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Question Paper Code : 71468

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Seventh Semester

Electronics and Communication Engineering

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

(Regulation 2008/2010)

(Common to PTEC 2402 – Optical Communication and Networking for B.E. (Part-Time) Sixth Semester – Electronics and Communication Engineering (Regulation 2009))

Time : Three hours Maximum : 100 marks

Missing data may be suitably assumed.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Calculate the critical angle of incidence between two substances with different refractive indices, where $n_1 = 1.5$ and $n_2 = 1.46$.

2. State Snell's law.

3. Define signal attenuation.

4. What are bending losses? Name any two types.

5. Define power-bandwidth product.

6. Contrast the advantages of PIN diode with APD diode.

7. Define bit-error rate.

8. List any two advantages of trans-impedance amplifiers

9. What is SONET?

10. What is Soliton?

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PART B — (5 × 16 = 80 marks)

11. (a) (i) For a multi-mode step-index fiber with glass core(n_1=1.5) and a fused quartz cladding (n_2=1.46), determine the acceptance angle (θ_{in}) and numerical aperture. The source to fiber medium is air. (6)

(ii) Explain the ray propagation into and down an optical fiber cable. Also derive the expression for acceptance angle. (10)

Or

(b) (i) Describe a step index and graded index cable. (6)

(ii) Contrast the advantages and disadvantages of step-index, graded-index, single-mode propagation and multi-mode propagation. (10)

12. (a) What are the loss or signal attenuation mechanisms in a fiber? Explain.

Or

(b) (i) Discuss in detail about fiber splicing. (10)

(ii) What are the primary requirements of a good fiber connector design? (6)

13. (a) (i) With neat sketch, explain the working of a light emitting diode. (8)

(ii) Derive an expression for the quantum efficiency of a double hetro-structure LED. (8)

Or

(b) (i) A photodiode is constructed of GaAs which has a band gap energy of 1.43 eV at 300K. Find the long wavelength cut-off. (4)

(ii) Derive an expression for the mean square photo detector noise current. (8)

(iii) Write a note on response time. (4)

14. (a) With schematic diagram, explain the blocks and their functions of an optical receiver.

Or

(b) (i) A digital fiber optic link operating at 850 nm requires a maximum BER of 10^{-9}. Find the quantum limit in terms of the quantum efficiency of the detector and the energy of the incident photon. (6)

(ii) Explain the attenuation and dispersion measurements in detail. (10)

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 OTDR and its applications. (8)

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