Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI(NEW) EXAMINATION – WINTER 2022

Subject Code:3161005 Date:14-12-2022

Subject Name:Fiber Optic Communication

Time:02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define: (i) V number (ii) Responsivity (iii) Spontaneous emission	**03**
	(b)	Give in brief the comparison of S.I. and G.I. fibers.	**04**
	(c)	Explain the advantages of the optical communication system using optical fiber over conventional copper system as a transmission link. State the optical transmission windows.	**07**
Q.2	**(a)**	Draw and explain schematic of a fiber drawing apparatus.	**03**
	(b)	Draw ELED configuration and explain its working in detail.	**04**
	(c)	Define Numerical Aperture and derive its expression for the step index fiber.	**07**
		OR	
	(c)	Explain the electromagnetic mode theory for light propagation through fiber.	**07**
Q.3	**(a)**	Compare LED and LASER diodes as light sources for optical fiber.	**03**
	(b)	What is ‘population inversion’ and how it can be achieve?	**04**
	(c)	With reference to LED, explain how to achieve. a) a high radiance and high quantum effect b) carrier and optical confinement.	**07**
		OR	
Q.3	**(a)**	A step index fiber in air has a numerical aperture of 0.16, a core refractive index of 1.45 and a core diameter of 60 µm. Calculate refractive index of cladding, relative refractive index difference (Δ) and acceptance angle.	**03**
	(b)	Explain the working principle of Avalanche photo diode.	**04**
	(c)	Discuss briefly the distributed feedback LASER with neat sketch.	**07**
Q.4	**(a)**	Explain types of Mechanical Misalignment occur during fiber joining process.	**03**
	(b)	Explain double crucible method of fiber fabrication.	**04**
	(c)	Explain the basic principles of WDM and DWDM with respect to optical fiber system.	**07**
		OR	
Q.4	**(a)**	Explain different fiber ‘end face’ preparation techniques.	**03**
	(b)	What is dispersion in fiber optic communication? Describe: Material dispersion	**04**
	(c)	Sketch and explain the different lensing scheme to improve coupling efficiency.	**07**

Q.5	**(a)**	What is dispersion in optical fiber? How to reduce the effect of dispersion?	**03**
	(b)	Summarize the attenuation loss in optical fiber.	**04**
	(c)	Write short notes on Synchronous optical fiber networks(SONET)	**07**

OR

Q.5	**(a)**	Explain the Scattering Losses occur in optical fiber.	**03**
	(b)	Calculate the link power budget to construct an optical link of 15KM and a bandwidth of 100Mb/s. Components are chosen with following characteristics: Receiver sensitivity is -50dBm, fiber loss is 2dB/KM and a transmitter launch power of 0dBm, source and detector coupling loss of 1dB each.It is anticipated that 10 splices are required with each of loss of 0.4dB.Determine whether the system operates with sufficient power margin or not.	**04**
	(c)	Discuss the need of optical amplifier and also describe the architecture and amplification mechanism of Erbium Doped Fiber Amplifier. (EDFA).	**07**

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