Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VII (NEW) EXAMINATION – WINTER 2024

Subject Code:3170314 Date:16-12-2024

Subject Name: LASER and Fiber Optics in Medical Technology

Time:10:30 AM TO 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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Explain Total Internal Reflection with necessary Diagram.	**03**
	(b)	The refractive index of the core of an optic fiber was 1.47 and that of the cladding was 1.44, Calculate Cone of acceptance.	**04**
	(c)	Explain Components of Endoscopic System in Detail.	**07**
Q.2	**(a)**	Compare the characteristics of LASER light and Ordinary Light.	**03**
	(b)	A light ray is traveling in a transparent material of refractive index 1.51 and approaches a second material of refractive index 1.46. Calculate the critical angle.	**04**
	(c)	What is intermodal dispersion? Give the Equation to calculate No. of Modes. How do we overcome internodal dispersion with GI and SI Fiber?	**07**
		OR	
	(c)	Explain below Given Auxiliary Mechanical Devices and Subsystems with necessary Figure. Grasping forceps, Biopsy forceps, Cytology brushes, Snare, Cutting tools	**07**
Q.3	**(a)**	What is LASER? Give classification of LASER.	**03**
	(b)	Explain Skew Ray, meridional and Axial ray in brief with necessary figure.	**04**
	(c)	Describe the Operation of LASER with Proper Diagram.	**07**
		OR	
Q.3	**(a)**	What is Window? Give importance of 850nm.	**03**
	(b)	Define: Population Inversion & Differentiate between Spontaneous Emission and Stimulated emission.	**04**
	(c)	Write a Short Note on ND-YAG LASER.	**07**
Q.4	**(a)**	Draw structure of Optical Fiber and give Importance of Cladding and Buffer element.	**03**
	(b)	Explain any One application of LASER in Diagnosis.	**04**
	(c)	Explain Principle of Fiber Optic Biomedical Sensing System (Direct and indirect) with necessary Diagram.	**07**
		OR	
Q.4	**(a)**	Short Note: LASER Lithotripsy	**03**
	(b)	Explain any One application of LASER in Therapy.	**04**
	(c)	Explain Thermal Interaction of LASER with Tissues.	**07**

Q.5	**(a)**	Explain Angioscopy In a brief.	**03**
	(b)	If light leaves a material of refractive index 1.45 and crosses an abrupt boundary into a material of refractive index 1.0, Calculate the Fresnel loss	**04**
	(c)	Explain different bending losses associated with optical fiber with proper illustrations.	**07**

OR

Q.5	**(a)**	Explain Arthroscopy in a brief.	**03**
	(b)	Explain: Rayleigh scattering, Fresnel reflection.	**04**
	(c)	Write a note on: Applications of LASERs in Detection of Plaque in Cardiology	**07**

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