[Total No. of Questions - 9] [Total No. of Printed Pages - 3] (2125)

15260

B. Tech 7th Semester Examination

Optical Fiber Communication (OS)

EC-7002

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all selecting one question each from sections A, B, C and D. Section E is compulsory.

SECTION - A

1. (a) Explain what is meant by graded index optical fiber, using simple ray theory concept. Discuss the transmission of light through the fiber. Give advantages of this type of fiber with regard of multimode propagation.

   (b) What is the difference between Acceptance angle, Critical angle and Numerical Aperture?

   (c) A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has core refractive index of 1.50 and 1.47. Determine:

   (i) Critical angle at core cladding interface.

   (ii) NA for the fiber.

   (iii) Acceptance angle. (8+5+7=20)

2. (a) What is meant by internodal dispersion? How it is differentiated from chromatic dispersion?

[P.T.O.]

   (b) List the major losses in optical fiber communication. How their losses can be minimized?

   (c) A 30km long optical fiber has an attenuation of 0.8 db/km at 1300 nm. If 200 micro Watt of optical power is launched into the fiber, determine the optical output power (P_{out}). (8+6+6=20)

SECTION - B

3. (a) Briefly explain the principle of Laser action. What are the necessary actions required for lasing action to take place?

   (b) What do you mean by DFB? What are the distinguishing characteristics of this type of Laser diode?

   (c) What are stimulated emission and spontaneous emission? Explain the principle of operation of a quantum-well laser diode. (8+6+6=20)

4. (a) List the various characteristics of LEDs and explain them in detail.

   (b) What do you understand by double hetro structure? Draw the schematic diagram of edge emitting hetro LED (DHLED). (10+10=20)

SECTION - C

5. (a) What do you understand by quantum efficiency? Discuss the concept of negative resistance in Avalanche Photo diode (APD).

   (b) Explain the layers of PIN photodiode. What is the purpose of middle layer? (10+10=20)

6. (a) Draw and discuss the digital optical receiver.

   (b) What is meant by receiver sensitivity and dynamic range in optical system? (10+10=20)

SECTION - D

7. (a) What do you understand by splicing? Explain the types of splices and steps involved in splicing of fibers.

   (b) What are optical networks? Explain networking components used in optical communication. (10+10=20)

8. What phenomenon determines the bandwidth of EDFA? Show by structural detail how amplification is done in EDFA. (20)

SECTION - E

9. (i) What do you mean by dominant modes?

   (ii) Define scattering.

   (iii) What is wavelength spacing?

   (iv) Discuss any two type of fiber optic connectors.

   (v) What is total internal reflection?

   (vi) Differentiate between Lasers and LEDs.

   (vii) What is meant by population inversion?

   (viii) Draw the block diagram of optical receiver.

   (ix) What type of noise generated due to spontaneous fluctuations in optical fiber communication system?

   (x) Define frequency chirp. (2×10=20)