Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

ME Semester –II Examination Dec. - 2011

Subject code: 1710405 **Date: 14/12/2011**
Subject Name: Fiber Optic Communication
Time: 02.30 pm – 05.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Why optical fiber are so good for communication? Briefly explain any one application of optical fiber **07**

(b) Explain classification of fiber based on modes of propagation & index profile, with diagram. Compare them. **07**
A multimode step index fiber has a relative refractive index difference of 1% and a core refractive index of 1.5. The number of modes propagating at a wavelength of 1.3 μm is 1100, Estimate the diameter of the fiber core.

Q.2 **(a)** What do you mean by dispersion? How it affects the bandwidth of OFC. Show that the delay difference between extreme meridonial ray and axial ray in multimode step index fiber is $\delta T_s=(Ln_1\Delta)/c$. **07**

(b) Explain how graded index profile reduces the dispersion. **07**
A multimode graded index fiber exhibits total pulse broadening of 0.1μs over a distance of 10km. Determine

1- The maximum possible bandwidth on the link assuming no inter symbol interference.
2- The pulse dispersion per unit length
3- The bandwidth length product for the fiber.

OR

(b) Explain material dispersion. Calculate the rms pulse broadening per kilometer for the fiber with the material dispersion parameter 95.0 ps $nm^{-1}km^{-1}$, when the optical source used is an injection laser with a relative spectral width σ_λ/λ of 0.0012 at a wavelength of 0.85μ **07**

Q.3 **(a)** Explain desirable characteristics of good optical source and good detector. **07**

(b) What do u mean by Einstein relations? Derive expression for Einstein's coefficients. **07**

OR

Q.3 **(a)** Compare **07**

(i) LED & LASER
(ii) Spontaneous & stimulated emission
(iii) Electrical & optical Bandwidth

(b) Explain various LED efficiencies. Derive equations for responsivity. **07**

Q.4 **(a)** Explain principal of photo detection in OFC. **07**

A p-i-n photo diode has a quantum efficiency of 50% at a wavelength of 0.9 µm. calculate

(i) Its responsivity at 0.9 µm

(ii) The received optical power if the mean photocurrent is 10^{-6}A.

(iii) The corresponding number of received photons at this wavelength.

(b) Draw the block diagram of optical receiver. explain various sources of noises in Optical receiver **07**

OR

Q.4 **(a)** Explain **07**

(i) Dispersion shifted fiber

(ii) Optical connector

(iii) Population inversion

(b) A double hetrojunction InGaAsP LED operating at 1310nm has radiative and non-radiative recombination times of 30 & 100ns respectively. The injected current is 40 mA. Calculates **07**

(i) Bulk recombination life time

(ii) Internal quantum efficiency

(iii) Internal power level

Q.5 **(a)** What is the function of optical amplifier? Explain advantage and dis-advantage of it. How it differs from repeater. **07**

(b) What do you mean by optical splicer? Describe various optical splicing techniques **07**

OR

Q.5 **(a)** Write short note on OTDR **07**

(b) Write short note on Optical Switches **07**

****