U.S.N.										

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

Autonomous Institute Affiliated to VTU

June 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 a neat sketch explain the rotating –mirror type of Q-switching.	*CO1*	*PO1*	**06**
	b)		Describe the construction and working principle of carbon dioxide (CO2) laser:	*CO1*	*PO1*	**08**
	c)		Discuss, how frequency stabilisation is achieved in a laser diode.	*CO1*	*PO1*	**06**
			OR			
2	a)		List and explain any four special characteristics of Laser.	*CO1*	*PO1*	**04**
	b)		With a neat sketch, explain the construction, working and energy level diagram of the Nd – YAG laser.	*CO1*	*PO1*	**10**
	c)		What is Mode Locking? Describe passive mode locking.	*CO1*	*PO1*	**06**
			MODULE - II			
3	a)		With a neat schematic diagram, explain the measurement of distance using beam modulation telemetry.	*CO2*	*PO2*	**10**
	b)		Describe the holographic construction and reconstruction processes with neat diagrams.	*CO2*	*PO2*	**10**
			OR			
4	a)		With the necessary block diagram and equations, explain distance measurement using the pulse echo technique (Time-of Flight).	*CO2*	*PO2*	**10**
	b)		Highlight the main advantages of the laser machining process over conventional machining process. Also, explain the different laser machining process.	*CO2*	*PO2*	**10**

			MODULE- III			
	5	a)	What is intermodal dispersion? Derive the formula for ΔI_{max}, the maximum intermodal dispersion.	*CO3*	*PO1*	**08**
		b)	Explain the different types of losses in optical fiber.	*CO3*	*PO1*	**08**
		c)	Calculate the critical angle of incidence, θc and the largest angle the ray can have with the axis of step-index fibre,given that the core and cladding refractive indices are 1.54 and 1.51,respectively.	*CO3*	*PO2*	**04**
			OR			
	6	a)	List and explain the advantages and disadvantages of optical fibre.	*CO3*	*PO1*	**06**
		b)	Describe in detail the step index fibre and graded-index fibre.	*CO3*	*PO1*	**10**
		c)	Calculate the maximum radius for a single- mode optical fibre with core and cladding refractive indices of 1.54 and 1.49, respectively. The wavelength of the radiation is 1μm.	*CO3*	*PO2*	**04**
			MODULE – IV			
	7	a)	Explain the construction and working of intensity-modulated fiber optic sensors with the help of a neat diagram.	*CO3*	*PO1*	**08**
		b)	Discuss the working principle of Fiber Bragg Grating sensors in strain measurement.	*CO3*	*PO2*	**08**
		c)	Differentiate between intrinsic and extrinsic fiber optic sensors.	*CO3*	*PO1*	**04**
			OR			
	8	a)	Write a short note on the following: i.Fiber Optic current sensor ii. Passive Multimode fiber optic sensors.	*CO3*	*PO1*	**10**
		b)	Describe the construction and working principle of a fiber optic gyroscope with a neat diagram.	*CO3*	*PO2*	**10**
			MODULE- V			
	9	a)	Explain the operation of Mach-Zehnder interferometer to measure the phase difference with a neat sketch.	*CO4*	*PO2*	**10**
		b)	Describe how temperature is measured using Michelson interferometer with the help of a diagram.	*CO4*	*PO2*	**10**
			OR			
	10	a)	Describe with a neat sketch, the operation of remote-sensing polarimatric temperature sensor.	*CO4*	*PO6*	**10**
		b)	What is LiDAR technology, and how does it function in autonomous vehicles? Describe the key components of a LiDAR sensor used in autonomous vehicles and their respective functions	*CO4*	*PO2* *PO6*	**10**

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