

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: VI

Branch: Electronics and Instrumentation Engineering

Duration: 3 hrs.

Course Code: 22EI6PCLOI

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)	With relevant energy level diagram explain the construction and working principle of CO ₂ Laser.	CO1	PO1	10
		b)	Define laser mode locking? With relevant representation explain the concept of mode locking in Laser.	CO1	PO1	06
		c)	List the characteristics of the laser light.	CO1	PO1	04
			OR			
	2	a)	With the help of neat labelled diagram and relevant energy level diagram, explain the construction and working principle of Nd-YAG Laser.	CO1	PO1	10
		b)	Summarize the Q-switching method to obtain "GIANT PULSE" with Rotating Mirror.	CO1	PO1	06
		c)	List the difference between three energy level and four energy level laser.	CO1	PO1	04
			UNIT - II			
	3	a)	Discuss how beam modulation telemetry method can be used to measure intermediate distances m to km.	CO2	PO1	10
		b)	"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.	CO2	PO2	10
			OR			
	4	a)	Write a note on various laser machining process and also highlight the main advantages of laser machining methods.	CO2	PO1	10
		b)	Discuss the following laser application used to measure distance in mm to meter. i) - Interferometric method and ii) Pulse echo techniques.	CO2	PO1	10

		UNIT - III			
5	a)	Write the advantages of optical fiber over conventional coaxial cable.	CO3	PO1	04
	b)	What is Intermodal dispersion? Derive a formula for Δt_{\max} , the maximum intermodal dispersion.	CO3	PO2	08
	c)	With relevant diagram explain the different types of optical fibers relevant to refractive index and modes.	CO3	PO2	08
		OR			
6	a)	Calculate the number of allowed modes in an optical fibre which has a core refractive index of 1.53 and cladding refractive index of 1.50. The Vacuum wavelength of incident ray is $1.3\mu\text{m}$. Core has diameter of $200\mu\text{m}$.	CO3	PO2	04
	b)	Using ray theory concept derive the expression of the numerical aperture and acceptance angle of the optical fiber.	CO3	PO1	08
	c)	Explain the following losses in optical fiber i) Absorption loss, ii) Scattering loss and iii) Radiation loss	CO3	PO1	08
		UNIT - IV			
7	a)	With neat schematic diagram explain the passive fiber optic displacement transducers.	CO3	PO1	10
	b)	With relevant diagrams explain the following phase modulated fiber optic sensor. a) Mach-Zehnder Interferometer, b) Michelson Interferometer	CO3	PO1	10
		OR			
8	a)	Fiber optic sensor used to measure the current using principle of polarization, justify this statement with relevant diagram.	CO3	PO1	10
	b)	Explain the following fiber optic sensor i)Fluro-optic temperature sensors and ii) Polarization fiber sensors.	CO3	PO1	10
		UNIT - V			
9	a)	Fiber optic Gyroscope is used to measure the angular motion. Justify this statement with relevant diagrams and mathematical expression.	CO4	PO1, PO6	10
	b)	What is Fiber Bragg gratings? Explain how FBG sensor used to measure the strain with relevant diagrams.	CO4	PO1, PO6	10
		OR			
10	a)	Describe the measurement of liquid level using fiber optic sensor.	CO4	PO1, PO6	10
	b)	Discuss the Moire fringes fabry perot optical sensor used to measure physical parameter of pressure and temperature.	CO4	PO1, PO6	10
