Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – SUMMER • 2014

Subject Code: 161005 Date: 26-05-2014

Subject Name: Optical 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 marks.**

Q.1	**(a)**	Briefly Describe the block diagram of Optical Communication Systems.	**04**
	(b)	What is equilibrium numerical aperture. Give the significance of the same.	**04**
	(c)	Define the following terms related to photo detector. (i) Responsivity (ii) Quantum efficiency (iii) Cut off wavelength	**03**
	(d)	A step index fiber has n_{core}=1.44 and n_{clad}= 1.40 find (i) The N.A.(ii) Delta (iii) The acceptance angle.	**03**
Q.2	**(a)**	Derive the equation for the power launched from LED Source in to a G.I. fiber.	**07**
	(b)	A multimode step index fiber with a core diameter of 80μm and a relative index difference of 1.5% is operating at a wavelength of 0.85 μm. If the core refractive index is 1.48 calculate the normalized frequency for the fiber and the number of guided modes.Also compute the power in the clad if the total input power is 500 mw.	**07**
		OR	
	(b)	An LED with a circular emitting area of radius 20 μm has a lambertian emission pattern with 100 w/cm^2.sr. axial radiance at 100 mA drive current. How much optical power can be coupled in to a step index fiber having a 100 μm core diameter and numerical aperture of 0.22? How much optical power can be coupled from this source in to a 50 μm core diameter graded index fiber having $\alpha = 2.0$ n_1=1.48 and Δ=0.01 ?	**07**
Q.3	**(a)**	Discuss briefly the distributed feedback LASER with neat sketch.	**05**
	(b)	A Laser diode has lateral $\varnothing$ =0°and transverse $\varnothing$ =90° half power beam widths of 2θ=60°and 30° respectively what are transverse and lateral power distribution coefficient for this device?	**05**
	(c)	Mention the advantages of optical communication over conventional communication.	**04**
		OR	
Q.3	**(a)**	Discuss briefly the structure of Edge emitting LED with neat sketch.	**05**
	(b)	A photo diode has a quantum efficiency of 65% when photons of energy 1.5 x 10^{-19} J are incident upon it. (i) At what wavelength is the diode operating? (ii) Calculate the incidient optical power required to obtain a photo current of 2.5 μA.	**05**
	(c)	"The optical power launched into a fiber does not depend on the wavelength of the source but only on it's brightness" Justify.	**04**
Q.4	**(a)**	Explain any one method for optical dispersion measurement.	**05**
	(b)	A typical LED emits light at a center wavelength of 920nm with $\Delta\lambda$=20nm, Calculate the relative line width of this source in percent and Δf.	**05**
	(c)	Give the comparison of S.I. and G.I. fibers.	**04**
		OR	
Q.4	**(a)**	Describe briefly the losses in optical fibers.	**05**
	(b)	A silicon APD has a quantum efficiency of 75 % at a wavelength of 900 nm. If 0.5 mw of optical power produces a multiplied photo current of 10 mA, then what is avalanche gain for this device.	**05**
	(c)	Give the comparison of S.M. and M. M. fibers	**04**
Q.5	**(a)**	Discuss optical power loss model for a point to point link.	**07**
	(b)	Discuss Optical Time Domian Reflectomarary in detail.	**07**
		OR	
Q.5	**(a)**	Explain Semiconductor optical Amplifiers (SOAS).	**07**
	(b)	Write short notes on Syncronous optical fiber networks(SONET)	**07**

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