

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, December - 2014

## OPTICAL COMMUNICATIONS

(Electronics and Communication Engineering)

Time: 3 Hours

Max. Marks: 75

Answer any Five Questions  
All Questions Carry Equal Marks

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- 1.a) The speed of light in vacuum and in the core of silicon fibre is  $3 \times 10^8$  m/s and  $2 \times 10^8$  m/s respectively. When the fibre is placed in air, the critical angle the core-cladding interface is  $75^\circ$  calculate the
  - i) Numerical aperture of the fibre
  - ii) Multi path time dispersion per unit length.
- b) Explain with necessary diagrams the different types of fiber structures.
- 2.a) What is a signal distortion? Discuss how it limits the performance of optical communication?
- b) Derive an expression for the mechanisms by which distortion is caused in optical fibre communication?
- 3.a) Briefly discuss the following parameters for optical fibres:
  - i) Wave guide dispersion
  - ii) Material Dispersion.
- b) Explain overall fibre dispersion in a single mode fibre and compute the maximum dispersion for an optical graded fibre with  $n_{\text{core}} = 1.46$  and  $\Delta = 0.03$ , the length of fibre is 5Km.
- 4.a) With the help of expressions, explain internal quantum efficiency and modulation capability of LED.
- b) With a neat diagram explain the construction and working of a high radiance surface emitting LED.
- 5.a) A GaAs optical source with a refractive index of 3.6 is coupled to a silica fiber that has a refractive index of 1.48. If the fiber end and the source are in close physical contact then calculate the Fresnel reflection at the interface .
- b) Explain some possible lensing schemes used to improve optical source-to-fiber coupling efficiency with examples.
- 6.a) Briefly explain the operation of an APD.
- b) Draw and explain the operation of a fiber optic receiver.
- 7.a) Explain the basic elements of an analog link with different noise contribution.
- b) Explain about point-to-point lines in optical fiber transmission.
- 8.a) Discuss about the different types of line codes optical fiber communication.
- b) Write the expressions for Excess loss and Insertion loss in  $2 \times 2$  fiber coupler and explain in detail.

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