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Seventh Semester B.E. Degree Examination, Dec.2013/Jan.2014
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. Describe block diagram of an optical fiber transmission link and explain the function of each element in link. (08 Marks)
 - b. Explain what is meant by graded index optical fiber using simple ray theory concept indicate the major advantages of this type of fiber with regard to multimode propagation. (06 Marks)
 - c. A Graded index fiber with parabolic refractive index has $n_1 = 1.48$ and $n_2 = 1.46$ if core radius is 20 μm . Find the number of modes at 1300nm and 1550 nm. (06 Marks)
2.
 - a. Describe Rayleigh Scattering in optical fiber. (06 Marks)
 - b. Briefly explain intramodal and intermodal dispersion. (06 Marks)
 - c. Glass fiber exhibits material dispersion given by, $\lambda^2 \left(\frac{d^2 n_1}{d\lambda^2} \right)$ of 0.025. Determine material dispersion parameter at a wavelength of 0.85 μm and estimate rms pulse broadening / km for good LED source with an rms spectral width of 20 nm at this wavelength. (08 Marks)
3.
 - a. Sketch and explain Fabry perot resonator cavity of laser. (07 Marks)
 - b. Discuss the operation of silicon RAPD with neat diagram. (07 Marks)
 - c. Consider a photodiode with quantum efficiency 75%, when photon of energy 1.6×10^{-19} J, are incident on the surface then calculate operating wavelength and if 2.6 μA photo current through detector corresponding, determine incident optical power when detector is operated at same wavelength. (06 Marks)
4.
 - a. Describe with aid of suitable diagram, three common technique used for mechanical splicing of optical fibers. (06 Marks)
 - b. With aid of simple sketches, outline major categories of fiber couplers. (06 Marks)
 - c. A GaAs optical source that has a refractive index of 3.6 is closely coupled to step index fiber which has a core refractive index of 1.465, if the source size is smaller than fiber core, and small gap between source and fiber is filled with a gel that has a refractive index of 1.305. What is the power loss in decibels from source into fiber? (08 Marks)

PART – B

5.
 - a. Briefly discuss the possible sources of noise in optical fiber receivers. (06 Marks)
 - b. Discuss how the eye diagram is powerful measurement tool for assessing the data handling capability in digital transmission system. (08 Marks)
 - c. Write a note on analog receivers. (06 Marks)
6.
 - a. Explain the multi AM techniques employed in broadband analog application. (08 Marks)
 - b. Explain : (i) Microwave photonics (ii) RF over fiber. (06 Marks)
 - c. Explain in brief : (i) Short wavelength band (ii) Chirping. (06 Marks)

- 7 a. Explain the design and operation of polarization independent isolator. How it is different from polarization dependent isolator. (06 Marks)
- b. Write a note on MEMS technology. (06 Marks)
- c. Explain operational principle and implementation of WDM with diagrams. (08 Marks)
- 8 a. Write basic applications and types of optical amplifiers. (08 Marks)
- b. Explain with the aid of neat diagram, three possible EDFA configurations. (06 Marks)
- c. Describe SONET / SDH frame formals
SONET / SDH frame rings. (06 Marks)
