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10EC/TE72

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

Optical Fiber Communication

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.

PART – A

- 1 a. What are the advantages, disadvantages and applications of optical fiber communication? (08 Marks)
- b. Write a neat sketch; derive the expression for numerical aperture of a step index fiber in terms of acceptance angle and core and cladding refractive indices and further in terms of relative index differences. (06 Marks)
- c. A multimode step index fiber has normalized frequency of 75, NA = 0.3, Refractive index of core is 1.458 and operation at 820nm. Find core radius, refractive index of cladding and number of modes that get propagated. (06 Marks)
- 2 a. Explain the absorption mechanism in optical fibers. (06 Marks)
- b. Explain the different types of bending losses in optical fibers. (06 Marks)
- c. Derive an expression for pulse spreading due to material dispersion which is a function of wavelength and time delay. (08 Marks)
- 3 a. With the help of neat diagram, explain the working of distributed feedback (DFB) laser diode. (07 Marks)
- b. Derive an expression for lasing condition and hence for optical gain in LASERS. (08 Marks)
- c. Explain briefly the structure of a PIN photodiode. (05 Marks)
- 4 a. What are the different types of mechanical misalignment? Explain. (06 Marks)
- b. Explain briefly the various fiber splicing techniques. (08 Marks)
- c. Explain the principle of operation of an expanded beam connector. (06 Marks)

PART – B

- 5 a. With neat diagram, explain the operation of transimpedance preamplifier equivalent circuit. (06 Marks)
- b. With the schematic diagram, explain the working of an optical receiver. (06 Marks)
- c. Discuss how the eye diagram is a powerful measurement tool for assessing the data handling capacity in digital transmission systems. (08 Marks)
- 6 a. Explain subcarrier multiplexing in optical fiber communication. (06 Marks)
- b. With neat sketches, explain the optical power loss model for a point to point link. (08 Marks)
- c. Explain rise time budget with relevant equations. (06 Marks)
- 7 a. Explain the principle of operation of WDM with relevant block diagram. (06 Marks)
- b. Explain the principle of Mach – Zehnder interferometer as a multiplexer. Obtain an expression for ΔL . (08 Marks)
- c. Write a short note on tunable optical fiber. (06 Marks)
- 8 a. With suitable diagram describe SONET/SDH optical network function. (10 Marks)
- b. Explain in detail the amplification mechanism with energy level diagram in an EDFA. (10 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.