

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM**IV B. Tech I Semester Advanced Supplementary Examinations March 2025****OPTICAL COMMUNICATION**

(Electronics & Communication Engineering)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from Each unit
All Questions Carry Equal Marks

UNIT-I

1. a) Write about the historical development of Optical Fiber Communications. [7M]
List out its major applications being used in our daily life.
 - b) Derive about the cutoff wavelength of a single mode fiber? [7M]
- (OR)
2. a) The refractive index of the core of step index fiber is 1.46 and the relative refractive index difference between core and cladding of the fiber is 2%. Estimate (i) Numerical Aperture (ii) Critical angle at the core cladding interface within the fiber. [7M]
 - b) Explain about Ray Theory Transmission and how it applies to optical fiber communication. [7M]

UNIT-II

3. a) What are the different types of fiber materials used in optical communication, and mention their applications? [7M]
 - b) What is the concept of Intermodal Dispersion and how it affects signal transmission. [7M]
- (OR)
4. a) Describe the process of Pulse Broadening in Graded Index Fibers? [7M]
 - b) Discuss the core and cladding losses in optical fibers, and how they can be minimized. [7M]

UNIT-III

5. a) Compare the performance of Single Mode Fiber Connectors and Multimode Fiber Connectors? [7M]
 - b) Explain about the Splicing Techniques used for single-mode fiber. [7M]
- (OR)
6. a) List out the factors affecting the performance of Fiber Joints. [7M]
 - b) How does Connector Return Loss impact the overall system performance? [7M]

UNIT-IV

7. a) Compare the key properties of Optical Detectors such as PIN diodes and Avalanche Photodiodes (APD)? [7M]
 - b) Explain how temperature affects Avalanche Gain in APDs. [7M]
- (OR)
8. a) Compare LED and ILD in terms of structure, quantum efficiency, and power bandwidth. [7M]
 - b) Distinguish about the reliability concerns of LED and ILD in optical systems. [7M]

UNIT-V

9. a) Explain how Laser Diode to Fiber Coupling is achieved? Mention the challenges involved. [7M]
 - b) What are the factors influencing the performance of Analog Optical Receivers? [7M]
- (OR)
10. a) Explain the Link Power Budget in point-to-point optical systems with an example. [7M]
 - b) Describe Line Coding in Optical Links and its importance in data transmission. [7M]
