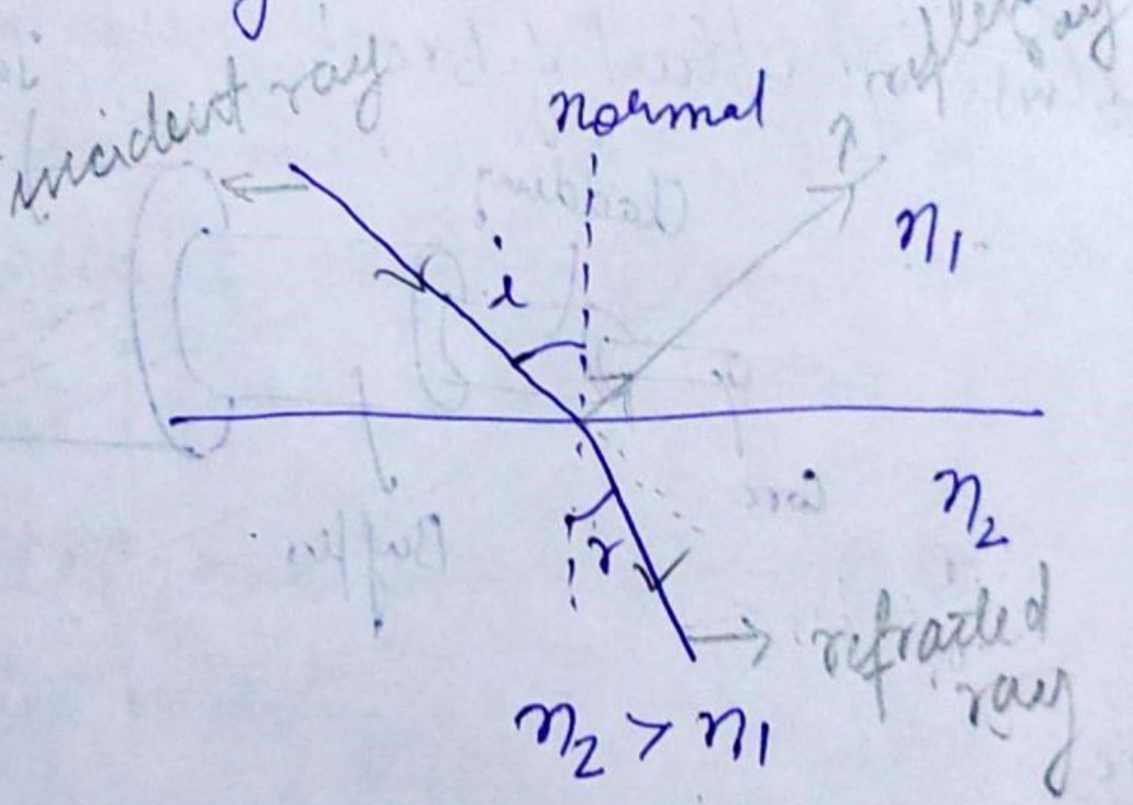
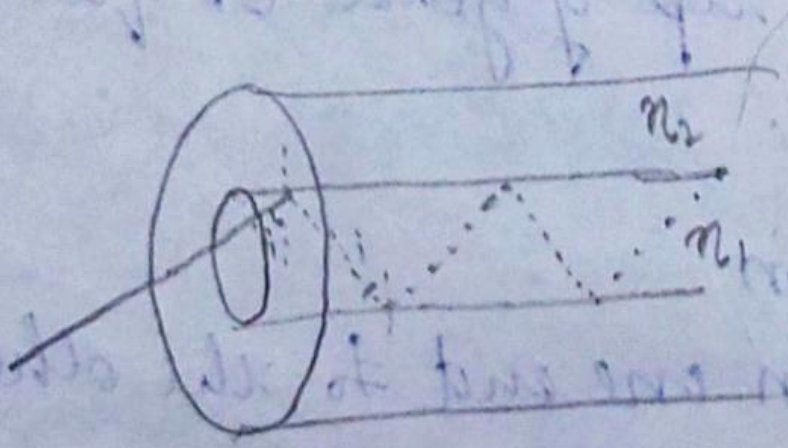
Working Principal

Snell's Law.

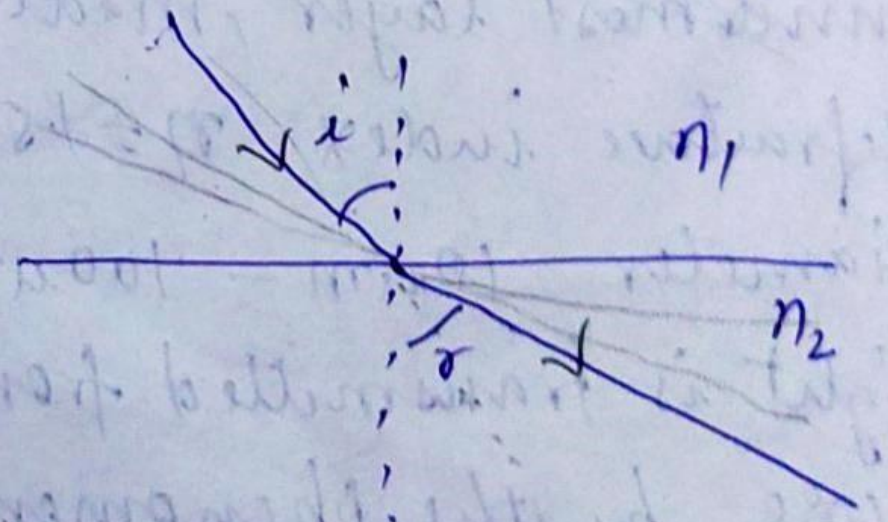
$$n_1 \cdot \sin i = n_2 \cdot \sin r$$

$$\frac{n_1}{n_2} = \frac{\sin r}{\sin i}$$





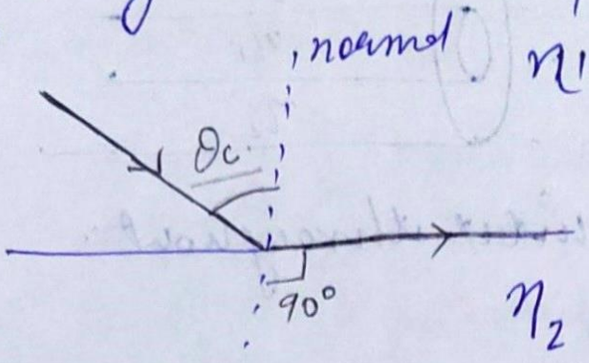
$n_1 > n_2$



$n_1 > n_2$

In case ② when $n_1 > n_2$, as the incidence angle '$\angle i$' is increased, the refracted ray moves away from the normal.

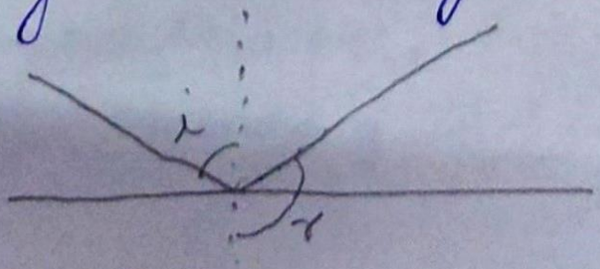
+ And at a certain angle say '$\angle \theta_c$', the refracted ray will become perpendicular to the normal.



This angle 'θ_c' at which, the refracted ray becomes perpendicular to the normal is called critical angle.

→ Now, if the incident angle, $\angle i$ is more than the critical angle $\angle \theta_c$, then the light is completely reflected, there is no refraited ray in this case. This phenomenon is called Total Internal Reflection (TIR).

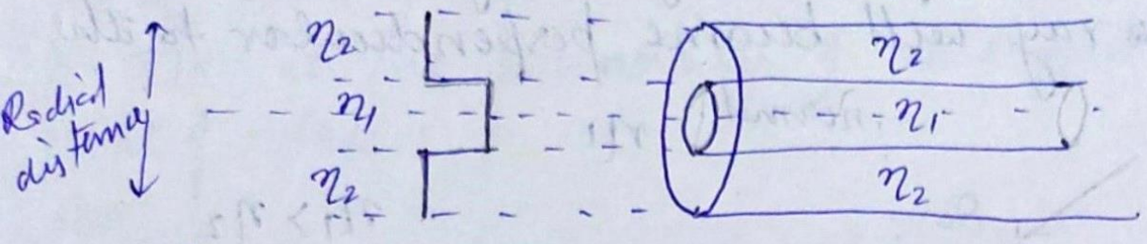
→ This effect is used in optical fibre to bound the light in the core. This light ray is made to enter the fibre at angle greater than θ_c, and it travells through the core by the phenomenon of TIR.



Types of optical fibre

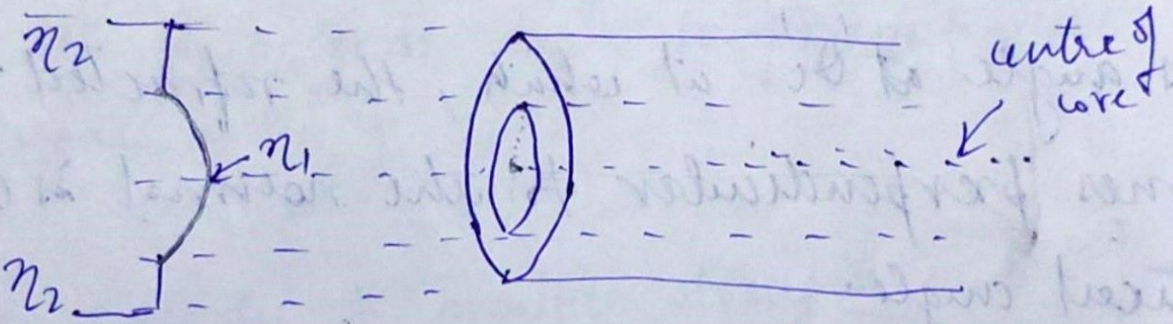
① On the basis of refractive index of core.

a)- step Index.

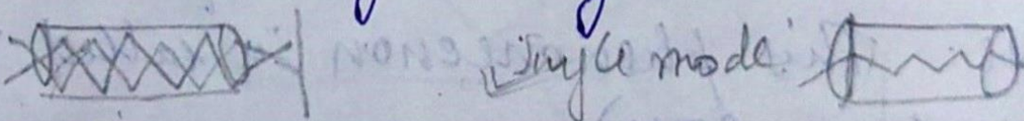


→ constant refractive index throughout.

b)- Graded Index



→ refractive index is maximum at the centre of the core, and then from centre of the core, the refractive index decreases gradually inside the core.



② On the basis of modes and refractive index.

a)- Single mode step index fibre

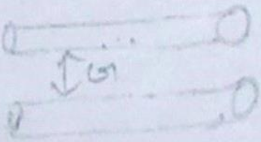
b)- Multimode step index fibre

c)- Multimode Graded index fibre

Transmission line parameters.

→ It is important to describe a transmission line in the terms of line parameters, in order to study the transmission lines and its analysis.

→ There are two parameters of transmission line Primary and Secondary.



→ Primary parameters are distributed elements.

i)- Resistance per unit length (R), Ω/m $R = R/\ell$

ii)- Inductance per unit length (L) H/m

iii)- conductance per unit length (G) ℧/m

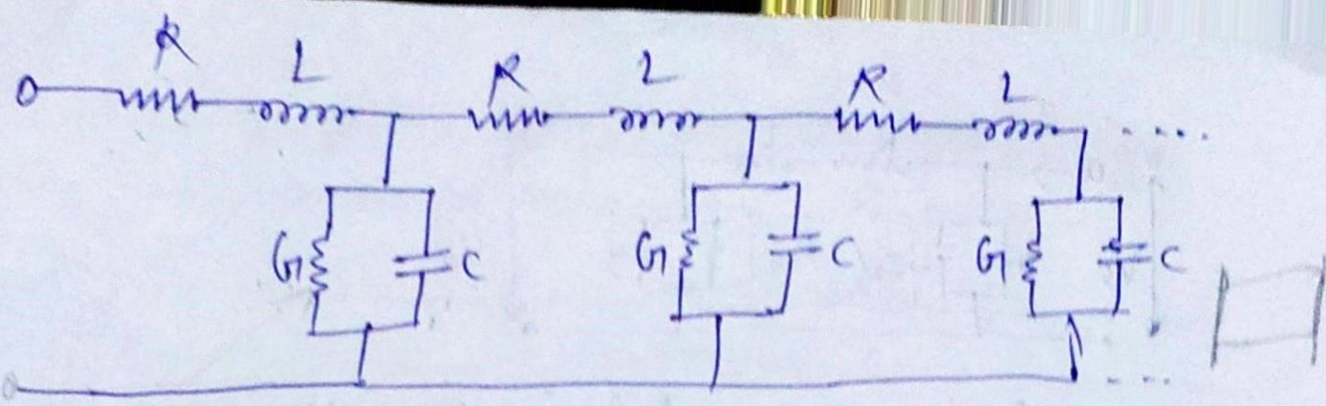
iv)- Capacitance per unit length (C) F/m

Notes-

i)- R, L, G, C are distributed, and NOT lumped or discrete. It means that the elements are uniformly distributed along the entire length of line.

ii)- $G \neq 1/R$. R = resistance/unit length of the conductor

G = conductance/unit length of dielectric.



Distributed parameters of Transmission line-section.

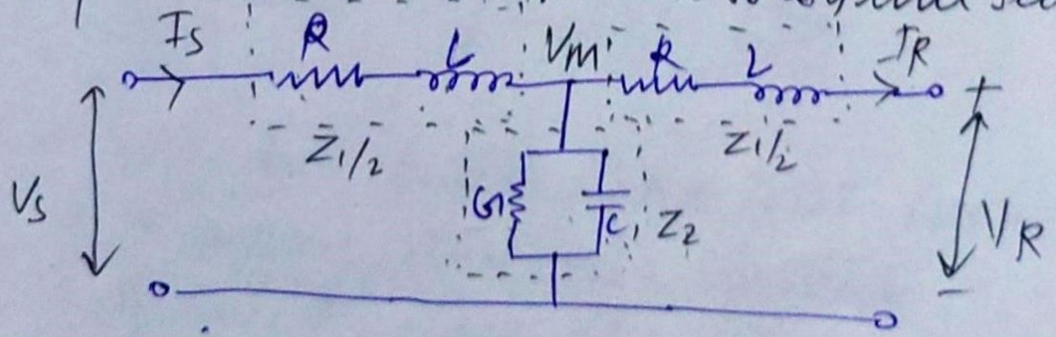
Secondary constants:

a) Characteristic Impedance (Z_0) → unique impedance with which if the line is terminated, the impedance value anywhere on the line is the same equal to Z_0.

→ If the line is terminated with Z_0, then it is said to be matched.

b) Propagation constant (γ) → measure of change in amplitude and phase of the E-M wave in a T-line, as the wave travels through it.

T and π representation a transmission line section.



T-section of a transmission-line section

$Z_1/2 = R + j\omega L$, $Z_2 = G + j\omega C$.