Dec.-22-0318

EC-703 (Optical Communication)

B.Tech. 7th (CBCS)

Time : 3 Hours   Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all selecting one question from each section A, B, C, D and Section E is compulsory.

SECTION - A

1. (a) Define acceptance angle. Derive $NA = n \sqrt{(2\Delta)}$ starting from the basic laws of transmission.   (7)

    (b) Differentiate the phase velocity and group velocity.   (3)

2. (a) What is the importance of Graded index multimode fiber? Explain with the help of a suitable diagram.   (4)

    (b) Differentiate the skew rays and meridional rays.   (2)

    (c) Calculate the V number and the number of modes supported by the step index fiber having $n_1 = 1.53$, $n_2 = 1.5$ and with a core radius of 50μm operating at 1500nm.   (4)

SECTION - B

3. (a) Given two single mode fibers with MFDs of 5.0μm and 10.0μm, respectively, which one is more sensitive to bending and why?   (3)

    (b) How is the data rate of the fiber link related to total dispersion?   (3)

    (c) Differentiate material dispersion and waveguide dispersion.   (4)

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4. (a) If a laser diode is intensity modulated, what parameter limits its modulation bandwidth? Explain.   (3)

    (b) Discuss the working of DFB Laser.   (4)

    (c) For a LED having wavelength 800nm and drive current 60mA, determine the total carrier recombination lifetime and power internally generated within the device. The radiative and non-radiative recombination lifetimes of the majority carriers are 50ns and 85ns, respectively.   (3)

SECTION - C

5. (a) Differentiate PIN photodiode and APD for use as optical detector in optical communication.   (6)

    (b) Define the Quantum efficiency and Responsivity of a photodetector.   (4)

6. (a) What is the function of an optical Add/drop Multiplexer in WDM networks?   (3)

    (b) Define Timing Jitter. Show it in reference to an Eye Diagram.   (3)

    (c) Discuss Rise time budget with a suitable example.   (4)

SECTION - D

7. (a) How Raman scattering is used for amplifying the signal? Explain the pumping schemes for Raman amplifier. (6)

    (b) Discuss the various types of fiber connectors.   (4)

8. (a) Describe the EDFA architectures with the help of sketch.   (5)

    (b) How Fusion Splicing differs from Mechanical Splicing? Discuss with suitable diagrams.   (5)

SECTION - E

9. (a) Why light travels within a cladding faster than it does within a core?

    (b) Differentiate radiative and non-radiative recombinations.

    (c) What do you mean by positive feedback in lasers?

    (d) Give examples of direct and indirect bandgap semiconductor materials.

    (e) Discuss the advantages of heterostructure LEDs over homostructure LEDs.

    (f) Define chromatic dispersion.

    (g) Define BER.

    (h) Define sensitivity of a photodetector.

    (i) What is the function of an optical coupler?

    (j) What is the principle of DBR?   (10×2=20)