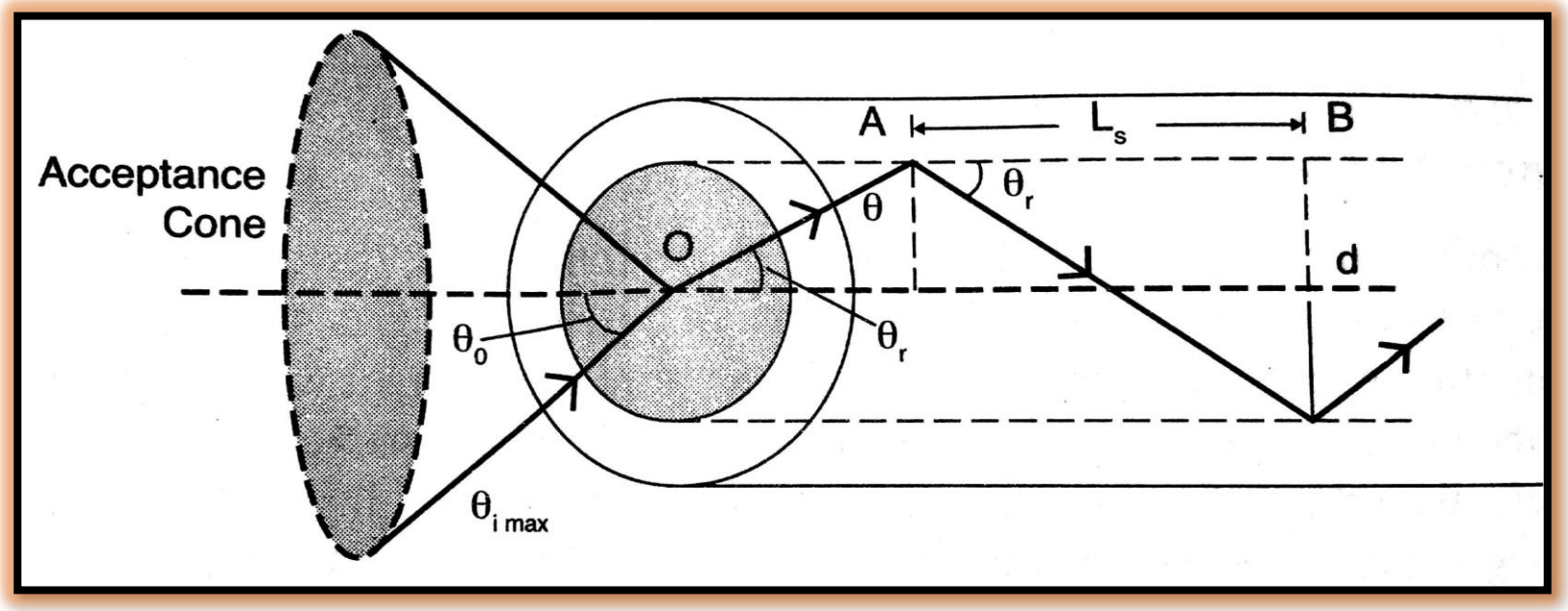
Engineering Physics
PHY-109

Tutorial Class

From Unit III: Fibre optics



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Unit III: Fiber optics

- **fiber optics introduction, optical fiber as a dielectric wave guide, total internal reflection, acceptance angle, numerical aperture, relative refractive index, V-number, step index and graded index fibers, losses associated with optical fibers, application of optical fibers**

Q1. The acceptance angle in terms of refractive index of core (μ_1) and cladding (μ_2), when the end face of an optical fibre is exposed by the air is equal to

(A) $\sin^{-1}(\mu_1^2 - \mu_2^2)$

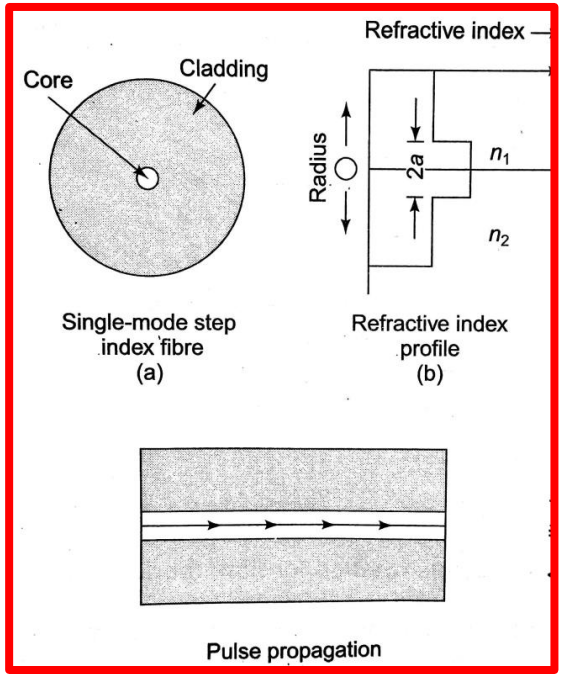
(B) $\cos^{-1}(\mu_1^2 - \mu_2^2)$

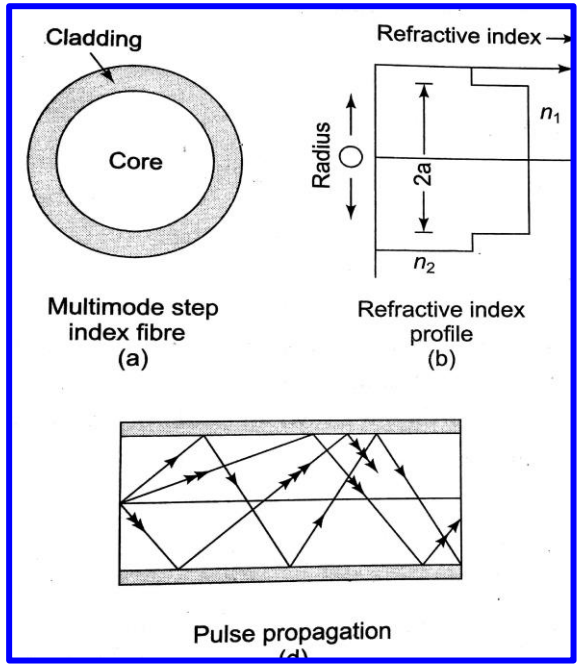
(C) $\sin^{-1}\sqrt{(\mu_1^2 - \mu_2^2)}$

(D) $\sin^{-1}\sqrt{(\mu_2^2 - \mu_1^2)}$

Q2. Modal dispersion in a SMSI fibre is

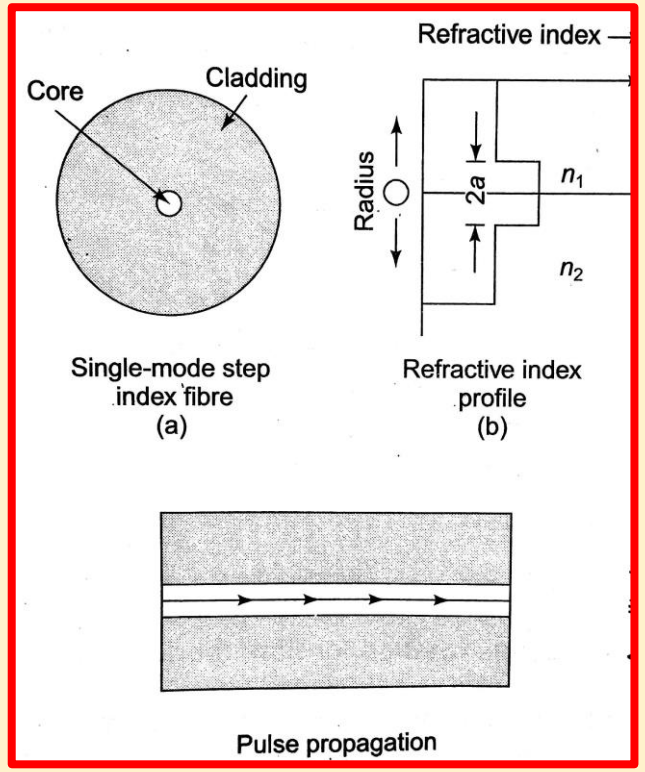
(A) Greater than MMSI
(B) Equal to MMSI fibre
(C) Very less than MMSI fibre



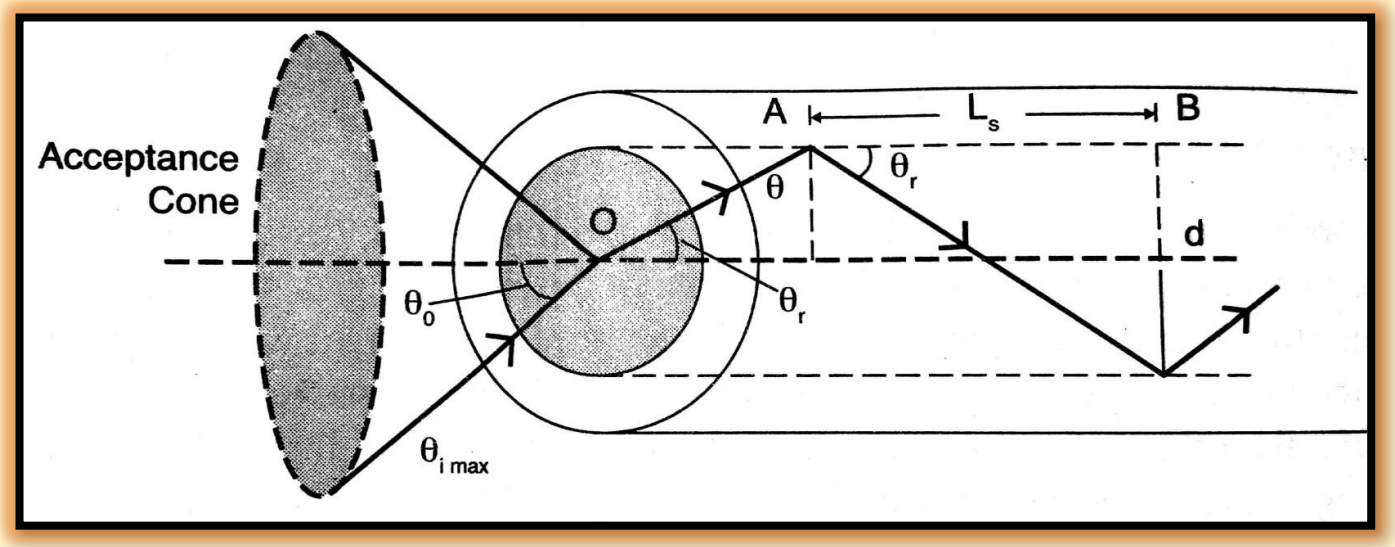


Q3. In single mode fibre the typical diameter of the core is around

(A) 125 µm -225 µm
(B) 90 µm -120µm
(C) 50 µm -80 µm
(D) 5 µm -10 µm



Q4. A step-index fibre (n_{core}= 1.425 and $n_{cladding}$=1.417) has numerical aperture of 0 .151 . The acceptance angle for light entering the fibre from air is found to be 8.50°. If the fibre were submersed in water then the value of numerical aperture of the fibre will



(A) be increased
(B)be decreased
(C) remain the same
but the acceptance angle will be decreased

Q5. By increasing the refractive index of core, the number of modes of propagation in an optical fibre cable

(A) remains unchanged

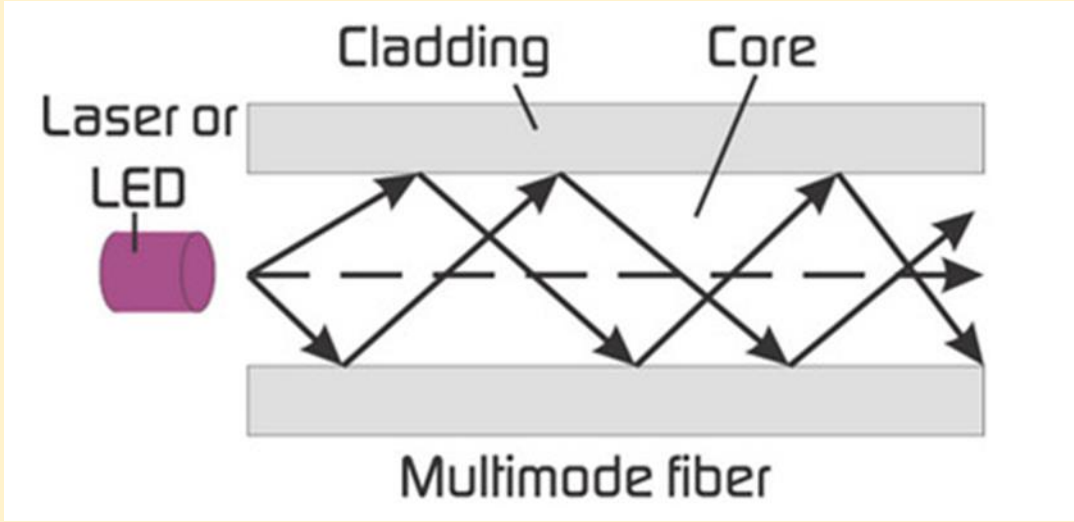
(B) increases

(C) decreases

(D) none of these

Q6. How many modes can propagate in a step-index fibre with a core diameter as 40 micro meter, if the refractive indices of its core and cladding are 1.461 and 1.456, respectively, and the light of wavelength is 8500 Å?

(A) 200
(B) 278
(C) 159
(D) None of the above



Q7.A signal of power 5 mW exists just inside the entrance of 0.1 km long fibre. If the power on the other end of the fibre is 1 mW, then the attenuation coefficient of the fibre is

(A) 69.89 dB/km
(B) 6.989 dB/km
(C) 69.89dB/m
(D) 6.989 dB/m

Q8. A communication system uses a 10 km fibre having a loss of 2.3 dB/km. What is the value of the output power if the input power is 900 µW (calculate upto three decimal places) ?

(A) 0
(B) 4.510 µW
(C) 90.232 µW
(D) None of the above

How do you convert log to antilog?

1.Note the base of your logarithm. 2. **Raise both sides** of the equation to that base. 3.**This removes the logarithm**.

E.g., $y = \log_{10}(9)$ becomes $10^y = 9$.

Q9. In an optical fiber, the concept of Numerical aperture is applicable in describing the ability of _____

A. Light Collection

B. Light Scattering

C. Light Dispersion

D. Light Polarization

Q10. A step-index fibre has a numerical aperture of 0.26, a core refractive index of 1.5 and a core diameter of 100micrometer. What is the acceptance angle (consider the medium outside the optical fibre is water) ?

A) 1.47°

B) 15.07°

C) 2.18°

D) 11.33°