



CBCS SCHEME

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Eighth Semester B.E. Degree Examination, Feb./Mar. 2022

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. Discuss the basic block diagram of optical fiber communication. What are the advantages of optical fiber communication? (10 Marks)
- b. An optical fiber with a core refractive index of 1.50 and a cladding refractive index 1.47. Using ray theory analysis, find: i) Critical angle at the core-cladding interface ii) The numerical aperture for the fiber iii) The acceptance angle in air for the fiber. (06 Marks)
- c. Two light sources are having the optical output powers; 1MW and 50MW. What are the power levels in dBm units? (04 Marks)

OR

- 2 a. Discuss the refractive index profile and ray transmission in multimode step index and single mode step index fiber. What are advantages and drawbacks of single mode and multimode step index fiber? (10 Marks)
- b. In a multimode step-index fiber with a $62.5\mu\text{m}$ core diameter and a core-cladding index difference of 1.5 percent. If the core refractive index is 1.480, estimate the normalized frequency of the fiber and the total number of modes supported in the fiber at a wavelength of 850nm. (06 Marks)
- c. What are the photon energies with 850nm and 1550nm wavelength? (04 Marks)

Module-2

- 3 a. Discuss the Rayleigh scattering losses. (08 Marks)
- b. A low loss fiber has average loss of 3dB/km at 900nm compute the length over which
i) Power decreases by 50%
ii) Power decreases by 75%. (08 Marks)
- c. Write short note on absorption in optical fiber. (04 Marks)

OR

- 4 a. Discuss the Intramodal dispersion. (08 Marks)
- b. When mean optical power launched in to 8km length of fiber is $12\mu\text{w}$, the mean optical power at the output is $3\mu\text{w}$. Determine: i) Overall signal attenuation in dB ; ii) The overall signal attenuation for 10km, optical link using the same fiber with splices at 1km intervals, each giving attenuation of 1dB. (08 Marks)
- c. Write brief note on Fiber splices. (04 Marks)

Module-3

- 5 a. What are the advantages and drawbacks of laser diode compared to LED sources? (08 Marks)
- b. Discuss the three key transition process involved in laser action. What is population inversion? (08 Marks)
- c. Define the quantum efficiency of the photo detector. (04 Marks)

OR

- 6 a. With the aid of neat diagrams discuss the LED configurations used in Fiber optics. (10 Marks)
b. Discuss the working of PIN photo diode. (06 Marks)
c. What are the main noise currents of photo detectors? (04 Marks)

Module-4

- 7 a. With the aid of neat diagram, describe the implementation of WDM network. (10 Marks)
b. Explain the basic operation of a generic optical amplifier. (06 Marks)
c. Explain the operation of 4×4 OADM. (04 Marks)

OR

- 8 a. Discuss the working of optical isolators and circulators. (10 Marks)
b. What are the general applications of optical amplifiers? (06 Marks)
c. What are S-matrices? (04 Marks)

Module-5

- 9 a. Discuss SONET and STS – 1/N frame structure. (10 Marks)
b. Write note on: optical network topologies and network routing. (10 Marks)

OR

- 10 a. Describe OSI reference model used for networks design. (10 Marks)
b. Write short note on LAN or FDDI and long haul optical networks. (10 Marks)
