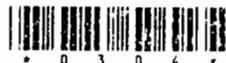


(b) Discuss with the aid of a suitable block diagram, a coherent optical fiber communication system.

(c) Outline the major techniques employed to achieve nonsynchronous optical ASK and FSK heterodyne detection. Indicate the benefits of these schemes over the corresponding synchronous demodulation schemes.

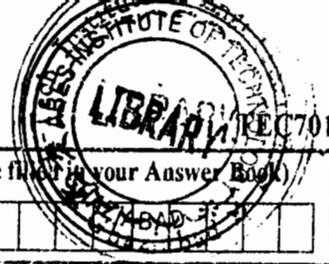


Printed Pages : 4

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

PAPER ID: 0304

Roll No.



B.Tech

(SEM VII) ODD SEMESTER THEORY EXAMINATION 2009-10
OPTICAL FIBER COMMUNICATION

Time : 3 Hours]

[Total Marks : 100

Note : Attempt all questions.

1 Attempt any four of the following : 5×4=20

- (a) Determine the refractive indices of the core and the cladding material of a fiber if numerical aperture is 0.22 and refractive index difference $\Delta = 0.012$.
- (b) Find the maximum diameter allowed for a fiber having core refractive index 1.53 and cladding refractive index 1.50. The fiber is supporting only one mode of a wavelength of 1200 nm.
- (c) Explain with suitable diagram evanescent field.
- (d) Explain wave theory for optical propagation in a cylindrical waveguide.
- (e) Explain block diagram of optical fiber communication system.



- (f) Find the maximum diameter of a core for a single mode optical fiber operating at $1.55 \mu\text{m}$ with $n_1 = 1.55$ and $n_2 = 1.48$.

Attempt any four of the following : $5 \times 4 = 20$

- (a) Briefly explain the reasons for pulse broadening due to material dispersion in optical fibers.
- (b) Calculate NA, multipath pulse broadening and bandwidth length product of a silica fiber with $n_{\text{core}} = 1.465$ and $n_{\text{clad}} = 1.45$.
- (c) Explain polarisation state in a single mode fiber modal birefringence.
- (d) Explain overall fiber dispersion in single mode fiber.
- (e) Compute the maximum dispersion for an optical graded fiber with $n_{\text{core}} = 1.46$ and $\Delta = 0.03$. The length of fiber is 5 km.
- (f) Explain linear and nonlinear scattering losses.

3 Attempt any two of the following : $10 \times 2 = 20$

- (a) With the suitable diagram give the mechanism of light from an LED and its use as an optical source for communication.

- (b) Discuss the relationship between electrical and optical modulation bandwidth for an optical fiber communication system. Estimate the 3dB optical bandwidth corresponding to a 3dB electrical bandwidth of 50 MHz.

- (c) Discuss the semiconductor injection laser. How is the efficiency of the laser defined? How is injection laser coupled to a fiber?

4 Attempt any two of the following : $10 \times 2 = 20$

- (a) How is silicon PIN operated? How does it differ from p-i-n photodiode? What are the advantage and disadvantage?
- (b) Define quantum efficiency and responsivity of a photodetector. Calculate the transit time for silicon photodiode which has a saturation of 10^5 ms^{-1} . The depletion layer thickness is $7 \mu\text{m}$.
- (c) Briefly discuss receiver structure. What is a PIN-FET hybrid receiver?

5 Attempt any two of the following : $10 \times 2 = 20$

- (a) Discuss the major considerations in the design of digital drive circuit for
- (i) An LED source
- (ii) An APD source.