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17EC82

Eighth Semester B.E. Degree Examination, June/July 2023
Fiber Optics and Networks

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1   a.   With the help of neat diagram, explain the main blocks of an optical fibre communication link. **(10 Marks)**
    b.   Using Snell's law derive an expression for Numerical Aperture of a Fiber Optic Cable. **(10 Marks)**

OR

2   a.   Differentiate between :
         i)   Single mode and Multi – mode Fiber.
         ii) Step Index and Graded Index multimode fiber. **(08 Marks)**
    b.   Write short notes on Photonic Crystal Fiber. **(06 Marks)**
    c.   Calculate NA, acceptance angle and critical angle of the fiber having $n_1 = 1.50$ and refractive index of clad $(n_2) = 1.45$. **(06 Marks)**

Module-2

3   a.   Describe different types of attenuation mechanism in an optical fiber. **(06 Marks)**
    b.   Write short notes on :
         i)   Rayleigh Scattering   ii)   Mie Scattering. **(08 Marks)**
    c.   A continuous 12km long optical fiber link has a loss of 1.5 dB/km.
         i) What is the maximum output power level that must be launched into the fiber to maintained as optical power level of $.3\pi w$ at receiver. **(06 Marks)**

OR

4   a.   Explain the three types of Fiber splicing techniques with neat diagram. **(06 Marks)**
    b.   Describe Ferrate connectors and Fiber couplers. **(06 Marks)**
    c.   Explain Mechanical Fiber misalignment with proper expression. **(08 Marks)**

Module-3

5   a.   With proper energy diagram, explain the construction and working of Hetrojunction LED structure. **(10 Marks)**
    b.   Describe Febry – Perot Resonator. **(04 Marks)**
    c.   The radiative and non – radiative life times of minority carrier in the active regions of a double hetrojunction LED are 60 ns and 90 ns respectively. Determine the total carrier recombination time and optical power generated internally if peak emission wavelength is 870 n m and drive current is 40 mA. **(06 Marks)**

OR

6   a.   Explain the working principle of APD photodetector with neat diagram. **(08 Marks)**
    b.   Explain the comparison between LED and Laser Diode. **(06 Marks)**
    c.   Derive the expression for quantum efficiency and responsivity of photodetector. **(06 Marks)**

Module-4

7 a. Derive an expression for different noise sources in an optical receiver. **(10 Marks)**
   b. Discuss the different types of pre – amplifiers in optical receiver. **(04 Marks)**
   c. A digital fiber optic line operating at 850nm requires a maximum BER of 10^{-9}. Calculate
      i) Minimum energy E   ii) Minimum incident power. **(06 Marks)**

OR

8 a. Describe the operational principle of WDM with typical network containing various type of optical amplifier. **(10 Marks)**
   b. Explain EDFA Architecture with neat energy level diagram. **(10 Marks)**

Module-5

9 a. With reference to a public network, explain the network architecture with optical fibers. **(10 Marks)**
   b. With reference to neat diagram, describe the features of wavelength – routing architecture. **(05 Marks)**
   c. Explain MEMS Technology. **(05 Marks)**

OR

10 a. Write short notes on :
       i) Asynchronous transfer mode   ii) Optical Switching network. **(10 Marks)**
    b. Explain :
       i) Multiprotocol Label Switching (MPLS)   ii) Local Area Network. **(10 Marks)**

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