Seat No.: Enrolment No. GUJARAT TECHNOLOGICAL UNIVERSITY M. E. - SEMESTER - I • EXAMINATION - SUMMER • 2014 Subject code: 710405 Date: 30-06-2014 **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 mark. 0.1. Answer the following. (14) (a) A Laser diode has lateral  $\emptyset = 0^{\circ}$  and transverse  $\emptyset = 90^{\circ}$  half power beam width of  $2 = 60^{\circ}$  and  $30^{\circ}$  respectively what are transverse and lateral power distribution (5) coefficient for this device? (b) A multimode step index fiber with a core diameter of 80µm and a relative index (5) difference of 1.5% is operating at a wavelength of 0.85  $\mu$ m. If the core refractive index is 1.48 calculate the normalized frequency for the fiber and the number of guided modes. (c) (4) A typical LED emits light at  $\lambda_0$ =820 nm with  $\Delta\lambda$ =40 nm. Compute the relative Line width in % and  $\Delta f$ . Q.2. (14) Discuss Modal analysis of step index fiber with necessary equations. (a) (7)Discuss briefly the DFB LASER with neat sketch and explain how it works as a (7)(b) LASER. OR (b) Consider a fiber with a 25 $\mu$ m core radius, a core index n<sub>1</sub>=1.48 and  $\Delta$ =0.001. If  $\lambda = 1320$  nm, what is the value of V and how many modes propagates in (i) (7) the fiber? (ii) What percent of the optical power flows in the cladding? If the core- cladding difference is reduced to 0.002, how many modes does (iii) the fiber support and what fraction of the optical power flows in the cladding? **O.3**. (14) Discuss EDFA Power conversion efficiency and Gain with necessary formulas. (7)(a) (b) Derive the formula for optical SNR for EDFPA. (7)OR Q.3. (14)Explain typical setup for Raman amplification system also discuss wideband optical (7) (a) amplifiers in series and parallel configuration. Discuss spectral broadening of a pulse due to self-phase modulation. (b) (7)0.4 (14)(a) Briefly Describe 4\*4 optical cross-connect architecture using optical space switches (7) and wavelength converters. Discuss coupled mode analysis of optical directional couplers. (b) (7)OR **Q.4** (14)(a) Discuss Optical link design with BER calculation by suitable example. (7) Describe amplification concept for operation in the C-and S-bands for WDM. (b) (7)**Q.5** (14)(a) A silicon RAPD operating at a wavelength of 0.80 m exhibits a quantum efficiency of (7)

90% a multiplication factor of 800, and a dark current of 2 nA. Calculate the rate at

	which photons should be incident on the device so that the output current (after	
	avalanche gain) is greater than the dark current.	
<b>(b)</b>	Explain any one method for optical attenuation measurement in OFC.	(7)
	OR	
Q.5		(14)
(a)	Write short note on role of Optical Time Domain Reflectometry (OTDR) for fibers measurement techniques.	
(b)	Write short note on electro-optic switches.	

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