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

Max. Marks:100

Time: 3 hrs.

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 " 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 lambertian distribution is given by $P = P_s (\text{NA})^2$ 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. (05 Marks)
- b. With suitable diagram describe SONET/SDH optical network function. (09 Marks)

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