



(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 131701

Roll No.

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B.Tech

(SEM. VII) (ODD SEM.) THEORY EXAMINATION, 2014-15 OPTICAL COMMUNICATION

Time : 3 Hours]

[Total Marks : 100

Note : Attempt all questions.

1. Attempt any four questions. 4x5=20
 - (a) A silica optical fiber with a core diameter large enough to be considered by ray diameter large enough to be considered by ray theory analysis has a core refractive index of 1.5 and cladding refractive index of 1.47. determine
 - (i) Critical angle at core cladding interface
 - (ii) NA for the fiber
 - (iii) Acceptance angle
 - (b) An optical fiber has numerical aperture of 0.344. what is the acceptance angle for meridional rays ? calculate the acceptance angle for skew rays which change direction by 100° at each reflection.

- (c) A multimode step index fiber has a relative refractive index of 1% and a core refractive index of 1.5. The number of modes propagating at wavelength of 1.3 micrometer is 1100. Estimate the diameter of fiber core.
- (d) What is the difference between step index fiber and graded index fiber? How does the ray of light propagate through the graded index fiber?
- (e) Explain mode field diameter and normalized propagation constant.

2. Attempt any two questions. 2x10=20

- (a) Explain intermodal dispersion in multimode step index fiber. A 6km optical link consist of multimode step index fiber with a core refractive index of 1.5 and relative refractive index difference of 1%. Estimate:
 - (i) The delay difference between the slowest and fastest mode at the fiber output
 - (ii) The rms pulse broadening due to intermodal dispersion on the link.
- (b) Write a note on polarization maintaining fiber.
- (c) Explain the losses caused by linear and non linear sattering.

3. Attempt any four questions. 4x5=20

- (a) Write down the difference between semiconductor diode and LED.

- (b) What are spontaneous emission and simulated emission? Explain the principle of laser action.
- (c) Explain and derive Einstein relation.
- (d) Differentiate between surface emitter LED and edge emitter LED.
- (e) Explain the process of population inversion.

4. Attempt any two questions. 2x10=20

- (a) Explain the working of PIN photodiode. A p-i-n photodiode has a quantum efficiency of 55% at a wavelength of 0.9 micrometer. Calculate:
 - (i) Its responsivity at 0.9 micrometer
 - (ii) The received optical power if the mean photocurrent is 10^{-8} A.
 - (iii) The corresponding number of received photons at this wavelength.
- (b) Draw and discuss the explain avalanche photodiode receiver and derive expression for SNR.
- (c) Draw the block diagram of optical receiver. What are the various sources of noise in the receiver?

5. Attempt any four questions. 4x5=20

- (a) Explain link power budget. A 5km length optical fiber link has a fiber cable which has attenuation of 4 db km^{-1} and connector losses at the source and detector are 4 and 3.5. considering no dispersion on the link, calculate the total channel loss.

- (b) Explain OTDR.
 - (c) What are the basic requirement of WDM ?
 - (d) In power budget analysis determine the expression for average power launched for any transmitter and channel loss.
 - (e) Discuss optical power penalties.
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