USN | | | | | | | | | | **15EC82**

Eighth Semester B.E. Degree Examination, Aug./Sept.2020
Fiber Optics and Networks

Time: 3 hrs.   Max. Marks: 80

Note: i) For Regular Students: Answer any FIVE full questions irrespective of modules.
ii) For Arrear Students : Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a. Explain Optical Fiber transmission link with suitable block diagram. **(06 Marks)**
    b. Discuss classification of Optical Fiber depending on Refractive Index profile, mode of operation and material used. **(06 Marks)**
    c. Find Numerical aperture and number of propagation modes for a step index fiber with indices 1.5 and 1.48 with core radius 25 μm. If the wavelength of the optical signal propagating in the fiber is 1300 nm. **(04 Marks)**

2   a. What are the different types of materials used for fabrication of optical fiber and their requirements? **(06 Marks)**
    b. Explain Index-guiding photonic crystal fiber with suitable diagram. **(04 Marks)**
    c. Discuss Ray Theory model for multimode step index and graded index fiber. **(06 Marks)**

Module-2

3   a. Explain the different mechanism caused by absorption loss. **(05 Marks)**
    b. The Input power to an optical fiber is 2 mw while the power measured at the output end is 2 μw. If the fiber alternation is 0.5 db/km, calculate the length of the fiber. **(05 Marks)**
    c. What are the different types of bending losses in fiber and explain with suitable diagram. **(06 Marks)**

4   a. Explain the different types of mechanical misalignment between two fibers. **(05 Marks)**
    b. What are the different types of splicing and explain V-groove optical fiber splicing technique. **(05 Marks)**
    c. What are the principles of good connector design. **(06 Marks)**

Module-3

5   a. Explain Electron recombination and the associated photon emission for Direct and Indirect bandgap materials. **(06 Marks)**
    b. With schematic explain high-radiance surface emitting LED. **(06 Marks)**
    c. A double-heterojunction InGaASp LED emitting at a peak wavelength of 1310 nm has radiative and non-radiative recombination time of 30 ns and 100 ns respectively. The drive current is 40 mA calculate internal efficiency and optical power generated internally to the LED. Assume $h = 6.6256 \times 10^{-34}$ J-s ; $Q = 1.602 \times 10^{-9}$ C. **(04 Marks)**

OR

6   a. Explain the three key transition process involved in laser action. **(04 Marks)**
    b. Explain Reach-Through avalanche photodiode with neat diagram. **(06 Marks)**
    c. With schematic explain reverse biased pin photodiode. **(06 Marks)**

Module-4

7 a. Explain the implementation of WDM networks with various types of optical amplifiers.
   (06 Marks)

   b. With layout explain 2×2 Mach-Zehnder Interferometer. (04 Marks)
   c. Explain Design and operation of a Polarization-Independent Isolator. (06 Marks)

8 a. Explain MEMS actuation method with neat diagram. (04 Marks)
   b. Explain 4×4 OADM with miniature switching mirrors. (06 Marks)
   c. Explain the Basic operation of a generic optical amplifier. (06 Marks)

Module-5

9 a. Explain IPV6 packet with extension header. (06 Marks)
   b. Explain ATM Protocol Architecture. (04 Marks)
   c. Explain the Basic operation of long-haul circuit switching Telecommunication Networks.
   (06 Marks)

10 a. Explain Optical-cross connect architecture using optical space switches. (08 Marks)
   b. Explain Generic Structure of an optical burst switching networks. (08 Marks)

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