U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Electronics and Instrumentation Engineering **Duration: 3 hrs.**
Course Code: 19EI3PCLOI **Max Marks: 100**
Course: Laser and Optical Instrumentation

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	*CO*	*PO*	Marks
1	a)		Explain the construction and working principle of Ruby Laser with relevant energy level diagrams.	*CO2*	*PO1*	**10**
	b)		Describe the mode locking method in laser and explain the same using EO switch method.	*CO2*	*PO1*	**10**
			OR			
2	a)		Explain the construction and working principle of CO2 Laser with relevant energy level diagrams.	*CO2*	*PO1*	**10**
	b)		What is frequency stabilization technique? With relevant diagram explain the asymmetric power method.	*CO2*	*PO1*	**10**
			UNIT - II			
3	a)		Discuss how beam modulation telemetry can be used to measure intermediate distances.	*CO3*	*PO2*	**10**
	b)		Write a note on various laser machining process and also high light the main advantages of laser machining methods.	*CO3*	*PO2*	**10**
			OR			
4	a)		"Holography is a technique that records the light scattered from an object and subsequently at a later time, reconstructs the object's image", justify this statement using relevant diagrams.	*CO3*	*PO2*	**10**
	b)		With relevant diagram discuss the Laser Doppler velocimetry to measure velocity of fluid.	*CO3*	*PO2*	**10**
			UNIT - III			
5	a)		List the advantages and application of the optical fiber communication system.	*CO3*	*PO2*	**05**
	b)		What is intermodal dispersion? Derive a formula for Δtmax, the maximum intermodal dispersion.	*CO3*	*PO1*	**10**

		c)	Calculate the critical angle of incidence θc and the largest angle the ray can have with the axis of step-index fibre with core and cladding refractive indices of 1.54 and 1.51 respectively. Also, calculate the full acceptance angle.	*CO3*	*PO2*	**05**
			OR			
	6	a)	Summarize the following attenuation losses in optical fiber i) Absorption loss, ii) Scattering loss and iii) Radiation loss	*CO3*	*PO1*	**10**
		b)	With neat diagram explain the different types of optical fiber with respect to refractive index and number of modes.	*CO3*	*PO1*	**10**
			UNIT - IV			
	7	a)	Distinguish between extrinsic and intrinsic fiber optic sensors.	*CO4*	*PO1*	**06**
		b)	With a neat sketch explain the basic principle of measuring the temperature using fluro-optic temperature sensor.	*CO4*	*PO1*	**07**
		c)	Explain how small displacements are measured using an active multiple mode fibre?	*CO4*	*PO2*	**07**
			OR			
	8	a)	With a neat schematic diagram explain the passive fiber optic displacement transducers.	*CO4*	*PO2*	**06**
		b)	With neat diagram and mathematical equation explain the polarimetric temperature fiber optic sensor.	*CO4*	*PO2*	**08**
		c)	Discuss the measurement of current using fiber optic sensor.	*CO4*	*PO1*	**06**
			UNIT - V			
	9	a)	With relevant diagrams explain the working of Mach-Zehnder interferometer and Michelson interferometer method.	*CO4*	*PO1*	**10**
		b)	Explain the operating principle of fiber optic gyroscope with relevant diagrams. Derive an expression for phase shift and also mention its applications.	*CO4*	*PO1*	**10**
			OR			
	10	a)	What are Fiber Bragg gratings? Explain how FBG sensors are used to measure the strain with relevant diagrams.	*CO4*	*PO1*	**10**
		b)	Describe the measurement of liquid level using fiber optic sensor.	*CO4*	*PO1*	**10**

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