

Roll No.

Total No. of Pages : 2

Total No. of Questions : 09

B.Tech. (ECE) (Sem.-7th & 8th)
OPTICAL FIBER COMMUNICATIONS

Subject Code : EC-404

Paper ID : [A0329]

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.

SECTION-A

1. Write briefly :

- a) What is total internal reflection and explain its importance for optical communication?
- b) What is group velocity dispersion?
- c) What do you mean by single mode and multimode fibers?
- d) What do you understand by coupling efficiency?
- e) How energy is lost from a leaky mode?
- f) In a 50ns pulse 6×10^6 photons at a wavelength of 1200nm fall on an InGaAs photodetector. On average 4.2×10^6 EHPs are generated. Calculate the quantum efficiency of photodetector.
- g) Draw the layer diagram of a pin photodiode.
- h) What is microbending? How can it be reduced?
- i) What do you mean by numerical aperture of fiber?
- j) What is frequency chirp?

SECTION-B

2. When 3×10^{12} photons each with a wavelength of $0.65\mu\text{m}$ are incident on a photodiode, on average 1.5×10^{12} electrons are collected at the terminals of the device. Determine the quantum efficiency and responsivity of the photodiode at $0.65\mu\text{m}$.
3. What are stimulated emission and spontaneous emission? Explain the principle of laser action.
4. What do you understand by double heterostructure? Draw the schematic diagram of an edge-emitting LED.
5. Explain the various measures of efficiency in PIN photodiode.
6. Define the term modal noise and briefly discuss the attempts have been made to estimate the extent of sensitivity degradation induced by modal noise.

SECTION-C

7. Write notes on :
 - a) MSM photodiode
 - b) CDM
8. Explain the different types of losses in optical fibers. Why the pulse broadening occurs in optical fibers? How you will prevent these losses?
9. a) Differentiate intermodal and intramodal dispersion.
b) The material dispersion parameter at a wavelength of $0.85\mu\text{m}$ is given by 98.1Ps/nm/km . Estimate the r.m.s. pulse broadening per km for a good LED source with an r.m.s. spectral width of 20nm at this wavelength.