

Roll No.

22149

**M. E. 1st Semester
(Electronics & Communication Engg.)
Examination – January, 2012**

OPTICAL COMMUNICATION

Paper : MEEC-504

Time : Three hours]

[Maximum Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any *five* questions. All the questions carry equal marks.

1. (a) Explain ray theory of propagation in optical fiber communication system. Also differentiate between skew rays and meridional rays. 10

- (b) Compute the number of modes in a 50/125 graded Index fiber having a parabolic Index 2.0, reflective Index of core = 1.485 and clad = 1.46 at an operating wave Length of 820 nm and at 1300 nm. Also calculate number of modes in an equivalent step Index fiber at both wavelengths.

10

2. (a) How bending effects the optical fiber communication. Derive the Bending Loss equation and also calculate the critical radius of bending.

10

- (b) Calculate macro bend Loss of single mode fiber with core diameter of $10\mu\text{m}$ and cut off wave length of 1250 nm, which is bent into a curve of Radius = 1.2 cm. The refractive Index at $1.3\mu\text{m}$ is 1.4469. Also calculate the Mode Field Diameter.

3. (a) Explain various modes of propagation in step Index Fiber and derive the equation.

10

- (b) Find the core radius necessary for single mode operation at 1320 nm of a step Index Fiber with

$n_1 = 1.480$ and $n_2 = 1.478$. What are the Numerical Aperture and maximum Acceptance angle of this fiber ? 10

4. (a) Derive the equation for Quantum efficiency and coupling efficiency of LED Power. 10

(b) A DH In Ga AsP LED emitting at peak wavelength of 1310 nm has radiative and non radiative recombination time of 25 and 90 ns respectively. The Drive current is 35 mA.

(i) Find Internal Quantum efficiency and Internal Power Level.

(ii) If refractive Index of Light source mtrl is 3.5 calculate power emitted from the device. 10

5. Explain the structure, working principle and operation of PIN photodiode. What are the factors affecting the selection of mtrl for fabrication of PIN photodiode. 20

6. (a) Explain importance of LEDs Laser drive circuit. Draw a neat diagram and explain working and implementation of the circuit. 10

(b) Why a pre amplifier circuits required for receiver.
Also explain function of Equalizer with suitable
diagram. 10

7. (a) Discuss evaluation of the digital Receiver
performance in optical communication system.
Bring out all the factors nods attention. 10

(b) Derive the equation for Noise in the detection
circuit. How it effects the receiver and methods to
overcome the Noise effects.

8. Write short note on : 20

(a) Homodyne Receiver.

(b) Reusability and Laser Line width.