Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– I (OLD course)• EXAMINATION – SUMMER 2015

Subject Code: 710405 **Date:15/05/2015**

Subject Name: Fiber Optic Communication

Time: 10:30 am to 1:00 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)**	Define the normalized frequency for an optical fiber and explain its use in the determination of the number of guided modes propagating within a step index fiber.	**07**
	(b)	A graded index fiber has a core with a parabolic refractive index profile which has a diameter of 50εm. The fiber has a numerical aperture of 0.2. Estimate the total number of guided modes propagating in the fiber when it is operating at a wavelength of 1εm.	**07**
Q.2	**(a)**	Briefly indicate with the aid of suitable diagrams the difference between meridional and skew ray paths in step index fibers.	**07**
	(b)	Determine the cutoff wavelength for a step index fiber to exhibit single-mode operation when the core refractive index and radius are 1.46 and 4.5 εm, respectively, with the relative index difference being 0.25%.	**07**
		OR	
	(b)	Consider a multimode silica fiber that has a core refractive index n_1= 1.48, cladding index n_2=1.46. Find the critical angle, the numerical aperture and the acceptance angle in air.	**07**
Q.3	**(a)**	Briefly describe linear scattering losses in optical fibers with regard to: (a) Rayleigh scattering; (b) Mie scattering.	**07**
	(b)	What do you mean by optical splicer? Describe various optical splicing techniques	**07**
		OR	
Q.3	**(a)**	Explain what is meant by: (a) fiber birefringence (b) the beat length; in single-mode fibers.	**07**
	(b)	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 ÖΓs=(Ln1æ)/c.	**07**
Q.4	**(a)**	Describe the structure of the fiber Bragg grating assisted coupler and explain how it can effectively block a specific optical signal at a particular wavelength.	**07**
	(b)	What is the function of optical amplifier? Explain advantage and disadvantage of it. How it differs from repeater.	**07**
		OR	
Q.4	**(a)**	Explain Mach-Zehnder Interferometer (MZI) multiplexer in detail.	**07**
	(b)	Explain the Nonlinear effects in fiber optic links.	**07**
Q.5	**(a)**	Draw the point to point link of optical communication system and explain it for calculating Link budget equation.	**07**
	(b)	Define the following terms related to photo detector: (i) Responsivity (ii) Quantum efficiency (iii) Cut off wavelength	**07**
		OR	
Q.5	**(a)**	Compare LEDs and LASERs.	**07**
	(b)	Explain the principle of operation of: (i) EDFA (ii) Wavelength division multiplexing.	**07**

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