Seat No.: _____

Enrolment No._____

Date:11/05/2015

Total Marks: 70

07

GUJARAT TECHNOLOGICAL UNIVERSITY PDDC - SEMESTER-V • EXAMINATION – SUMMER • 2015

Subject Code: X51102 Subject Name: Optical Communication Time:02:30 pm - 05:00 pm Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q.1 (a) Draw the block diagram of an optical communication system. Also explain the 07 advantage of the optical communication.
 - (b) Compare the followings:
 - 1) Step index fiber and Graded index fiber.
 - 2) Single mode fiber and Multimode fiber.

Q.2 (a) Solve the followings:

Connectors.

- 1) A graded index fiber with a parabolic refractive index profile which has a diameter of 50 μ m. The fiber has a numerical aperture of 0.2. Estimate the total number of guided modes propagating in the fiber when it is operating wavelength of 1 μ m.
- 2) A multimode step index fiber has a numerical aperture of 0.3 and a core refractive index of 1.45. The material dispersion parameter for the fiber is 250 ps nm⁻¹ km⁻¹ which makes material dispersion the totally dominating chromatic dispersion mechanism. Estimate a) The total rms pulse broadening per kilometer when the fiber is used with an LED source of rms spectral width 50 nm and corresponding bandwidth length product for the fiber.
- (b) List the basic attenuation mechanisms in fiber, and discuss any two in brief. 07

OR

- (b) A typical relative refractive index difference for an optical fiber designed for long distance transmission is 1%. Estimate the NA and the solid acceptance angle in air for the fiber when the core index is 1.46. Calculate the critical angle at the core cladding interface within the fiber.
- Q.3(a) Discuss briefly the Fabry parrot resonator cavity LASER with neat sketch.07(b) Explain splicing techniques and list the characteristics of optical fiber07

OR

Q.3	(a)	Explain pulse broadening in graded-index fiber. Also explain how graded	07
		Index profile reduces the dispersion?	
	(b)	Write a brief note on PIN photodiode.	07

- Q.4 (a) Write a short note on possible lensing schemes used to improve optical source 07 to fiber coupling efficiency.
 - (b) Explain the light generating mechanisms in LASER. Also write a brief note on **07** population inversion.

Q.4	(a)	Write a short note on1) Optical couplers.2) Optical circulators.	07
	(b)	Describe key system requirements needed for analyzing point to point link, discuss the component selection for the same based on the characteristics of the Components.	07
Q.5	(a)	Explain Mach-Zehnder Interferometer (MZI) multiplexer in detail.	07
•	(b)	Describe the insertion loss method for optical attenuation measurement.	07
		OR	
Q.5	(a)	Write detail note on synchronous optical network (SONET).	07
	(b)	Explain eye pattern with neat sketch along with key performance parameters.	07
