(Following Paper ID and Roll No. to be filled in your Answer Book)										
PAPER ID : 2723 Roll No.										

B.Tech.

(SEM. VII) ODD SEMESTER THEORY EXAMINATION 2013-14

OPTICAL FIBER COMMUNICATION

Time : 3 Hours *Total Marks : 100*

Note :– Attempt **all** the questions. All questions carry equal marks.

1. Attempt any **four** parts of the following : **(5×4=20)**

   (a) A light wave is travelling in a semiconductor medium (Ga As) of refractive index 3.6. It is incident on a different semiconductor material of refractive index 3.4 and the angle of incidence is 80°. Will this result in total internal reflection ? Comment on this result.

   (b) Draw the block diagram of optical fiber communication system. Discuss the advantages of optical fiber communication system.

   (c) Explain the terms – mode field diameter, V number and mode volume.

   (d) What does Numerical Aperture signify ? Calculate refractive index of core and cladding material of a fiber, if NA is 0.22 and refractive index difference is 0.012.

   (e) Explain the concept of phase velocity and group velocity.

   (f) What do you understand by the term 'mode' in optical waveguide ? Sketch the various modes in a planer waveguide.

2. Attempt any **two** parts of the following : **(10×2=20)**

(a) Describe, with the aid of sketches, the techniques that can be employed to produce both high and low birefringence PM fibers. A two polarization mode PM fiber has a mode coupling parameter of 2.3×10^{-5} m^{-1} when operating at a wavelength of 1.55 μm. Estimate the polarization crosstalk for the fiber at this wavelength.

(b) What is signal attenuation ? A 40 km long optical fiber li has a loss of 0.4 db/km. Calculate min. optical power level, launched into fiber to maintain power level of 2.0 μW at receiving. What is required input power, if fiber has a loss of .6 db/km ?

(c) What is Chromatic dispersion ? How material dispersion is different from waveguide dispersion ?

3. Attempt any **four** parts of the following : **(5×4=20)**

(a) Discuss any one LED structure usable most in communication.

(b) What is hetero junction structure ? How is it helpful for LEDs ?

(c) Explain the operation of DFB and FPR laser.

(d) A GaAs injection laser has 1700 longitudinal modes emitted. The peak emission wavelength of device is 0.85 μm. Refractive index of GaAs is 3.6. Calculate:– (i) Length of cavity (ii) The wavelength separation between two modes.

(e) Outline the semiconductor material used for emission over the wavelength range 0.8 μm to 1.7 μm. Give reasons for their choice.

(f) Explain the principle, construction and working of p-i-n photo-detector.

4. Attempt any **two** parts of the following : **(10×2=20)**

(a) Photons of wavelength 0.85 μm are incident on a PN photo diode at a rate of 5×10^{10} per sec. and on an average electrons are collected at the terminals of the diode at the rate of 2×10^{10} sec. Calculate :– (i) Quantum efficiency of diode (ii) Maximum possible band gap energy (iii) Mean optical photocurrent, when incident power is 10 μW.

(b) Sketch the full equivalent circuit for a digital optical fiber receiver. Briefly discuss the possible sources of noise in optical fiber receivers.

(c) Define the quantum efficiency and responsivity of a photo-detector. Derive an expression for the responsivity of an intrinsic photo-detector in terms of the quantum efficiency of the device and the wavelength of the incident radiation.

5. Write short notes on any **two** of the following : **(10×2=20)**

(a) Multichannel Transmission techniques used in Optical Fiber System.

(b) Channel Losses.

(c) Direct Intensity Pulse Modulation technique for optical fiber transmission.

(d) Power budgeting in optical systems.