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.