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: 23EI3ESLOI **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.

			MODULE - I	*CO*	*PO*	Marks
1	a)		With the help of suitable energy level diagram explain different lasing action.	CO1	PO1	**10**
	b)		With help of a neat diagram explain the working of He-Ne laser and write energy level diagram	CO1	PO1	**10**
			OR			
2	a)		Discuss how Q switching is obtained by Rotating Mirrors and Electro-Optic switch.	CO1	PO1	**08**
	b)		Write four main characteristics of laser light.	CO1	PO1	**04**
	c)		Considering suitable energy level diagram explain Rubby laser.	CO1	PO1	**08**
			MODULE - II			
3	a)		By employing Beam modulation telemetry explain how distance is measured with suitable diagram	CO2	PO1	**10**
	b)		What is laser welding? Explain different laser machining process with advantages.	CO2	PO1	**07**
	c)		Write the different applications of holography.	CO2	PO1	**03**
			OR			
4	a)		With relevant diagram explain the process of construction and reconstruction of hologram.	CO2	PO1	**10**
	b)		By employing Michelson interferometer explain how distance is measured.	CO2	PO2	**05**

		c)	A He- Ne laser 50 cm long with two longitudinal modes is used to measure distance in a Michelson interferometer. 2200 fringe changes are observed (bright to dark to bright) as the movable mirror is moved. Find the distance the mirror moved. The maximum distance that could have been measured.	CO2	PO2	**05**
			MODULE - III			
	5	a)	Write the advantages and application of optical fiber cable.	CO3	PO1	**06**
		b)	Calculate the critical angle of incidence and the largest angle the ray can have with the axis of step index fiber and core and cladding refractive indices of 1.54 and 1.52	CO3	PO2	**04**
		c)	Define following terms i. Acceptance angle ii. Acceptance cone iii. Numerical Aperture Derive the expression of Numerical Aperture using ray theory.	CO3	PO2	**10**
			OR			
	6	a)	Discuss the following attenuation losses in optical fibers i. Absorption loss ii. Scattering loss iii. Radiation loss	CO3	PO2	**09**
		b)	With relevant diagram explain Step index Single mode and multi-mode fiber	CO3	PO2	**06**
		c)	Graded index fiber is used to minimize dispersion loss. Justify the statement.	CO3	PO2	**05**
			MODULE - IV			
	7	a)	With the help of a neat diagram explain the working of intrinsic and extrinsic fiber optical sensor.	CO4	PO1	**06**
		b)	Explain intensity based fiber optic sensor.	CO4	PO1	**06**
		c)	Fiber bragg grating used to measure the strain and pressure Justify the statement.	CO4	PO2	**08**
			OR			
	8	a)	With relevant diagram explain the working of fiber optic current sensor.	CO4	PO2	**08**
		b)	With help of a neat diagram explain the working of fiber optic gyroscope.	CO4	PO2	**08**
		c)	Write the advantages of fiber optic sensor.	CO4	PO1	**04**

			MODULE - V			
	9	a)	Mach–Zehnder interferometer is used for determine the relative phase shift variations. Justify the statement.	CO4	PO2	**10**
		b)	Define LiDAR sensor. Explain how LiDAR is used in self-driven vehicles.	CO4	PO6	**10**
			OR			
	10	a)	Summarize the following optical sensor i. Michelson interferometer ii. Palarimetric Temperature sensor.	CO4	PO2	**10**
		b)	Explain how Fabry-Pérot interferometers are used to determine the resonant modes of a laser cavity.	CO4	PO2	**10**

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