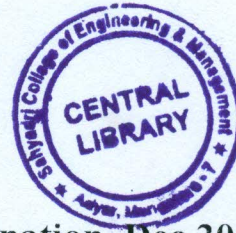


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10EC/TE72

**Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018**

**Optical Fiber Communication**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting at least TWO questions from each part.**

**PART – A**

- 1 a. Derive the expression for Numerical Aperture using ray theory. (07 Marks)
- b. In brief discuss the different design approaches for single-mode fibers. (07 Marks)
- c. A graded index fiber has a core with a parabolic-index profile which has a diameter of 50  $\mu\text{m}$ . The fiber has a numerical aperture of 0.2. Estimate the total number of guided modes propagating in the fiber when it is operating at a wavelength of 1  $\mu\text{m}$ . (06 Marks)
- 2 a. In brief explain linear scattering losses. (07 Marks)
- b. Derive the expression for rms-pulse broadening due to intermodal dispersion in a step index fiber. (08 Marks)
- c. A multimode graded index fiber exhibits total pulse broadening of 0.1  $\mu\text{s}$  over a distance of 15 km. Estimate the following:
  - (i) Maximum possible bandwidth on the link assuming no ISI.
  - (ii) Pulse dispersion per km.
  - (iii) BW-length product for the fiber. (05 Marks)
- 3 a. Explain the GaAlAs double-heterojunction LED structure. (07 Marks)
- b. Explain the structure of RAPD and its working. (08 Marks)
- c. A double-heterojunction structure in GaAsP LED emitting a peak wavelength of 1310 nm has a radiative and non radiative recombination times of 30 ns and 100 ns respectively. The drive current is 40 mA. Estimate the
  - (i) Bulk recombination life time.
  - (ii) Internal power level. (05 Marks)
- 4 a. Explain lensing schemes for coupling improvement. (07 Marks)
- b. List out the requirements that a good connector design has to meet. (07 Marks)
- c. A GaAs optical source with refractive index of 3.6 is coupled to a silica fiber that has a refractive index of 1.48. If the fiber ends face and source are in close physical contact. Estimate Fresnel reflection at the interface and power loss in dB. (06 Marks)

**PART – B**

- 5 a. In brief explain basic structure of an optical receiver. (08 Marks)
- b. Discuss the features of Eye-pattern. (07 Marks)
- c. Write short note on "Burst-mode receiver". (05 Marks)
- 6 a. Derive the expression for rise-time budget analysis. (08 Marks)
- b. In brief explain multi channel AM technique. (07 Marks)
- c. Write a short note on "Microwave photonics". (05 Marks)
- 7 a. Explain in brief design and operation of polarization – independent isolator. (08 Marks)
- b. Explain in brief operational principle and implementation of WDM with diagram. (07 Marks)
- c. Write a short note on "MEMS technology". (05 Marks)
- 8 a. Explain three possible configurations of a EDFA. (08 Marks)
- b. Explain the SONET/SDH frame format. (07 Marks)
- c. Write a short note on "Semiconductor Optical Amplifiers" (05 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.