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# Question Paper Code : 80462

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

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. 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. A continuous 12 kms-long optical fiber link has a loss of 1.5 dB/km. What is the minimum optical power that must be launched into the fiber to maintain an optical power level of 0.3 μW at the receiving end?

4. Define dispertion in multimode fibers. What is its effect?

5. Calculate the band gap energy for an LED to emit 850 nm.

6. Define Detector response time.

7. Draw and describe the operation of fiber optic receiver.

8. Mention few fiber diameter measurement techniques.

9. What is SONET?

10. What is Soliton?

PART B — (5 × 16 = 80 marks)

11. (a) (i) With the help of a block diagram explain the different components of a optical fiber link. (12)

(ii) Compare the optical fiber link with a satellite link. (4)

Or

(i) Explain the differences between meridional and skew rays. (4)

(ii) Bring out the differences between phase and Group velocities. (6)

(iii) Deduce an expression for NA of a fiber with the help of a neat figure showing all the details. (6)

12. (a) (i) Derive expressions for material dispersion and waveguide dispersion and explain them. (8)

(ii) Describe the various types of fiber connectors and couplers. (8)

Or

(b) (i) Explain fiber alignment and joint losses. (6)

(ii) Describe various fiber splicing techniques with their diagrams. (10)

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. (16)

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 layered architecture and transmission formats of SONET. (8)

(ii) Explain with neat sketch of two popular architecture of SONET. (8)

Or

(b) Explain in detail different types of Broad cast and select WDM networks. (16)

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