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GA—26—2023

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

APRIL/MAY, 2023

(CBCS/New Course)

PHYSICS

Paper XV

(Fiber Optical Communication)

(Wednesday, 26-4-2023)

Time : 10.00 a.m. to 12.00 noon

Time— Two Hours

Maximum Marks—40

N.B. :—All questions are compulsory.

1. Describe with the aid of simple ray diagram : 15
 - (i) The multimode step index fiber.
 - (ii) The single mode step index fiber compare the advantages and disadvantages of these two fiber for use as an optical channel.
A silica optical fiber has core refractive index of 1.5 and, cladding refractive index of 1.47.
Determine the critical angle at the core-cladding interface, the NA of the fiber and acceptance angle in the air for the fiber.

Or

 - (a) Describe Snell's law and total internal reflection. 8
 - (b) Explain the concept of acceptance angle and Numerical aperture and derive a relation between them. 7

2. Explain the working of Graded index fiber with the help of refractive index profile and ray transmission theory. Derive an equation for number of modes in graded index fiber. 15

P.T.O.

Or

- (a) Estimate the maximum core diameter for a optical fiber having relative refractive index difference 1.5%, the core refractive index is 1.48 the core diameter is 80 μm and it is operating at a wavelength of 0.85 μm . Estimate the normalized frequency. 8
- (b) Derive equation for cutoff wavelength for a single mode fiber. Determine the cutoff wavelength for a step index fiber to exhibit single mode operation when the core refractive index and radius are 1.46 and 4.6 μm respectively with the relative refractive index difference being 0.3%. 7
3. Write short notes on (any two) : 10
- (i) Advantages of single mode fiber
 - (ii) Intermodal dispersion in graded index fiber
 - (iii) Meridional and skew rays
 - (iv) Mode volume of step index fiber.