

- N.B. : (1) Question No. 1 is compulsory.
 (2) Attempt any four questions out of remaining six questions.
 (3) Any assumptions made should be clearly stated.

1. Answer the following questions in brief :- 20
- Explain optical communication with block diagram.
 - What are the advantages of optical communication over electrical communication.
 - Compare dark current with optical current.
 - Explain the importance of numerical aperture in the analysis of optical fiber.
 - What do you mean by linearly polarised optical wave. How they are different from circularly polarised wave.

2. (a) Draw the structure of Avalanche Photo Diode (APD) alongwith electrical field profile that exist in the various regions of APD structure. Explain the working and also explain why it is also called reach through APD (RAPD). 10
- (b) Differentiate between the following terms in context with optical communication : 10
- GIF and SIF
 - Optical source and photo-detector
 - Coherent and non-coherent optical transmission.

3. (a) For GIF, prove that :- 10

$$M = \frac{\alpha}{(\alpha + 2)} a^2 k^2 n_1^2 \Delta$$

Where :
 M = bounded mode
 α = index profile
 a = radius of core
 k = propagation constant in free space
 n_1 = core refractive index
 Δ = relative refractive index variation.

- (b) Find the core radius necessary for single mode operation at 820 nm of SIF with $n_1 = 1.480$ and $n_2 = 1.478$. What is the numerical aperture and maximum acceptance angle of this fiber ? Also calculate the corresponding solid angle. 10
4. (a) Explain any one fiber fabrication process with a neat diagram. 10
- (b) Explain with neat sketches fiber splicing techniques. Enlist the desirable requirements of a good fiber connector. 10
5. (a) Discuss the operation of a si-RAPD. Compare it with PIN diode. Outline the advantages and disadvantages of RAPD as a optical demodulator. 10
- (b) A photodiode has a quantum efficiency of 65% when a photon of energy of 1.5×10^{-19} J are incident upon it : 10
- At what wavelength is the photodiode operating.
 - Calculate the incident optical power required to obtain a photo current of $2.5 \mu\text{A}$ when the photodiode is operating as above.
6. Explain the various factors responsible for optical signal attenuation and dispersion while propagating through optical fiber. 20

7. Write notes on any four :- 20
- Optical link power budget
 - Multiplexing of optical signal
 - Wave propagation in GIF
 - OTDR-Meter
 - Amplifiers used with optical fiber (transmitter and receiver).