Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : R 40542

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2025.

Seventh Semester

Electronics and Communication Engineering

EC8751 — OPTICAL COMMUNICATION

(Common to: Computer and Communication Engineering)

(Regulations 2017)

Time : Three hours　　　　Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the principle of light propagation in a optical fiber.

2. Calculate the numerical aperture of a stepindex fiber having $n_1 = 1.48$ and $n_2 = 1.46$. What is the acceptance angle θ_A for this fiber if the outer medium is air with n = 1.00?.

3. Comment on polarization mode dispersion.

4. How does absorption in a optical fiber occurs?

5. A double-heterojunction InGaAsP LED emitting at a peak wavelength of 1310 nm has radiative and non radiative recombination times of 35 and 100 ns. respectively. The drive current is 50 mA. Calculate the internal power level.

6. Compare PIN detector and Avalanche photodetector.

7. Consider a single-mode fiber, Find the loss at a joint having an angular misalignment of 1° =0.02 radians at a 1300-nm wavelength for $n_2 = 5.3$, mode field radius (w)=5.3.

8. Define quantum limit.

9. How crosstalk is reduced in optical networks.

10. Write short notes on WDM?

PART B — (5 × 13 = 65 marks)

11. (a) With a neat sketch explain in detail the functional block diagram of a fiber optical link? Why OFC is preferred over twisted pair cable?

Or

(b) Discuss the methods employed for the fabrication of optical fiber cable and explain in detail with a neat sketch.

12. (a) Explain in detail how intersymbol interference affects the bandwidth of optical fiber communication.

Or

(b) Describe the construction, mode field diameter, and propagation modes of single mode fiber in detail.

13. (a) How optical sources are classified? Explain in detail the construction and working of a edge emitting LED.

Or

(b) (i) Discuss the principle of Photo detector. (5)

(ii) Explain an equivalent receiver model and obtain the noise current of the device (8)

14. (a) Discuss on the optical fiber power measurement and attenuation measurement in detail?

Or

(b) Explain the variety of lensing schemes adopted for improving the coupling of energy in detail with a neat sketch.

15. (a) Define budgeting and explain the link budget and rise budget of a optical fiber in detail.

Or

(b) Illustrate the architecture of SONET layers and frame structure in detail.

PART C — (1 × 15 = 15 marks)

16. (a) (i) Consider an optical fiber cable, the cylindrical coordinate system $\{r, \emptyset, z\}$. The electromagnetic wave travels along the axis in z direction. (8)

(ii) Obtain the wave equation in cylindrical coordinate systems and wave equation for step index fibers (7)

Or

(b) (i) Explain in detail the various losses occurring in the optical fiber cable in detail. (8)

(ii) Explain the splicing techniques and the fiber connectors. (7)