G 1650 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2015

Eighth Semester

Branch : Electronics and Communication Engineering

EC 010 803—LIGHT WAVE COMMUNICATION (EC)

(New Scheme—2010 Admission onwards)

[Regular/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Describe with the aid of simple ray diagrams :

   (a) Single-mode fiber ; (b) Multimode step index fiber.

2. Define V number. Write the relationship between V number and number of modes in graded index and step index multmode optical fibers.
3. Write short notes on optical fiber coupler.
4. What is meant by splicing with regard to optical fibers ? Describe the technique of fusion splicing of optical fibers.
5. Compare the performance parameters of LED and LASER diode.
6. Describe the working principle of a PIN diode detector.
7. Briefly expalin the principle of operation of a semiconductor laser amplifier.
8. What are the system considerations in point to point links ?
9. What do you mean by wavelength routing networks ?
10. What are the system consideration in point to point links ?

(10 × 4 = 40 marks)

Part B

Answer **all** *questions.*
Each question carries 12 *marks.*

11. (a) Explain what is meant by graded index optial fiber. Give an expression for the possible refractive index profile of GI fiber. Indicate the major advantage of this type of fiber with regard to multimode propagation.

(b) A graded index fiber with a parabolic index profile supports the propagation of 742 guided modes. The fiber has a numerical aperture of 0.3 and a core diameter of 70 μm. Determine the wavelength of the light propagating in the fiber.

(7 + 5 = 12 marks)

Or

12. (a) Derive an expression for critical angle, acceptance angle and numerical aperture (NA) of an optical fiber. Give the significance of NA of an optical fiber.

(b) A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.49 and a cladding refractive index of 1.46.

Determine : (i) the critical angle at the core-classing interface ; (ii) the NA for the fiber ; (iii) the acceptance angle in air for the fiber.

(7 + 5 = 12 marks)

13. Explain the different dispersion mechanisms present in optical fibers. Bring out the difference between intermodal dispersion and intramodel dispersion with neat sketches.

Or

14. Discuss various kinds of losses that an optical signal might suffer while propagating through the fiber. What is the effect of these losses on light power and pulse shape ?

15. (a) Explain the construction and working principle of APD with neat diagrams.

(b) Define the terms quantum efficiency and responsivity of a photo detector.

(7 + 5 = 12 marks)

Or

16. (a) Outline the common LED structures for optical fiber communications, discussing their relative merits and drawbacks. In particular, compare surface emitting (SLED) and edge emitting (ELED) devices.

(b) Define internal quantum efficiency and external quantum efficiency of a LED.

(8 + 4 = 12 marks)

17. (a) With the help of neat sketches, explain the gain mechanism and working of Erbium Doped Fiber Amplifiers (EDFAs).

(b) Compare the performance of EDFAs and semiconductor optical amplifiers.

(7 + 5 = 12 marks)

Or

18. (a) Explain the principle of operation of a MZ optical modulator.

(b) Explain the different noise mechanisms present in EDFAs.

(7 + 5 = 12 marks)

19. Explain the distinguish features of optical switching and optical wavelength routing. With the aid of block diagrams outline the optical network hierarchy for the public telecommunications network.

Or

20. (a) Write the concept of link power budget. What is the role of system margin in link power budgeting ?

(b) Write notes on rise time budget and differentiate link power budget and rise time budget.

(8 + 4 = 12 marks)

[5 × 12 = 60 marks]