Section-C

Attempt **any two** questions fron this section. (15×2=30)

10. (i) What is Mode Coupling? Describe Step Index Fibre with its refractive index profile and ray transmission through it.

(ii) Define Grade Index Fibers. A multimode graded index exhibits the total pulse broadening of 0.1 μm over a distance of 15km. Estimate: (a) Maximum possible BW without ISI.)b) Pulse dispersion per unit length (c) Information carrying capacity.

11. (i) Discuss the working principle of Laser. The total efficiency of an injection laser with a GaAs active region is 18%. The voltage applied to the device is 2.5 V and the band gap energy for GaAs is 1.43 eV. Calculate the external power efficiency of the device.

(ii) Describe the factors which limit the speed of response of a photodiode and show the impact of change in temperature over the avalanche multiplication factors/internal gain.

12. Write note on the following

(i) WDM and its components

(ii) OTDR and Optical Power Meter.

—x—

(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 131701 Roll No. | | | | | | | | | |

B.Tech

(SEM. VII) THEORY EXAMINATION, 2015-16

OPTICAL COMMUNICATION

[Time : 3 hours] [MaximumMarks : 100]

Section-A

1. Attempt all sections. All sections carry **equal** marks. Write answer of each section in short. (2×10=20)

(a) What is Acceptance Angle? Discuss its importance.

(b) Define Numerical Aperture for an optical fibre mathematically and what does it signify?

(c) Name the fibre materials and its fabrication techniques.

(d) What do you mean by the term-Waveguide Dispersion?

(e) How the Information Capacity of an optical fibre does is specified? Give examples.

(f) What is the reason for pulse broadening in the case of Material Dispersion?

(g) Comment on the Reliability of LASER (ILD).

(h) Name the materials suitable for making photodiodes for short distance links and long haul links.

(i) List/Name the techniques used for coupling the optical sources (LEDs/LASERs) to the fibre.

(j) What are the methods used for Error Detection and Correction in an optical link design?

Section-B

Attempt **any five** questions from this section. (10×5=50)

2. (i) A silica optical fibre with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.50 and a cladding refractive index of 1.47. Determine: (a) the critical angle at the core-cladding interface; (b) the *NA* for the fibre; (c) the acceptance angle in air for the fiber.

   (ii) Discuss Skew Rays. An optical fibre in air has a *NA* of 0.4. Compare the acceptance angle for meritional rays with that for skew rays which change direction by 100° at each reflection.

3. Explain Absorption Loss mechanisms with their causes in the Silica Glass Fibers in detail.

4. Explain different types Optical Fibre Connectors: Joints Couplers and Isolators with suitable diagrams.

5. Draw and discuss the basic laser structure using optical feedback for producing laser oscillations/laser modes at resonant frequencies.

6. What is the function of an optical detector? Draw an optical receiver configuration with different possible structures for front-end amplifier. Explain the different types of error/noise sources in an optical receiver.

7. What are the different multichannel transmission techniques used in optical communication? Describe each in brief.

8. Name the materials used for fabrication of LEDs. Explain the working principle of LED and how its efficiency can be defined? Discuss the Double Hetro-Junction LED.

9. (i) Explain the structure of Silicon Reach through Avalanche Photodiode (RAPD) with its gain mechanism.

   (ii) A graded index fibre with a parabolic refractive index profile core has a refractive index at the core axis of 1.5 and a relative refractive index difference of 1%. Estimate the maximum possible core diameter which allows single mode operation at a wavelength of 1.3 μm.