USN ☐☐☐☐☐☐☐☐☐☐

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 Aparture 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 μm. 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 μm. **(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 μ.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 GaAIAs 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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