Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–I(New course)• EXAMINATION – WINTER- 2015

Subject Code: 2710503 **Date: 05/01/2016**

Subject Name: Fiber Optic Communication

Time:2:30 pm to 5:00 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)** Answer The Following **07**

(1) Optical bandwidth is higher compared to electrical bandwidth. Why?

(2) ITU specify channel spacing in terms of frequency not wavelength. Why?

(3) Write down conditions to propagate light into optical fiber.

(b) Explain the following: **07**

i) Bending Loss ii) Scattering Loss & iii) Absorption Loss

Q.2 **(a)** Explain the phenomenon of total internal refection using Snell's law and derive the expression for Numerical Aperture. **07**

(b) A step index multimode fiber with a Numerical aperture of 0.25 supports approximately 1200 modes at an 850 nm wavelength. **07**

i) What is the diameter of this core?

ii) How many modes does the fiber support at 1320 nm?

iii) How many modes does the fiber support at 1550 nm?

OR

(b) A point source of light is 12 cm below the surface of a large body of water (n= 1.33 for water). What is the radius of the largest circle on the water surface through which the light can emerge? **07**

Q.3 **(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 $\delta Ts=(Ln1\Delta)/c$. **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

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

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

Q.4	**(a)**	Compare (i) LED & LASER (ii) Spontaneous & stimulated emission (iii) Electrical & optical Bandwidth	**07**
	(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 (i) Bulk recombination life time (ii) Internal quantum efficiency (iii) Internal power level	**07**

OR

Q.4	**(a)**	Write a short note on fiber bragg gratings	**07**
	(b)	What is the function of optical amplifier? Explain advantage and disadvantage of it. How it differs from repeater.	**07**
Q.5	**(a)**	Write a short note on: PIN Receivers & APD Receivers.	**07**
	(b)	Write a short note on: EDFA & Raman Amplifiers	**07**

OR

Q.5	**(a)**	Explain different protection schemes in SONET/SDH	**07**
	(b)	Write a short note on WDM.	**07**

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