Experiment no. 3

Aim: To study refractive index profile for step index and graded index fiber

Lab Outcome: Acquire proficiency in identifying the different types of fibers and understanding their properties.

Software: Scilab

Theory:

a) Step index fiber: Refractive index of the core is constant throughout core diameter. Refractive index profile can be described as:

$$n(r) = \begin{cases} n_1 & r < a \quad \text{(core)} \\ n_2 & r \geq a \quad \text{(cladding)} \end{cases}$$

b) Graded index fiber: Refractive index in the core is not constant but it is maximum at center (n1) and then it decreases gradually towards the periphery of the core and then in the cladding it is constant(n2). Refractive index profile can be described as:

$$n(r) = \begin{cases} n_1(1 - 2\Delta(r/a)^{\alpha})^{\frac{1}{2}} & r < a \quad \text{(core)} \\ n_1(1 - 2\Delta)^{\frac{1}{2}} = n_2 & r \geq a \quad \text{(cladding)} \end{cases}$$
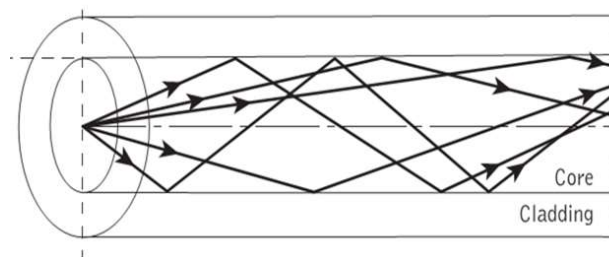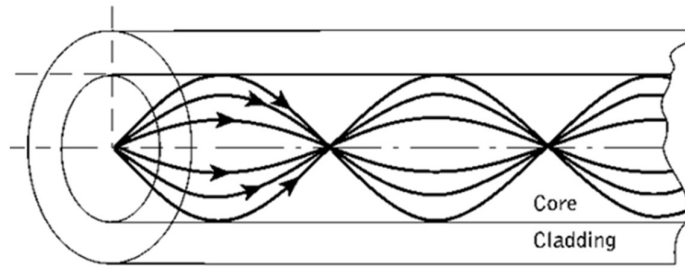
Where, α: profile parameter
a: radius of fiber core
Δ: Relative refractive index difference

c) Ray propagation through step index and graded index fibers:

Ray transmission in Multi-mode step index fiber:

Core
Cladding

Ray transmission in Multi-mode graded index fiber:

Core

Cladding

Problem statement:

Write a program to plot refractive index profile for step index and graded index fiber.

   a) If fiber is step index plot RI as a function of radial distance.
   b) If a fiber is graded index, plot RI as function of radial distance for alpha=1,2,3 and 15

Program:

Attach printouts of program and output.

Conclusion: