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10EC/TE72

**Seventh Semester B.E. Degree Examination, Dec.2016/Jan.2017****Optical Fiber Communications**

Time: 3 hrs.

Max. Marks:100

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

**PART – A**

- 1 a. What are the advantages and disadvantage of optical fiber communication? (07 Marks)  
b. Derive necessary mathematical condition that the angle of incidence “ $\theta$ ” must satisfy for the optical skew ray to propagate in a step index fiber. (08 Marks)  
c. Calculate the number of modes of an optical fiber having diameter of 50  $\mu\text{m}$ ,  $n_1 = 1.48$ ,  $n_2 = 1.46$  and wavelength ‘ $\lambda$ ’ of 820 nm. (05 Marks)
- 2 a. Explain the different types of absorption losses in optical fiber. (06 Marks)  
b. Derive an expression for pulse spreading due to material dispersion which is a function of wavelength and time delay. (08 Marks)  
c. Explain the different types of bending losses in optical fiber. (06 Marks)
- 3 a. Draw the cross section of GaALAS double hetero structure LED energy band diagram and refractive index variation. Explain their importance. (07 Marks)  
b. Derive an expression for lasing condition and hence for optical gain in LASERS. (08 Marks)  
c. With proper sketch briefly explain the structure of RPAD photodiode. (05 Marks)
- 4 a. Show that optical power coupled into a step index fiber due to an LED with lambertian distribution is given by  $P = P_s (NA)^2$  for  $r_s \leq a$ , with usual notations. (07 Marks)  
b. What are different types of mechanical misalignments? (05 Marks)  
c. Explain briefly the various fiber splicing techniques. (08 Marks)

**PART – B**

- 5 a. With neat diagram, explain the operation of transimpedance preamplifier equivalent circuit. (06 Marks)  
b. Derive an expression for receiver sensitivity and also explain quantum limit. (08 Marks)  
c. Discuss how the eye diagram is powerful measurement tool for assessing the data handling capability in digital transmission system. (06 Marks)
- 6 a. Explain with block diagram, the elements of analog link. List the signal impairments in analog systems. (06 Marks)  
b. Explain sub-carrier multiplexing techniques in optical fiber communication. (04 Marks)  
c. Briefly explain the rise time budget analysis with its basic elements contribute to system risetime. (10 Marks)
- 7 a. With a neat sketch, explain WDM scheme. (05 Marks)  
b. Derive an expression for difference in length in MZI multiplexers. (09 Marks)  
c. Write a note on optical add | drop multiplexers. (06 Marks)
- 8 a. Explain in detail the amplification mechanism with energy level diagram in an EDFA. (10 Marks)  
b. With suitable diagram describe SONET/SDH optical network function. (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.