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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.***

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.

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 "θ" 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 μm, $n_1 = 1.48$, $n_2 = 1.46$ and wavelength 'λ' 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 lambartian 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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