16-12-17

Roll No. ..... Total Pages : 3

BT-7/D-17 **37010**

OPTICAL COMMUNICATION

Paper–ECE–405E

Time : Three Hours] [Maximum Marks : 100

Note : Attempt *five* questions in all, selecting atleast *one* question from each unit.

UNIT–I

1. (a) Define numerical aperture, critical angle and acceptance angle. Derive the relationship between them. 8

(b) Explain the different types of fibers. List their merits and demerits. With the help of ray diagram show how light propagate through them. 12

2. Define mode, normalized frequency and cut off wavelength. How number of modes can be defined in the terms of normalized frequency and wavelength. Derive the expression for single mode as well as multimode fibers.

A step index fiber in air has NA of 0.16, a core refractive index of 1.45 and core dia of 60 μm. Determine the normalized frequency and no. of guided modes in the fiber if light of a λ 0.9 μm is transmitted. 20.

UNIT–II

3. (a) What is attenuation? A 50 km long optical fiber operating at a wavelength of 850 nm offers an attenuation of 0.5 dB/km an optical power of 100 μW is launched in fiber at the input. What is the value of optical power at a distance of 30 km from the input? What is the optical power received at the end of fiber.

(b) Define scattering. List the different scattering mechanisms along with the reasons for them. (10+10=20)

4. (a) What is meaning of Dispersion. Derive the expression for pulse broadening due to material dispersion. 10

(b) List the effects of dispersion. Find the extent of pulse broadening due to chromatic dispersion. 10

UNIT–III

5. (a) Explain how photons are produced in a semiconductor dio de? Explain with the help of energy band diagrams.

(b) What do you mean by LASERS. What is the importance of heterojunction structure? Explain the detailed working of double heretojunction injection LASER. (8+12=20)

6. (a) What is meant by responsivity? Derive the expression for it. Explain resposivity-wavelength characteristic of photodetector. Also define long wavelength cutoff.

(b) Describe the working of Avalanche photodiode. (12+8=20)

UNIT–IV

7. (a) What is the function of optical coupler? Explain in detail the construction and working of 2 × 2 directiona' coupler. 10

   (b) Explain in detail the working of optical amplifiers. Also list different types of optical amplifiers. 10

8. Write short note on (any *two*):

   (a) WDM.

   (b) Linear divider combiner.

   (c) Single hop and multi hop networks. (10×2=20)