Optical Fiber Communication

Assignment 1

1. A light ray traveling in air (n1= 1.00) is incident on a smooth, flat slab of crown glass, which has a refractive index n2 = 1.52. If the incoming ray makes an angle of ɸ1= 30.0° with respect to the normal, what is the angle of refraction ɸ2 in the glass?
2. Consider a multimode silica fiber that has a core refractive index n1= 1.480 and a cladding index n2 = 1.460. Find (a) the critical angle, (b) the numerical aperture, and (c) the acceptance angle
3. Consider a multimode fiber that has a core refractive index of 1.480 and a core-cladding index difference 2.0 percent (∆ = 0.020). Find the (a) numerical aperture, (b) the acceptance angle, and (c)the critical angle.
4. A step-index fiber has a normalized frequency V = 26.6 at a 1300-nm wavelength. If the core radius is 25 µm, what is the numerical aperture?
5. Suppose we have a multimode step index optical fiber that has a core radius of 25 µm, a core index of 1.48, and an index difference ∆ = 0.01. What are the number of modes in the fiber at wavelengths 860, 1310, and 1550 nm?
6. An applications engineer has an optical fiber that has a 3.0-µm core radius and a numerical aperture of 0.1. Will this fiber exhibit single-mode operation at 800 nm?
7. Discuss different fiber materials used for the fabrication of optical fiber cable.
8. Explain fiber optic cables- structure, indoor and outdoor cables in detail.
9. Write short notes on the transmission wavelengths available for optical communications.