This question paper contains **2** printed pages]

## NA—18—2023

### FACULTY OF SCIENCE

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

### NOVEMBER/DECEMBER, 2023

### (CBCS/New Pattern)

PHYSICS

Paper–XV

(Fiber Optic Communication)

**(Wednesday, 6-12-2023)**          **Time : 10.00 a.m. to 12.00 noon**

*Time—2 Hours*          *Maximum Marks—40*

*N.B. :—*      *All* questions are compulsory.

1. What are different types of optical fiber ? Explain the propagation of light through all these fibers with the help of ray transmission theory.     15

*Or*

(*a*) Derive expression for the numerical aperture. When the meridional ray is launched into fiber.     8

(*b*) Describe skew rays and derive expression for numerical aperture when skew rays are launched in fiber.     7

P.T.O.

2. Describe 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

*Or*

(a) Derive an expression for cut-off wavelength for a single mode fiber. Determine the cut-off wavelength for a step index fiber to exhibit single mode operation. When the core refractive index is 1.46 μm and core radius is 4.5 μm with a relative index difference of 0.25%. 8

(b) A graded index fiber with an parabolic refractive index profile. The core has a refractive index of 1.5 and a relative index difference of 1%. Estimate the maximum possible core diameter which allow single mode operation of $\lambda$ = 1.3 μm. 7

3. Write short notes on any *two* : 10

(a) Total internal reflection

(b) Intermodel dispersion

(c) Advantages of single mode fiber

(d) Guided modes in graded index fiber.