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Question Paper Code : 51255

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014

Seventh Semester

Electronics and Communication Engineering

080290058 – OPTICAL FIBER, COMMUNICATION

(Regulation 2008)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Determine the critical angle at an interface between doped silica with $n_1 = 1.460$ and pure silica with $n_2 = 1.450$.
2. Define V parameter.
3. Determine the optical power output for a 100 km optical fiber with an attenuation of 0.25 dB/km , if the signal input power is 0.1 mW.
4. Distinguish between intramodal and intermodal dispersion.
5. Compare the characteristics of LED with Laser diode.
6. Write the water marking technique.
7. What are the desired features and characteristics to be possessed by a photo detector?
8. Determine the responsivity of a photodiode operating at $1.3 \mu\text{m}$ and having a quantum efficiency of 40%.
9. What is wavelength division multiplexing?
10. What is WDM?

PART B — (5 × 16 = 80 marks)

11. (a) With a neat sketch, explain the modes and configurations of optical fiber.

Or

- (b) With a neat diagram, explain the mode theory of circular waveguides.

12. (a) (i) Explain about bending losses, core and cladding losses in detail. (8)
(ii) Explain about design optimization of single mode fiber in detail. (8)

Or

- (b) (i) A 10 km optical link consists of multimode step index fiber with a core refractive index of 1.48 and a relative refractive index difference of 1%. Estimate the delay difference between the slowest and fastest modes at the fiber output. Deduce the expression used here. (10)
(ii) A graded index fiber has a core with a parabolic refractive index profile which has a diameter of $50 \mu\text{m}$. The fiber has a numerical aperture of 0.2. Estimate the total number of guided modes propagating in the fiber when it is operating at a wavelength of $1 \mu\text{m}$. (6)

13. (a) (i) Draw and explain the operation of Fabry-Perot and distributed feedback laser diodes. (10)
(ii) Briefly discuss the modulation of laser diodes and also discuss the impact of temperature on the performance of semiconductor laser diodes. (6)

Or

- (b) (i) Explain the important issues involved in source to fiber power launching. Discuss the coupling of LEDs and laser diodes to optical fibers with suitable diagrams and expressions. (10)
(ii) Discuss the methods of improving the source power coupling into optical fibers. (6)

14. (a) Discuss the principle of operation of APD with neat circuit diagram. Also discuss the requirements of photo detector. (16)

Or

- (b) (i) Explain the fundamental receiver operation in optical communication. (10)
(ii) Write short notes on the temperature effects on photo detectors. (6)

15. (a) (i) Describe the principle and application of solutions with suitable diagrams and expressions. (10)
(ii) Explain the link power budget analysis of an optical digital transmission link. (6)

Or

- (b) (i) Explain the basic concepts of SONET/SDH. (8)
(ii) Discuss the principle of Erbium doped fiber amplifier. (8)