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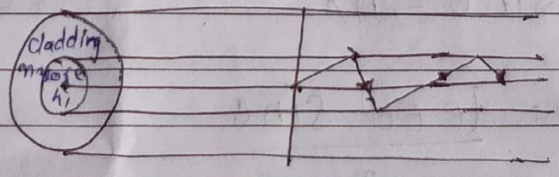
(2) What do you understand by modes of an optical fibres? Discuss propagation of light in single mode, multimode and geraded index fibre.

Ans: Optical fibre: optical fibre consists of a core surrounded by a cladding and a sheath. It is a thin, transparent and flexible stand. It is made up of glass or plastic. It works on the principle of total internal reflection.

Single mode:

(1) In this fibre, the core of a fibre is made so small that only one ray of light can enter the core and get guided by the total internal reflection thence the name single mode.

This will be the only ray of light or mode that can enter the core at such a shallow angle.



Different fibre designs have a specific wavelength called cut off wavelength above which it carries only one mode.

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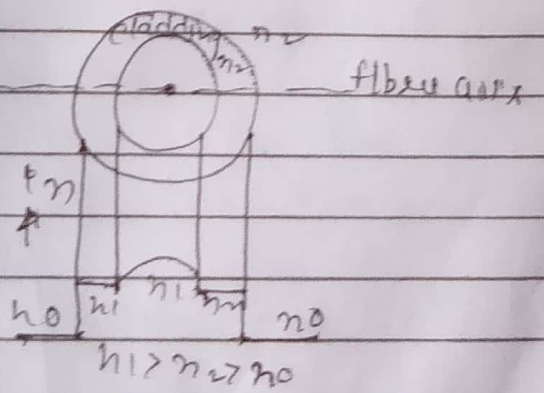
multimode graded

In this the material in the core is modified so that the refractive index profile does not exhibit step index change but a parabolic refractive index profile which is maximum at the fiber axis.

In this fiber index of refraction has a maximum value n_1 at the axis and lower values falling of gradually and hence the name graded index is given to the fiber.

Since the light travels faster in a medium with lower refractive index, the light ray which is farther from the fiber axis travels faster than the ray which is nearer to the axis. Light rays are curved towards the fiber axis by refraction. Light rays periodically diverge and converge along the length of the fiber.



Graded Index fibers:- In graded index fiber, the index of refraction in the core decreases continuously unlike in multimode step index fibers the refractive index of a core has a constant value. Therefore graded index fiber is better than multimode step index fibers.