

[Duration: 3 hours]

[Max marks: 80]

N.B.: (1) Question No.1 is Compulsory.

(2) Attempt any three questions out of the remaining five.

(3) All questions carry equal marks.

(4) Assume suitable data, if required and state it clearly.

Q1. Attempt any four

- a. What is the Numerical aperture of a fiber? Explain its significance. (05)
- b. Explain different types of fibers with their refractive index profiles and mention their diameters. (05)
- c. Explain the Cut-off wavelength for a single-mode fiber. (05)
- d. What are Optical windows and mention attenuation in each window. (05)
- e. Explain the concept of Fiber Bragg Grating and its applications. (05)

Q2. a. An Optical fiber is made of a glass core of radius  $50\mu\text{m}$  with a refractive index of 1.55 and cladding with a refractive index of 1.51.

For the fiber, find.

- (i) Numerical Aperture (ii) Solid Acceptance angle
  - (iii) Normalized frequency  $V$  at  $0.8\mu\text{m}$ .
  - (iv) Number of modes that the fiber can support at  $0.8\mu\text{m}$ . (10)
- b. What are the causes for signal attenuation in a fiber (10)
- Q3. a. Explain intramodal and intermodal dispersion in fiber. (10)
- b. Explain any one fiber fabrication process with a neat diagram. (10)

Q4. a. A 12 Km. long optical fiber link has a loss of 1.5 dB/Km

- (i) What is the minimum optical power that must be launched into the fiber to maintain an optical power of  $0.3\mu\text{W}$  at the receiving end. (10)
  - (ii) What is the required input power if the fiber has a loss of 2.5dB/Km (10)
- b. Explain different types of optical Amplifiers. (10)

Q5. (a) Explain SONET architecture. Draw the SONET frame and determine.

its bit rate .

(10)

(b) With the help of neat diagrams, explain Couplers, Circulators, Isolators and Fiber Bragg Gratings.

(10)

Q6. Write short notes on any two:

- (a) Protection mechanism in optical network
- (b) Quantum efficiency, Responsivity and long wavelength Cut off for photodetector.
- (c) FTTH network

(20)