Hall Ticket Number:

Code No. : 12122 AS N

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD
Accredited by NAAC with A++ Grade
B.E. II-Semester Advanced Supplementary Examinations, September-2023
Optics, Acoustics and Sensors
(Civil Engg.)

Time: 3 hours

Max. Marks: 60

Note: Answer all questions from Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Distinguish between damped and forced oscillations.	2	1	1	1,2,12
2.	Define quality factor and give the relationship between quality factor and bandwidth.	2	2	1	1,2,12
3.	Mention the properties of O-ray and E-ray	2	2	2	1,2,12
4.	Distinguish between Fraunhofer and Fresnel diffraction.	2	1	2	1,2,12
5.	Differentiate between stimulated and spontaneous emission processes.	2	1	3	1,2,12
6.	Write the necessity of cladding in an optical fiber.	2	1	3	1,2,12
7.	Elucidate the sound proofing applications used in civil and building engineering.	2	2	4	1,2,12
8.	Narrate Kundt's tube methods to detect ultrasonic waves	2	1	4	1,2,12
9.	Explain strain gauges working	2	2	5	1,2,12
10.	What are the objectives of monitoring the health of a structure?	2	1	5	1,2,12

Part-B (5 × 8 = 40 Marks)

11. a)	Write the conditions for critical damping, under damped and over damped motions by deriving the equation for damped harmonic oscillator.	6	2	1	1,2,12
b)	Write a note on resonant frequency and sharpness of resonance	2	4	1	1,2,12
12. a)	Derive an expression for the intensities of maxima and minima formed by a single slit diffraction.	5	2	2	1,2,12
b)	In a Newton's ring experiment the diameter of the 10th ring changes from 1.30 cm to 1.25cm when a liquid is introduced b/w the lens and the plate. Calculate the refractive index of the liquid.	3	3	2	1,2,12
13. a)	Derive an expressions for numerical aperture and acceptance angle. If the fiber were submersed in water, what would be the new numerical aperture?	4	4	3	1,2,12

			M	L	CO	PO
	b)	Write the conditions to achieve laser action. What is pumping and mention various pumping mechanisms used in the production of laser light?	4	2	3	1,2,12
14.	a)	With a neat sketch describe the production of ultrasonic waves by inverse piezoelectric method.	5	2	4	1,2,12
	b)	The fundamental vibrational frequency of quartz is 2.5 MHz. If it is vibrating at resonance, calculate its thickness. (Young's modulus of quartz is $7.9 \times 10^{10} N/m^2$ and density of quartz is 2.6466 gm/cm^3).	3	3	4	1,2,12
15.	a)	Explain the role of optical fiber Sensors in Structural Health Monitoring System?	4	2	5	1,2,12
	b)	Illustrate LVDT sensor working for structural health monitoring.	4	3	5	1,2,12
16.	a)	Obtain expression for the total energy of a simple harmonic oscillator	4	1	1	1,2,12
	b)	Explain action of a polarizer and an analyzer in polarization of light	4	4	2	1,2,12
17.		Answer any *two* of the following:				
	a)	Describe the construction and working of a Ruby laser with necessary diagrams?	4	2	3	1,2,12
	b)	Obtain Sabine's formula.	4	3	4	1,2,12
	c)	How temperature sensors can be used in Structural Health Monitoring System?	4	3	5	1,2,12

M : Marks;   L: Bloom's Taxonomy Level;   CO; Course Outcome;   PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	40%
iii)	Blooms Taxonomy Level – 3 & 4	40%

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