Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

Subject code: 710405 **Date: 08-12-2014**

Subject Name: Fiber Optic Communication

Time: 10:30 am - 01:00 pm **Total Marks: 70**

Instructions:

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

Q.1 **(a)** Explain any seven advantages of optical fiber communication. **07**

(b) Define:(1) Snell's law **07**
(2) Acceptance angle
(3) Numerical Aperture

Q.2 **(a)** Define:(1) Phase velocity **07**
(2) Group Velocity
(3) Skew rays
(4) Total internal reflection
(5) Normalized frequency of fiber
(6) Mode volume for step index fiber
(7) Mode volume for graded index fiber

(b) With figure explain the refractive index profile and ray transmission in step index fiber. **07**

OR

(b) With figure explain the refractive index profile and ray transmission in multimode graded index fiber. **07**

Q.3 **(a)** Describe linear scattering losses in detail. **07**

(b) Explain Non linear scattering losses in detail. **07**

OR

Q.3 **(a)** Define material dispersion and derive the equation for it. **07**

(b) A long single mode optical fiber has an attenuation of 0.5 $dBkm^{-1}$.when operating at a wavelength of 1.3µm.The fiber core diameter is 6 µm and the laser source bandwidth is 600 MHz .Compare the threshold optical powers for stimulated Brillouin and Raman scattering within the fiber at wavelength specified. **07**

Q.4 **(a)** With figure explain the double crucible method for fiber drawing. **07**

(b) A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.50 and a cladding refractive index of 1.47 Determine : **07**
(1)The critical angle at the core cladding interface.
(2)The N.A. for the fiber
(3)The acceptance angle in air for the fiber.

OR

Q.4 **(a)** With figure explain the plasma activated chemical vapor deposition (PCVD) technique for the production of optical fiber. **07**

Q.4 **(b)** A multimode graded index fiber exhibits total pulse broadening of 0.1µs over a distance of 15 km .estimate: **07**
(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.

Q.5 **(a)** With figures explain the classification of fiber couplers briefly. **07**

(b) With figures explain the general principles of laser action briefly. **07**

OR

Q.5 **(a)** With figure explain the principle of operation of the double hetrojunction LED. **07**

(b) With necessary diagrams explain the operation of p-n photo diode in detail. **07**

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