NY—44—2023

FACULTY OF SCIENCE

M.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2023

PHYSICS

Paper–PHY-401

(Fiber Optics and Optical Fiber Communication)

(Wednesday, 6-12-2023)   **Time : 2.00 p.m. to 5.00 p.m.**

Time—3 Hours   *Maximum Marks—75*

N.B. :— (i) *All* questions are compulsory.

(ii) Figures to the right indicate full marks.

1. Discuss propagation of light in an optical fiber. What is the basic structure of optical fiber ? Calculate velocity of light in an optically active region of a substance at 5000 Å and 6500 Å. Compute the corresponding frequencies. 15

Or

(a) Explain double crucible method for fabrication of fibers.   8

(b) Describe numerical aperture of an optical fiber.   7

2. Discuss in detail Rayleigh scattering losses and impurity losses in an optical fiber. Explain characteristics of photodetectors.   15

Or

(a) Explain photoemissive and photoconductive detectors.   8

(b) Describe electrical and optical bandwidths for dispersion in optical fiber. 7

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3. Describe in detail liquid level type hybrid sensor and internal effect intensity modulated sensor. Explain LED analog modulation in optical fiber communication. 15

Or

(*a*) Discuss digital laser transmitter. 8

(*b*) Explain diffraction grating and interferometric fiber optic sensors. 7

4. Discuss important applications of integrated optical fiber communication technology and long haul communication. 15

Or

(*a*) A fiber has numerical aperture of 0.30. What is the cut-off angle in degrees for this fiber, if it is surrounded by vacuum ? 8

(*b*) An optical fiber has core radius 4.5 μm, numerical aperture 0.12 and single wavelength 850 nm. Calculate fundamental mode MFD of the optical fiber. 7

5. Write short notes on any *three* :

(*a*) Number of modes and cut-off parameters 5

(*b*) Characteristics of photodetectors 5

(*c*) Pulse code modulation 5

(*d*) Cut-off wavelength measurements. 5