GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–I & II EXAMINATION – WINTER 2024

Subject Code:3110011   **Date:04-01-2025**

Subject Name:Physics

Time:10:30 AM TO 01:00 PM   **Total Marks:70**

Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Calculate the twisting couple on a solid shaft of length 1.5 m and diameter 120 mm when it is twisted through an angle 3º. The coefficient of rigidity for the material of the shaft may be taken to be 93 X 10^9 N/m^2.	**03**
	(b)	(i) What is Young's modulus? Give its equation. (ii) What is Bulk modulus? Give its equation. (iii) What is modulus of rigidity? Give its equation. (iv) What is Poisson's ratio? Give its equation.	**04**
	(c)	Explain the Stress-Strain diagram in detail.	**07**
Q.2	**(a)**	Define sound absorption coefficient. Define reverberation time.	**03**
	(b)	The volume of room is 1500 m^3. The wall area of the room is 260m^2, the floor area is 140m^2 and the ceiling area is 140 m^2 .The average sound absorption coefficient for wall is 0.03, for the ceiling is 0.8 and for the floor is 0.06. Calculate the average absorption coefficient and the reverberation time.	**04**
	(c)	Explain in detail about characteristics of SHM.	**07**

OR

	(c)	Discuss various factors affecting the acoustics of buildings and give their remedies.	**07**
Q.3	**(a)**	Distinguish between transverse and longitudinal wave?	**03**
	(b)	What are ultrasonic waves? List out the properties of ultrasound.	**04**
	(c)	Explain with required circuit diagram the generation of ultrasonic waves with piezoelectric effect.	**07**

OR

Q.3	**(a)**	Calculate the length of an iron rod which can be used to produce ultrasonic waves of 20 KHz. Density of iron is 7.23 X 10^3 kg/m^3 and Young's modulus is 11.6 X 10^{10} N/m^2.	**03**
	(b)	Briefly discuss the applications of ultrasound.	**04**
	(c)	Explain in detail the method for measuring velocity of ultrasound using acoustical grating method.	**07**
Q.4	**(a)**	The critical temperature of Nb is 9.15 K. At zero kelvin the critical field is 0.196 tesla. Calculate the critical field at 6K.	**03**
	(b)	Compare Type-I and Type-II superconductor.	**04**

(c) What is meant by superconductivity? Describe the effect of (1) magnetic field, (2) isotope, (3) impurity, (4) current and (5) pressure on superconductors. **07**

OR

Q.4 (a) Calculate the critical current which can flow through a long thin superconducting wire of aluminum of 10^{-3} m diameter. The critical magnetic field for aluminum is 7.9×10^3 A·m^{-1}. **03**

(b) Explain properties of Laser light. **04**

(c) Explain the construction and working of ruby laser. **07**

Q.5 (a) A typical laser emits a 6940 Å wavelength. Find the energy difference (in eV) between the energy levels of this laser. **03**

(b) Explain various applications of LASER. **04**

(c) List out various advantage and disadvantage of NDT. **07**

OR

Q.5 (a) What is cantilever? Write expressions for depression of cantilever when the load is fixed at the center for rectangular and circular bar. **03**

(b) Explain population inversion with suitable diagram. **04**

(c) Give a brief account of few important applications of superconductors. **07**

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