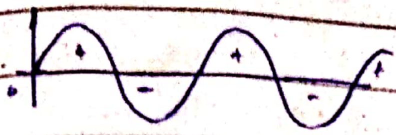
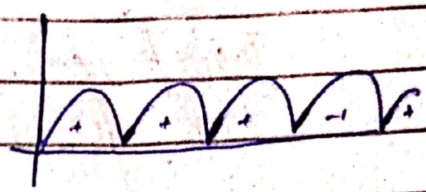
Result

Input



Output



8) Center Tap Transformer

(Book)

Physics

Transistors

~~Transformer~~
(Transfer + resistor)

(allow the motion of charge + oppose the motion of charge)

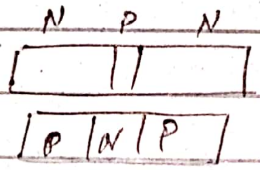
⇒ Transistor is a Bipolar/Uni polar junction Transistor having 3 Terminals.

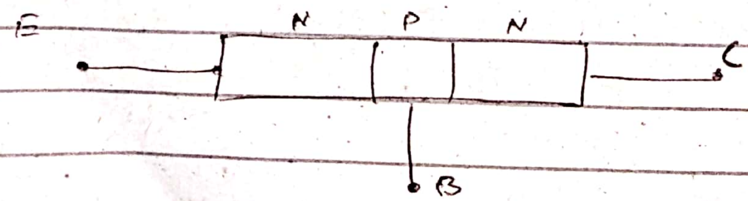
Uses

Amplifier
Oscillator (converts DC → AC)
Electronic Switch

Types

1)
2)





1) Size of E > size of B but ↓ than size of C.
2) E is highly dopped to increase condution

3) B is very thing region of transistor. (10^{-6}).
4) B region has very small dopping level.

5) C region has largest size
6) C region dopping level is larger than B but smaller than E region.

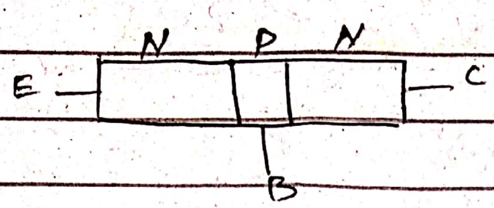
tr⟶J

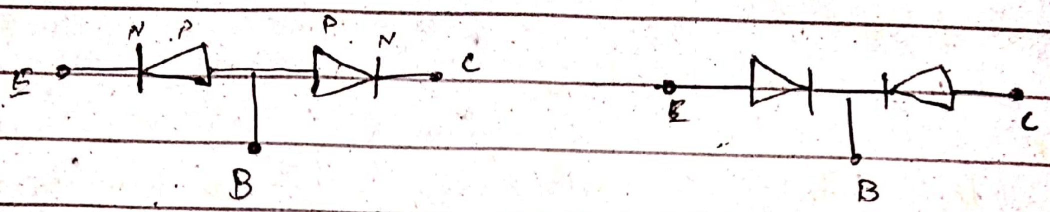
When P-type is sandwiched between two N-type substance N-p-N transistor forms.
Current flows due to majority charge carriers é's.

When N-type is sandwiched between two p-type substance p-N-p transistor is formed.
Current flows due to majority charge carries holes.
Holes are difficult to move to conduct current.

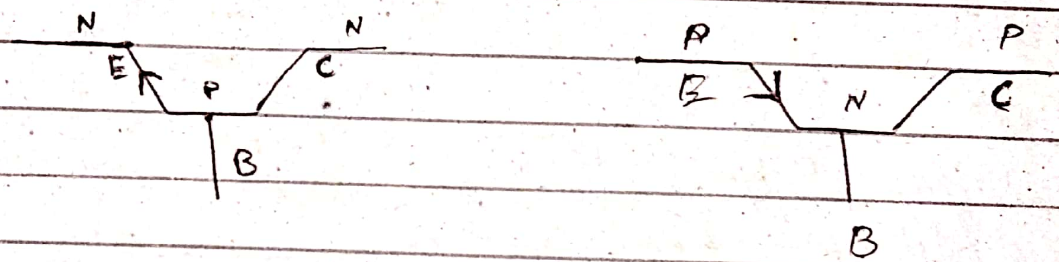
Q: Why N-p-N is preffered over p-N-p transistor.
Becaus NPN é's are charge carries, so they can easily move than holes in p-n-p.

Construction.





Symbol



Q: What is significance of arrow head on Emitter of a transistor.

Ans: It represent conventional current. (P to N)
Positive to negative terminal.

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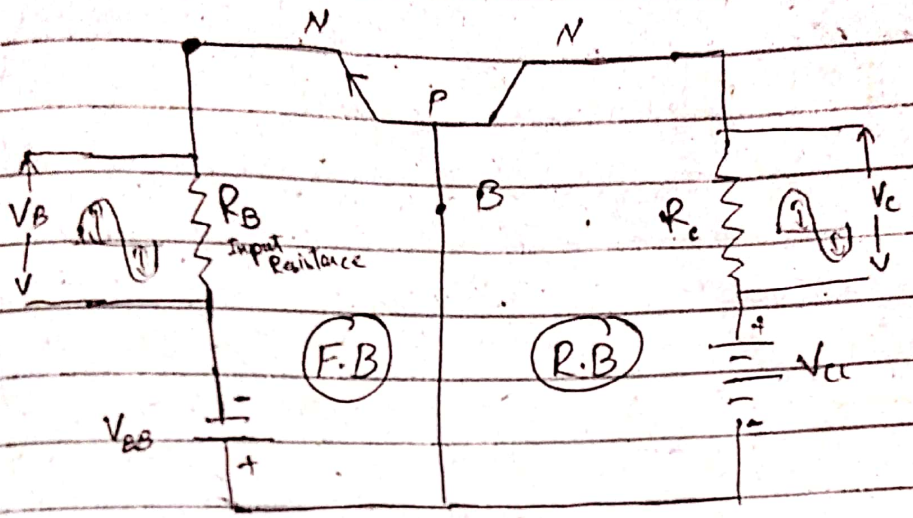
- 2 circuits used Input & output.

Input → Forward baised

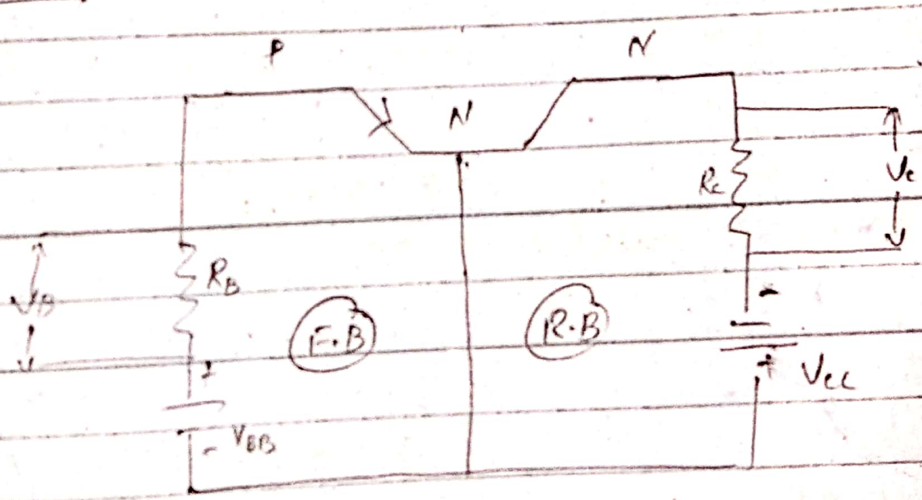
Output → Reverse baised.

N-P-N



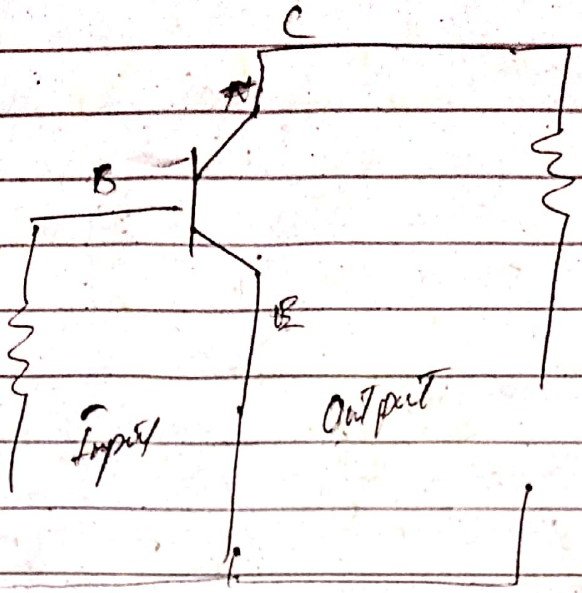
$\therefore V_{CC} >> V_{BB}$

P-N-P

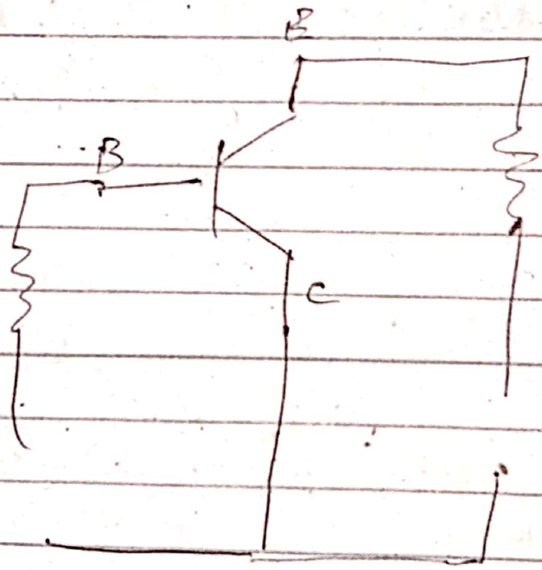


$V_{CC} >> V_{BB}$

For common Emitter (NPN / PNP)



For common Collector (NPN / PNP)

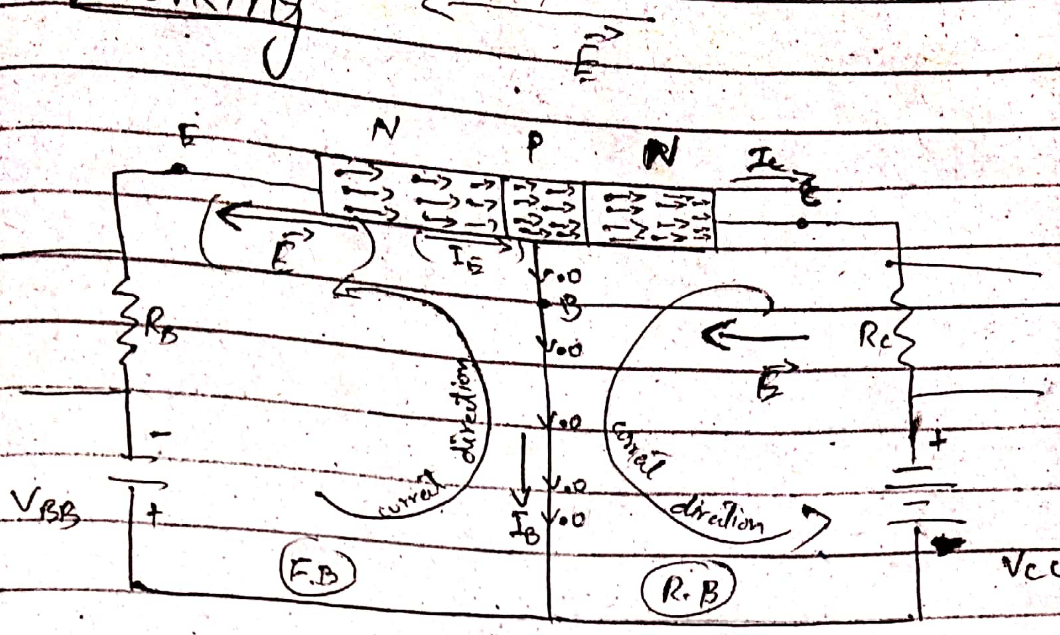


Assignment

Q Where common B & common C configuration is used?

Common-Base Amplifier	Common Collectors	Common Emitter
where low input impedance is required. It is used in moving coil microphone, preamplifiers	where high impedance input needs. used when output load high current gain needed	in radio frequencies Transiver circuits. Used in low noise amplifiers

Working



$\vec{F} = q\vec{E}$

Electric force on each electron

Electron moves opposite to the direction of Electric field $\vec{E}$.

$\because \quad I_E = I_B + I_c$

$\therefore$ Current Gain $= \dfrac{I_c}{I_B}$

{common base $\to \alpha \approx 1$

" Emitter $\to \beta \approx 50/100/200$

" Collector $\to \gamma$ }

Relation b/w α & β

(Book)

(Q: What is relation b/w α & β) — vip

(Book) 281

Q: What is Si control Rectifier?
Q: Which factors control the capacitance of capacitor?
Q: Why e's have greater mobality than holes?
Q: What is rehostate and it's uses?
Q: Diff b/w regulated & unregulated power supply?
Q: Why is diff mobile charge carriers & immobile ions?
Q: Diff b/w step-up & step down transformer?

Q: How optical fiber communication is different from electrical communication.
Q. Why we need cells in series & parallel.
Q: What is effect of T on Barrier Voltage.
Q: Why Base region is kept narrow in transistors?
Q: Why we use series voltage divider circuit?

Q: Write down 2 examples of linars & non-linear resistor.
Q: What are basic principal of optical fiber?
Q: Diff b/w Drift & Electronic Current?
Q: Why Semiconductor behaves as an insulator at absolute 0.
Q: Maintion at least 5 diff E sources?
Q: Can a potentiometer be used as Rehostate?
Q: What is effect of T on resistance of Conductor & Semiconductor?

Q: What do you mean by Term Tolerance & power rating.
Q: Diff b/w passive & ~~Ele~~ Active Electronic Components?
Q: Diff b/w para dia & fero magnetive material.
Q: What is diff b/w UJT & BJT.
Q: How power is lost in an optical fiber?

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24/02/2020 Physics

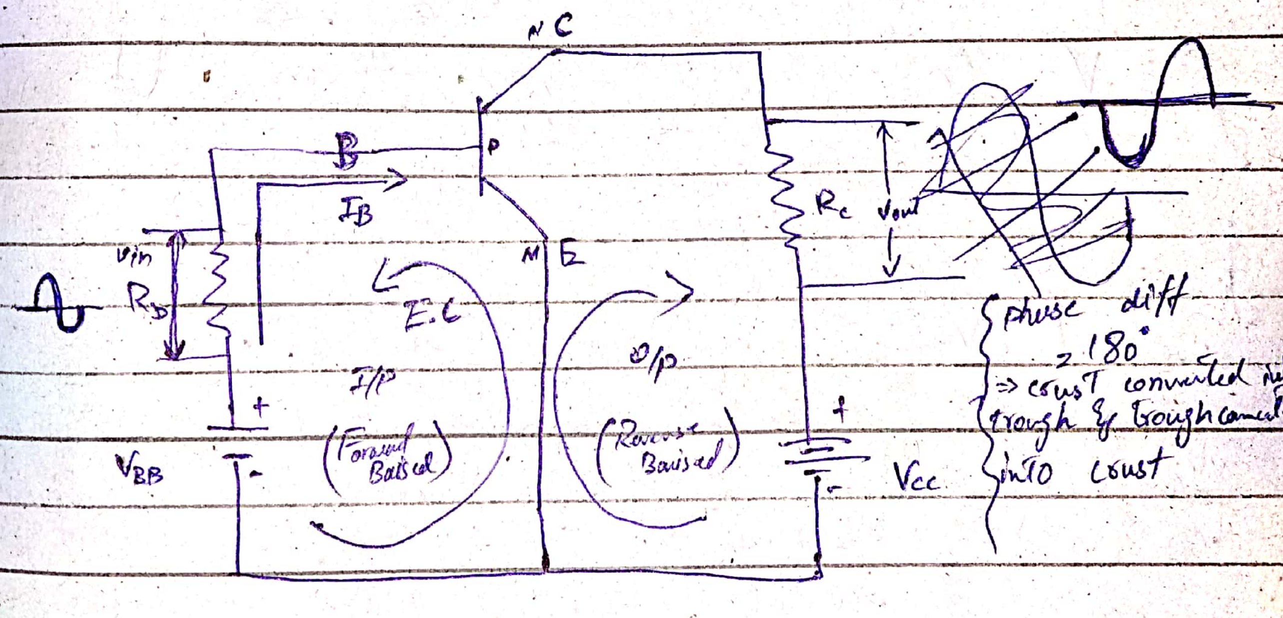
Transistor as an Amplifier & Switch (Electronic Switch) (vip)

~~comm~~ commonly used.

N-P-N → common emitter configuration

Transistor as an Amplifier

Common Emitter



V_{BB} & V_{cc} are baising battery they provide the path for flow of current

$$\Delta I_B = I_{in} = \frac{V_{in}}{r_{ie}}$$

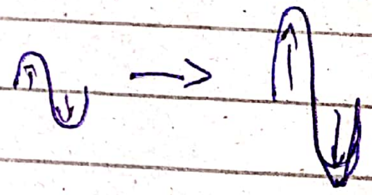
$$\Delta I_C = I_{out} = \frac{V_{out}}{R_c}$$

∵ r_{ie} is input emitter resistance when current flows through emitter to Base region

$$\beta = \frac{\Delta I_c}{\Delta I_B}$$

∵ Power amplifiers only changes amplitude of signal. They do not change wavelength & frequency of signal

$$\beta = \frac{I_{out}}{I_{int}}$$



$$\beta = \frac{V_{out}/R_c}{V_{in}/r_{ie}}$$

$$\beta = \frac{V_{out}}{R_c \cdot V_{in}} \times r_{ie}$$

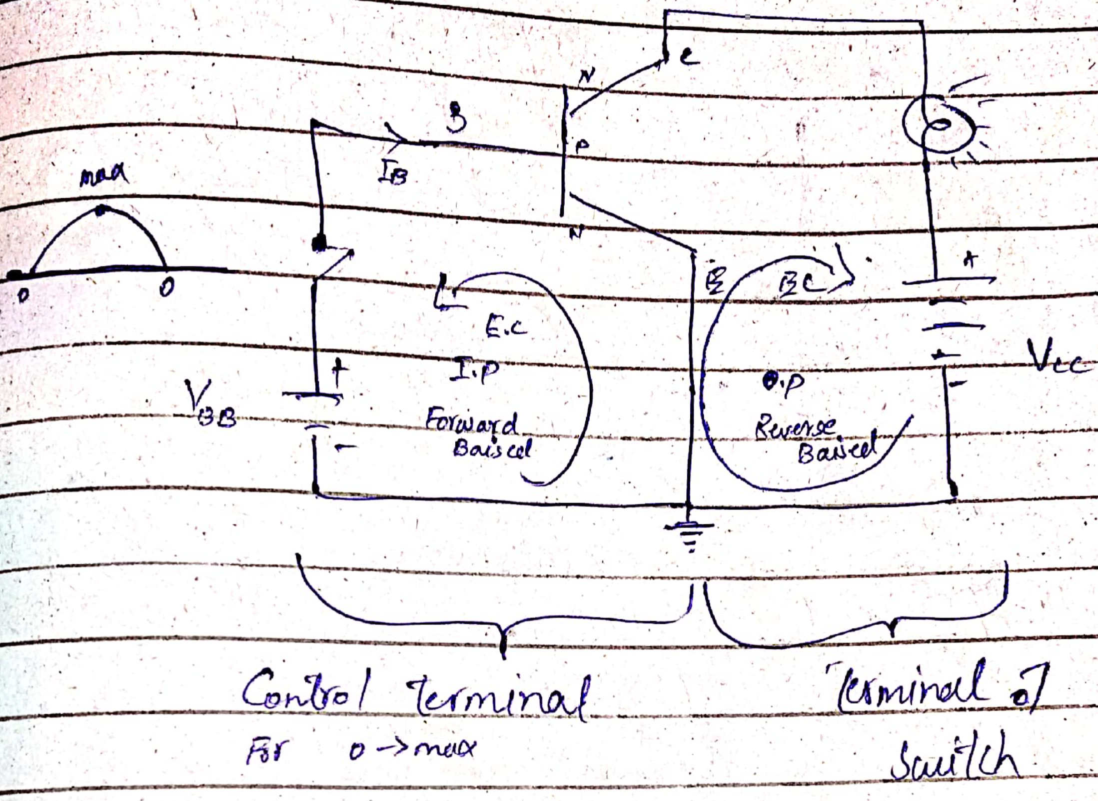
$$\frac{V_{out}}{V_{in}} = \frac{\beta R_c}{r_{ie}}$$

$$V.G = \frac{\beta R_c}{r_{ie}}$$

∵ $V.G$ is voltage gain

$$V_G = \frac{V_{out}}{V_{in}}$$

Transistor as Switch



For 0 -> max

$$\beta = \frac{I_c}{I_B}$$

$$I_c = \beta \times I_B$$

For max -> 0

$$I_c = B \times I_B$$

$I_B = 0$

$$I_c = B \times 0$$

$$\boxed{I_c = 0}$$

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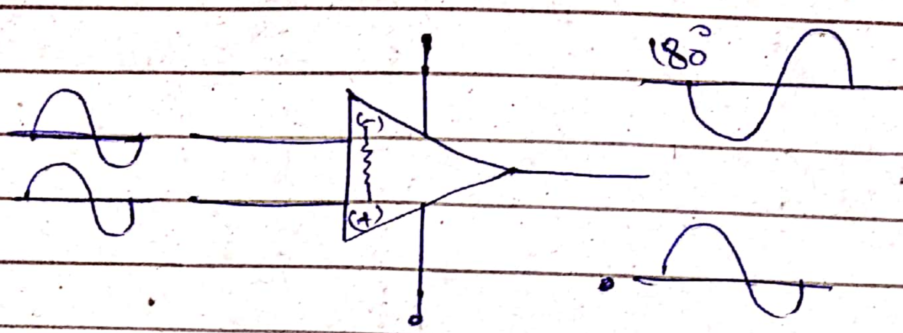
25/02/2020

Physics

Op-Amplifier



1) Higher Input Impedance (Several Mega Ω)

2) Output Resistance should be low (few $m\Omega$)

3) Open loop gain should be very high ($\approx 10^5$)

$$A_{OL} = \frac{V_o}{V_{in}}$$

$$A_{OL} = \frac{V_o}{V_+ - V_-}$$

$$(10^5 \approx)\ A_{OL} \propto \frac{1}{V_+ - V_-}$$

$A_{OL} \approx 10^5$

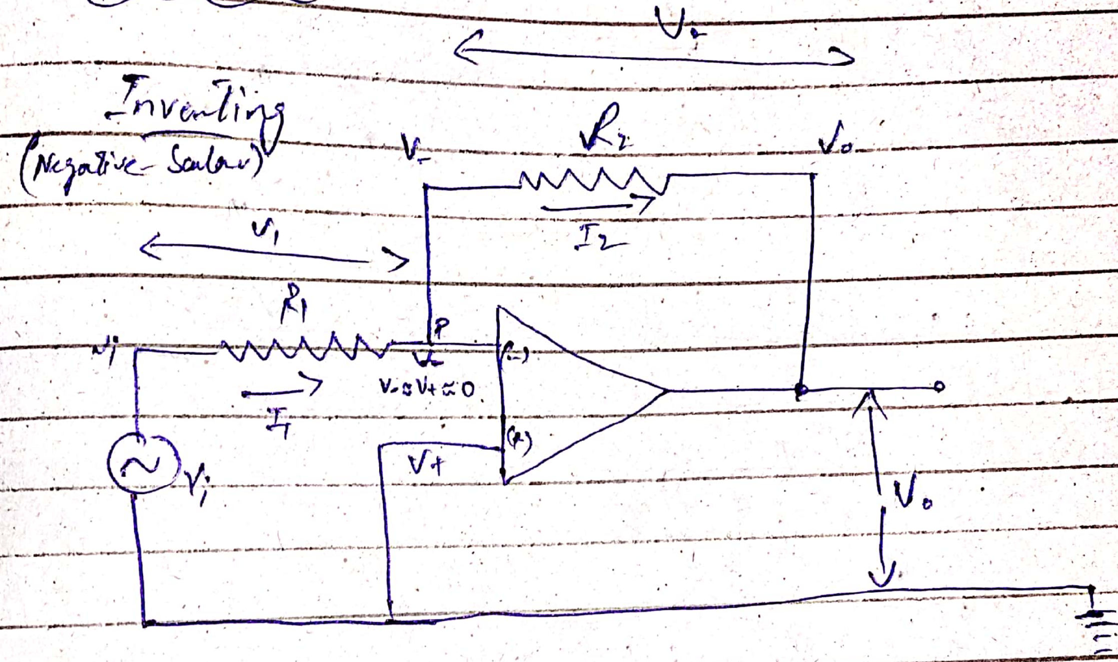
$V_+ - V_- \approx 0$

When there is no feedback from output to input terminal then it would be a open loop gain

When there is feedback from output to input terminal then it would be a close loop gain.

Application

Inverting
(Negative Scalar)



At point P
Acc to Kirchoff rule

$$I_1 = I_2$$

$$\frac{V_1}{R_1} = \frac{V_2}{R_2}$$

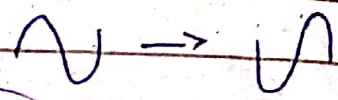
$$\frac{V_i - V_-}{R_1} = \frac{V_- - V_o}{R_2}$$

$$\frac{V_i - V_+}{R_1} = \frac{V_+ - V_o}{R_2} \quad \Rightarrow \quad \frac{V_o}{V_i} = -\frac{R_2}{R_1}$$

$$\frac{V_i - 0}{R_1} = \frac{0 - V_o}{R_1} \quad \Rightarrow \quad \boxed{G = -\frac{R_2}{R_1}}$$

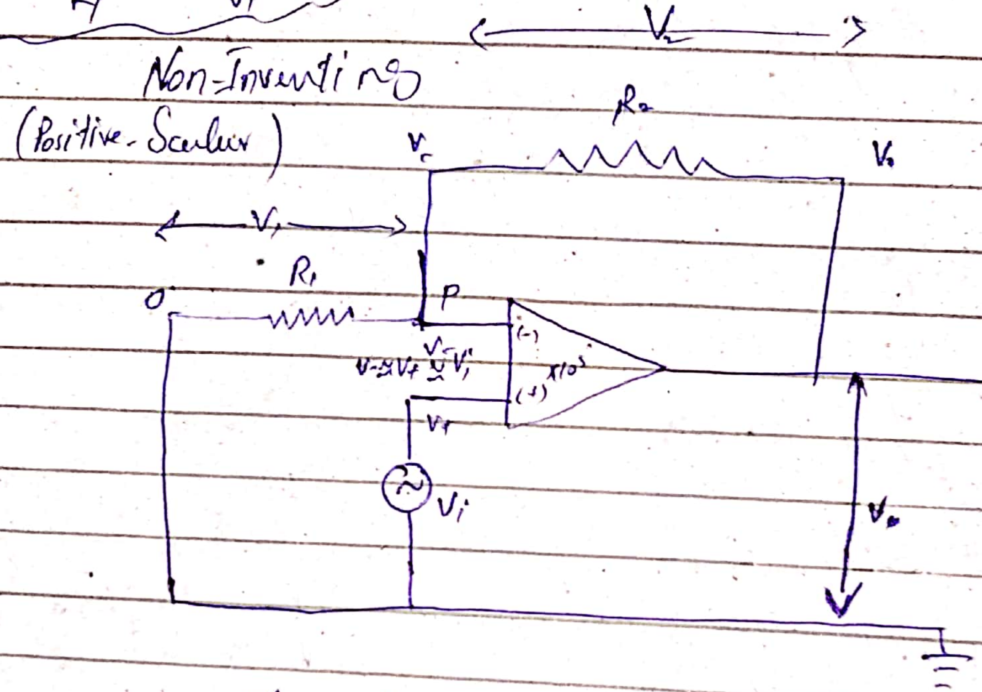
$$\frac{V_i}{R_1} = -\frac{V_o}{R_2}$$

∵ -Ve sign shows inverted signal or 180° phase diff



$$\frac{R_2}{R_1} = -\frac{V_o}{V_i}$$

Non-Inverting
(Positive Scalar)



at point p
acc to Kirchoff rule

$$I_1 = I_2$$

$$\frac{V_1}{R_1} = \frac{V_2}{R_2}$$

$$\frac{0 - V_-}{R_1} = \frac{V_- - V_o}{R_2}$$

$$\frac{0 - V_+}{R_1} = \frac{V_+ - V_o}{R_2}$$

$$\frac{0 - V_i}{R_1} = \frac{V_i - V_o}{R_2}$$

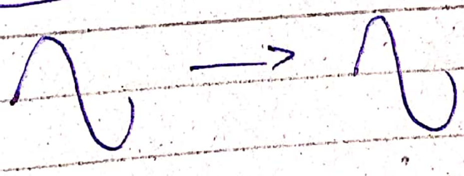
$$\frac{-R_2}{R_1} = \frac{V_i - V_o}{V_i}$$

$$\frac{-R_2}{R_1} = \cancel{\frac{V_i}{V_i}} - \frac{V_o}{V_i}$$

$$\frac{-R_2}{R_1} = 1 - \frac{V_o}{V_i}$$

$$\Rightarrow \frac{V_o}{V_i} = 1 + \frac{R_2}{R_1}$$

$$\Rightarrow \boxed{A_v = 1 + \frac{R_2}{R_1}}$$



03/02/2020

Physics

Optical Fiber

long

Charles $ cun
Jorge A Holman

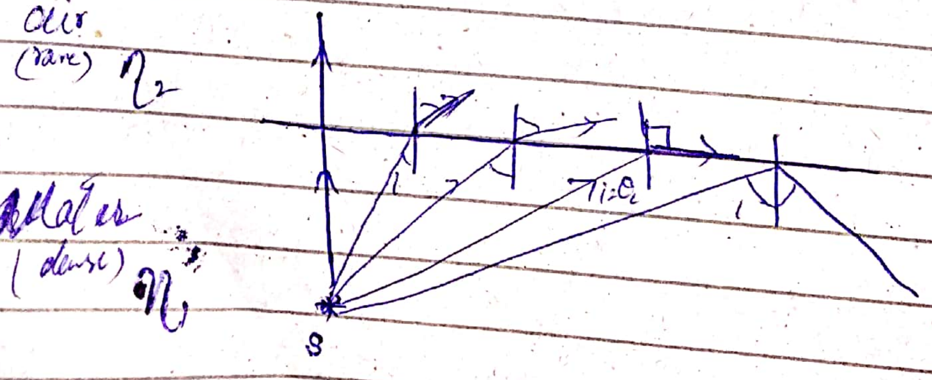
Principal

1- Total Internal Reflection
2- Continous Refraction.

The medium in which speed of light is lesser than speed of light in air is called optical denser medium

Refractive Index

$$\eta = \frac{C \text{(speed of light in air)}}{V \text{(speed of ligh in medium)}}$$



when angle of incedence becomes greater than critical angle then all the rays reflect back into the same medium.

Condition

1) Light should travel from denser to rare medium

2) $\theta_i > \theta_c$

Q: What are conditions for total internal reflection.

Q: What are two principals of an optical fiber

Q: What is a refractive index

To find critical angle

Using snell's law

$$n = \frac{1}{\sin\theta}$$

$$n\sin\theta = 1$$

$$n_1\sin\theta_1 = n_2\sin\theta_2$$

$n_1 \sin\theta_1 = n_2 \sin\theta_2$

$\theta_1 = \theta_c$ when $\theta_2 = 90^\circ$

(angle of incidence) (critical angle) (angle of refraction)

$n_1 \sin\theta_c = n_2 \sin 90^\circ$

$n_1 \sin\theta_c = n_2 (1)$

$\sin\theta_c = \dfrac{n_2}{n_1}$

$$\boxed{\theta_c = \sin^{-1}\left(\frac{n_2}{n_1}\right)}$$

For ~~water~~ water air boundary

$\theta_c = \sin^{-1}\left(\dfrac{1}{1.33}\right)$

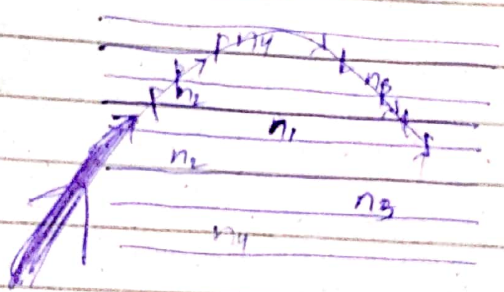
$\Rightarrow \theta_c =$

For glass air boundary

$$\theta_c = \sin^{-1}\left(\frac{1}{1.5}\right)$$

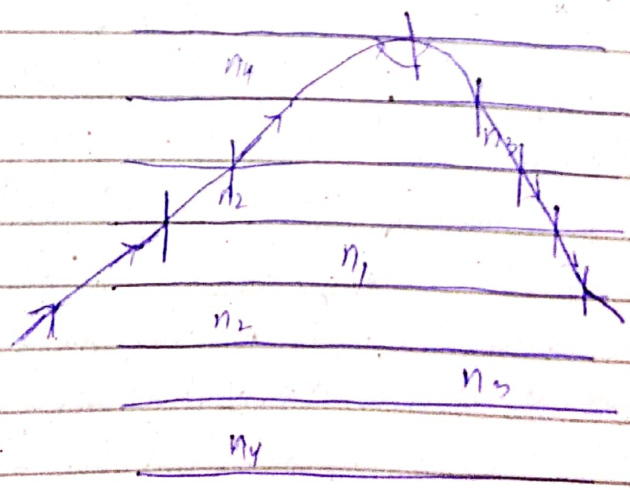
$$\Rightarrow \underline{\theta_c = 41.8^\circ}$$

2- Continous Refraction



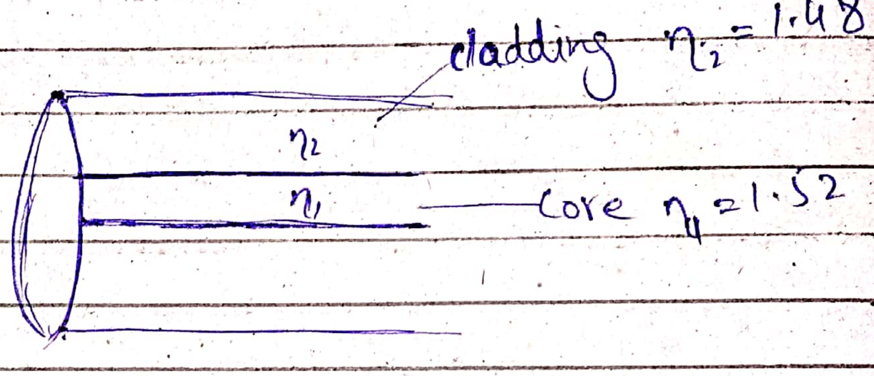
$n_1 > n_2 > n_3 > n_4$

(This phenomen is called continous refraction.)



Construction

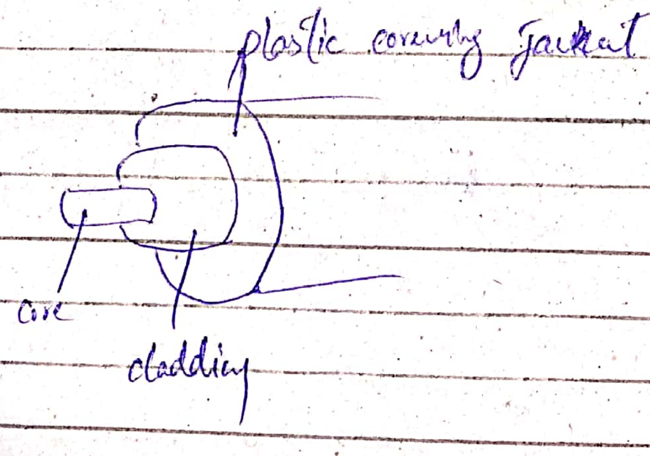
Optical fiber made from pure silica SiO_2

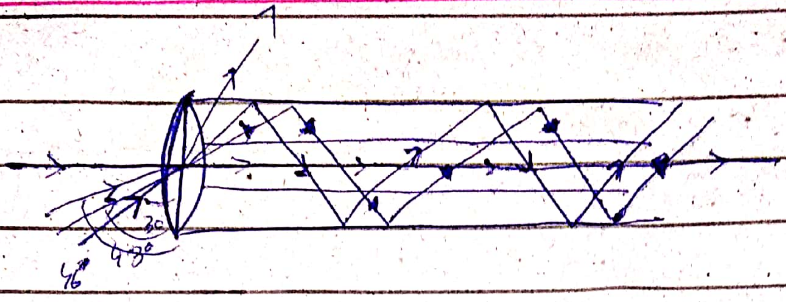


$\eta_1 > \eta_2$

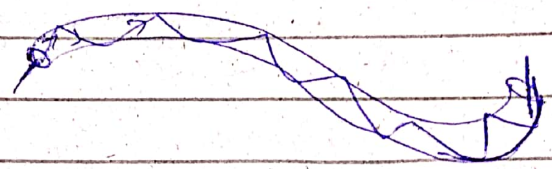
To increase η optical fiber is doped with 'Ge'

" decrease η " " " " " Boron 'B'



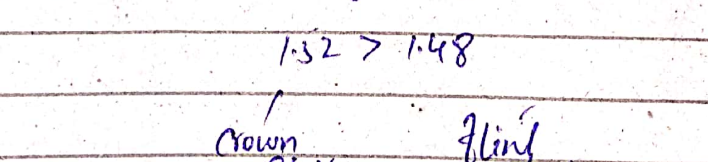


Glass optical fiber
$\theta_c = 41.8°$



Types
1) mono mode step index fiber
2) multimode step index fiber
3) multimode graded index fiber

Monomode Step Index fiber



$\eta_1 > \eta_2$

1.52 > 1.48

crown glass   flint glass

η_1 & η_2 will be constant throughout the core & cladding

η Step downs as — 1.52 > 1.48
that's why called step index - -

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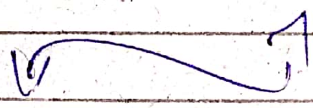
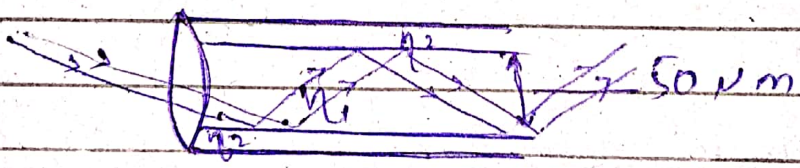
White light can't pass through it.
Only Strong, monochromatic, cohertic, Intense beam laser ligh can pass through it

Capacity
can operates { 14 TV chaneel
14000 Telephones calls



② Multimode Step Index fiber



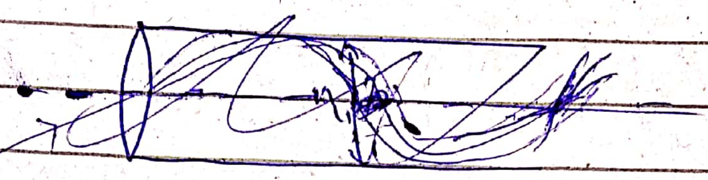
$\eta_1 > \eta_2$

=> Step down ($\eta_1 > \eta_2$)

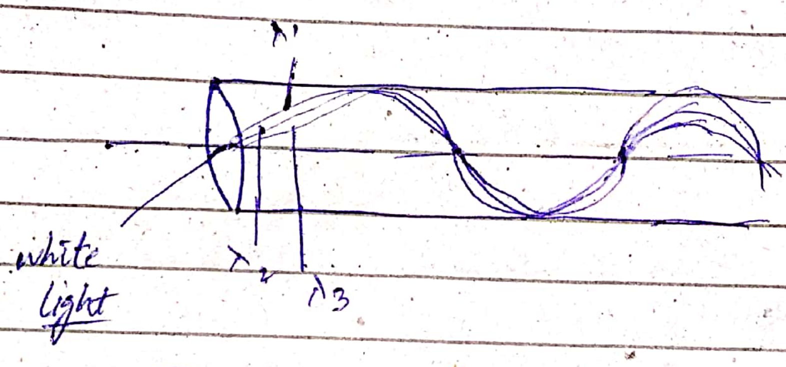
Can operate on white light

Drawback
Distorted signals due to diff in λ & v of colours of white light

③ Multimode graded index fiber



n_1 decreases as we move towards outer boundary from the centre.



Power loss

Due to scattering

joints of the fibre

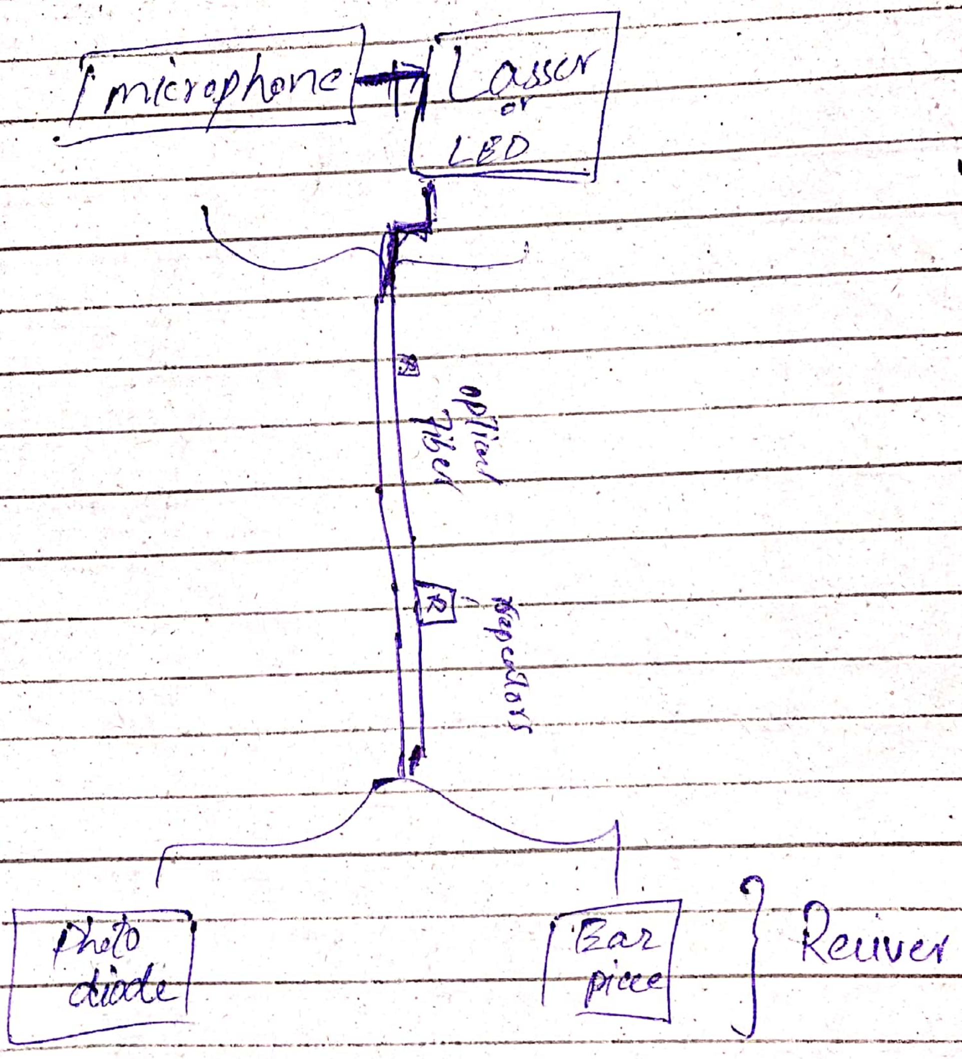
Due to dispersion of white light.

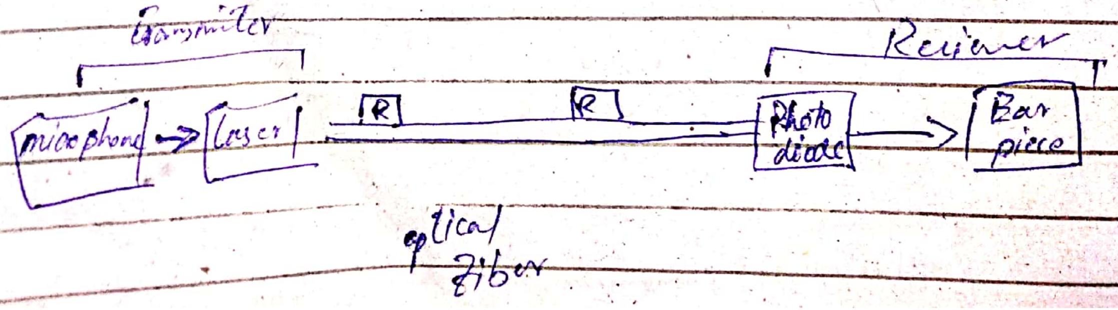
Uses

Fiber Optic Communication

Transmitter

Converts Electrical pulses into light signals





Guess

1) PN-Junction Rectification
2) Transistor configurations & characteristics (I/O)
3) Transistor as an Amplifier
4) Diode (Forward & Reverse Baising)
5) Operation Amplifer characteristics
Inverting and Non-Inverting

6) Capacitor & Capacitance
7) Capacitor, Resistor in Series & Parallel
8) Transformer complete
9) Optical Fiber, Types, Communication System

10) Energy Band Theory
11) Classification of Conductor, Insulator & Semiconductor on the basic of EBT.

12) Intrinsic & Extrinsic Semiconductor.
13) Types of Extrinsic Semiconductor

14) Variable Resistor
Rehostate, Potentiometer, Potential Divider

Q: What is breakdown voltage in a Reverse Baised PN-Junction.
Q: Diff b/w avolunch & Zeenar current
Q: Can a transformer operate on DC?
Q: Eddy Loss & Hystersis loss in Transformer?
Q: How power is Transfered from Primary to Secondary coil?
Q: Can a pure Semi Conductor obey's Ohm's law.
Q: Draw symbols of air core, Feritcore, iron core Inductor?