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Question Paper Code : 42464

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Seventh Semester
Electronics and Communication Engineering
EC 2402 – OPTICAL COMMUNICATION AND NETWORKING
(Regulations 2008)
(Common to PTEC 2402 – Optical Communication and Networking for B.E. (Part-Time) Sixth Semester – Electronics and Communication Engineering – Regulations 2009)

Time : Three Hours | Maximum : 100 Marks

Missing data may be suitably assumed.
Answer ALL questions

PART – A (10×2=20 Marks)

1. What is mode coupling ?
2. Give the refractive index profile of a step index fiber.
3. What are the causes of dispersion ?
4. What is Fusion splicing ?
5. Define detector response time.
6. List the advantages of pin photodiodes.
7. What are the methods employed for measuring attenuation in optical fiber ?
8. Define surface dark current.
9. Define wavelength-routed WDM network.
10. List out the benefits of SONET over PDH networks.

PART – B (5×16=80 Marks)

11. a) i) A typical relative refractive index difference for an optical fiber designed for long distance transmission is 1%. Estimate the NA and the solid acceptance angle in air for the fiber when the core index is 1.46. Further, calculate the critical angle at the core-cladding interface within the fiber. It may be assumed that the concepts of geometric optics hold for the fiber. (8)

ii) Explain the characteristics of single mode fiber. (8)

(OR)

b) i) An optical fiber in air has an NA of 0.4. Compare the acceptance angle for meridional rays with that for skew rays which change direction by 100° at each reflection. (6)

ii) Explain about graded index optical fiber with an expression for the possible refractive index profile. Using simple ray theory concepts, discuss the transmission of light through the fiber. Mention the major advantage of this type of fiber with regard to multimode propagation. (10)

12. a) i) When the mean optical power launched into an 4 km length of fiber is 120 μW, the mean optical power at the fiber output is 3 μW.
Determine :
a) the overall signal attenuation or loss in decibels through the fiber assuming there are no connectors or splices;
b) the signal attenuation per kilometer for the fiber.
c) the overall signal attenuation for a 10 km optical link using the same fiber with splices at 1 km intervals, each giving an attenuation of 1 dB.
d) the numerical input/output power ratio in (c). (12)

ii) Write short notes on material dispersion. (4)

(OR)

b) i) A multimode graded index fiber exhibits total pulse broadening of 0.1 μs over a distance of 15 km. Estimate :
a) the maximum possible bandwidth on the link assuming no inter symbol interference;
b) the pulse dispersion per unit length;
c) the bandwidth-length product for the fiber. (10)

ii) Write short notes on stimulated Raman scattering and Stimulated Brillouin scattering. (6)

13. a) With neat sketch, discuss about structure and working principle of surface emitting LED and edge emitting LED. **(8+8)**

(OR)

b) Describe about the mechanism behind lasing operation. Derive rate equation and obtain quantum efficiency of laser diode. **(16)**

14. a) Discuss about different methods of Fiber refractive index profile measurements. **(16)**

(OR)

b) What are the performance measures of a digital receiver. Derive an expression for bit error rate of a digital receiver. **(16)**

15. a) i) Explain about intrachannel and interchannel crosstalk that occur in WDM systems. **(6)**

ii) Draw the architecture of 12 × 12 optical cross connect and explain. **(10)**

(OR)

b) Discuss about protection mechanism in UPSR and BLSR ring architecture and point to point architecture with neat sketch. **(16)**
