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Question Paper Code : 60468

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Seventh Semester

Electronics and Communication Engineering

EC 2402/EC 72/10144 EC 702 — OPTICAL COMMUNICATION AND NETWORKING

(Regulations 2008/2010)

(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 total internal reflection in a fiber?
2. Define phase and group velocity.
3. What is chromatic dispersion?
4. What are the causes for self phase modulation and cross phase modulation?
5. Write two differences between a Laser diode and a LED.
6. For a photodiode define quantum efficiency- η and responsivity - R.
7. What are the error sources of receiver?
8. What is known as quantum limit?
9. What is SONET?
10. What is Soliton?

PART B — (5 × 16 = 80 marks)

11. (a) (i) With a diagram, explain acceptance angle and Numerical Aperture of fibres. (8)

(ii) Classify fibers and explain them. (8)

Or

(b) Describe and derive the modes in planar guide. (16)

12. (a) Explain in detail with necessary mathematical expression the various attenuation mechanisms in optical fiber. (16)

Or

(b) (i) Describe the mechanism of intermodal dispersion in a multimode step index fiber. Show that the total broadening of a light pulse δTs due to intermodal dispersion in a multimode step index fiber may be given by : $\delta Ts = L(NA)^2/2n_1c$, where L is the fiber length, NA is the numerical aperture, n_1 is the core refractive index and c is the velocity of light in a vacuum. (10)

(ii) A multimode step index fiber has a numerical aperture of 0.2 and a core refractive index of 1.47. Estimate the bandwidth-distance product for the fiber assuming only intermodal dispersion and return to zero code when :

- there is no mode coupling between the guided modes.
- mode coupling between the guided modes gives a characteristic length equivalent to 0.6 of the actual fiber length. (6)

13. (a) (i) Draw the structures of SLED and ELED and explain their principle of operation. (8)

(ii) Draw the injection laser diode structure and explain lasing in it. (8)

Or

(b) (i) Draw the structures of PIN and APD photo detectors and explain their operations. (8)

(ii) Derive expressions for the SNR of both PIN and APD by incorporating all noise sources. (8)

14. (a) (i) Explain any two types of preamplifiers used in a receiver. (12)

(ii) Define the terms — 'Quantum limit' and 'Probability of Error' with respect to a receiver with typical values. (4)

Or

(b) (i) Explain the 'Insertion-Loss method' used for attenuation measurement. (8)

(ii) Explain the technique used in 'Frequency - Domain Intermodal Dispersion measurement'. (8)

15. (a) (i) Explain the principle of WDM networks. (8)

(ii) Discuss the non linear effects on optical network performance. (8)

Or

(b) (i) Explain the features of Ultra High capacity networks. (8)

(ii) Explain about OTDR and its applications. (8)

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