Q4. A typical relative refractive index difference for an optical fiber is 1%. Estimated the numerical aperture and the critical angle at the core cladding interface if the core refractive index is 1.46.

Given:- Δ=0.01; μ_1=1.46

Formula:- $\Delta=\frac{\mu_1-\mu_2}{\mu_1}$; N.A.= $\mu_1\sqrt{2\Delta}$; $\varphi_c = \sin^{-1}\frac{\mu_2}{\mu_1}$

Solution:- N.A.=1.46(2 x 0.01)$^{1/2}$ = 0.2064

Δ= 1- $\frac{\mu_2}{\mu_1}$

$\frac{\mu_2}{\mu_1}$ = 1- Δ = 0.99

φ_c=sin^{-1}0.99 = 81.89^o

Ans:- The N.A. is 0.2064 and the critical angle is 81.89^o.