

Roll No.

Total Pages : 03

BT-7/D-19

37010

OPTICAL COMMUNICATION

ECE-405-E

Time : Three Hours]

[Maximum Marks : 100

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit.

Unit I

1. What do you mean by acceptance angle and numerical aperture of an optical fiber, show how is it related to refractive index of core and cladding of fiber ? Differentiate between the numerical aperture of meridional and skew rays. An optical fiber in air has NA 0.4; compare the acceptance angle for skew rays which changes direction by 100° at each reflection. **20**
2. (a) What is the structure of Optical fiber ? Differentiate between step index and Graded index fiber. How the rays do propagates in graded index fiber ? **10**
(b) What do you mean by Fiber Splices ? List different methods of splicing. Explain electric arc fusion splicing in detail. **10**

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Unit II

3. (a) Mention the reasons responsible for absorption in optical fibers. A continuous 12 km long optical fiber link has a loss of 1.5 dB/km. What is the minimum optical power level that must be launched into the fiber to maintain an optical power level of $0.3 \mu\text{m}$ at the receiving end ? **10**
(b) Define Scattering. Discuss in detail the linear scattering losses in optical fibers. **10**
4. Explain the different dispersion mechanisms in optical fibers along with the reasons responsible for them. Derive an expression for pulse spreading due to material dispersion. How does dispersion effect the data rate that can be transmitted through fiber. A multimode graded index fiber exhibits total pulse broadening of $0.1 \mu\text{s}$ over a distance of 15 km. Estimate : (i) The maximum possible bandwidth without ISI. (ii) Pulse dispersion per unit length. **20**

Unit III

5. (a) What is the Population Inversion ? Explain the different methods of achieving population inversion in LASER. **10**

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- (b) Explain the working principle of LED. How the quantum efficiency of a LED is defined ? Derive expression for quantum efficiency of LED. 10
6. What do you understand by Optical Detector ? Explain the construction and working of PIN photodetector. Also define absorption coefficient, responsivity and quantum efficiency of photodetector. 20

Unit IV

7. (a) Explain the working of 2×2 star coupler. 10
(b) What is WDM ? Define. 10
8. Write short notes on the following :
(a) Single hop and multihop networks 10
(b) Photonic networks. 10