Seventh Semester B.E. Degree Examination, December 2012
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.   List the disadvantages of copper wire at the optical frequency range.   **(06 Marks)**
    b.   Explain the ray theory of the optical fiber, with the help of a neat sketch.   **(08 Marks)**
    c.   A silica glass fiber has a core refractive index of 1.5 and the cladding refractive index of 1.45. Calculate (i) critical angle for the core-cladding interface, (ii) the NA of the fiber and (iii) percentage of light collected by the fiber.

                                                                                            (06 Marks)

2   a.   Describe the attenuation mechanisms in an optical fiber.   **(10 Marks)**
    b.   Derive the equation for material dispersion in the optical fiber.   **(06 Marks)**
    c.   An optical signal at a specific wavelength has lost 55% of its power, after traversing 7 km of fiber .What is the attenuation in dB/km of this fiber.   **(04 Marks)**

3   a.   What are the characteristic requirements of an optical source? With the help of diagram, describe the operation of surface emitting LED.   **(10 Marks)**
    b.   Which are the noise types affecting the optical detector.   **(03 Marks)**
    c.   Describe the PIN diode performance, using the diagram.   **(07 Marks)**

4   a.   Derive an equation for power coupling to the step index fiber and graded index fiber.
                                                                                            (10 Marks)
    b.   What is equilibrium numerical aperture of a fiber? With the help of diagrams, explain the lensing schemes for coupling improvement.   **(10 Marks)**

PART – B

5   a.   Discuss the error sources in the optical signal detection.   **(07 Marks)**
    b.   Derive an equation for optical receiver sensitivity.   **(10 Marks)**
    c.   Calculate the PIN diode receiver sensitivity, if the gain of the photo detector is 1, its noise figure is 1 and bandwidth of the receiver is assumed to be half of the bit rate. Note the BER is 10^{-12} and data rate is 100 Mb/s.   **(03 Marks)**

6   a.   Write the diagram and explain the radio over fiber links.   **(10 Marks)**
    b.   What is link power budget? With an example, explain the link power budget calculation.
                                                                                            (10 Marks)

7   a.   With the help of neat diagram, explain the operation of WDM.   **(08 Marks)**
    b.   Describe the principles of working of isolators, circulator and ADM using suitable diagrams.
                                                                                            (12 Marks)

8   a.   What are the optical amplifiers? Describe with the help of a sketch the semiconductor laser amplifier.   **(10 Marks)**
    b.   Describe the SONET optical network working with reference to suitable diagram.   **(10 Marks)**

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