Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–I & II(NEW) EXAMINATION – WINTER 2022

Subject Code:3110011 Date:04-03-2023

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)**	Discuss stress-strain diagram.	**03**
	(b)	A wire of length 2 m and radius 0.5 mm is clamped at one of its ends. Calculate the torque required to twist the other end by 90°. The rigidity modulus of the wire is 2.8×10^{10} N/m^2.	**04**
	(c)	Derive an expression for the depression of the free end of cantilever. What are the applications of cantilevers?	**07**
Q.2	**(a)**	Define the term: (1) Reverberation time (2) Piezoelectric effect (3) Acoustic grating.	**03**
	(b)	A hall has a volume of 2265.6 m^3. Its total absorption is equivalent to 92.92 OWU. What will be the effect on the reverberation time if curtains of total absorption equivalent to 92.90 OWU are placed inside?	**04**
	(c)	What is simple harmonic motion? Obtain equation for kinetic energy and potential energy of simple harmonic oscillator. Show that at any time the sum of kinetic energy and potential energy remains constant.	**07**
		OR	
	(c)	Derive differential equation for forced oscillator. Explain transient behavior and steady state behavior with necessary equation.	**07**
Q.3	**(a)**	A piezoelectric X-cut crystal plate has a thickness of 1.6 mm. If the velocity of propagation of sound waves along the X-direction is 5760 m/s, calculate the fundamental frequency of the crystal.	**03**
	(b)	Explain the process of non-destructive testing of materials using ultrasonic waves by pulse echo system.	**04**
	(c)	What is meant by magnetostriction effect? Explain how the ultrasonic waves are produced using magnetostriction oscillator.	**07**
		OR	
Q.3	**(a)**	Write the properties of ultrasound wave.	**03**
	(b)	Calculate the value of capacitance required to produce ultrasonic waves of 10^8 Hz with an inductance of 1 henry.	**04**
	(c)	Described the different methods used for detection of ultrasonic waves.	**07**
Q.4	**(a)**	How is superconductivity affected by magnetic field and current?	**03**
	(b)	Distinguish between Type - I and Type - II superconductor.	**05**
	(c)	What is BCS theory? Enumerate the important results of BCS theory.	**06**
		OR	
Q.4	**(a)**	Explain how cooper pair state is responsible for superconductivity?	**03**
	(b)	The magnetic field intensity in the tin material is $\frac{3\times10^5}{4\pi}$ A/m at 0 K. Calculate the temperature of the superconductor if the field intensity is measured	**04**

as $\frac{2\times10^5}{4\pi}$ A/m. Critical temperature of tin is 3.69 K.

(c) Explain the properties of superconducting materials in detail. **07**

Q.5 **(a)** Write the advantages of using laser drilling in industries. **03**

(b) Using Einstein's theory, show that in the optical region, say, at λ=5000 A° and T=300 K, the amplification is not possible. **04**

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

OR

Q.5 **(a)** In Ruby laser, total number of Cr^{+3} ions in excited state are 2.8×10^{19}. If the laser emits radiation of wavelength 7000 A°, calculate energy of laser pulse. **03**

(b) What is population inversion? Explain the different methods for achieving population. **04**

(c) What is a gas laser? Explain the working of He-Ne laser with relevant diagrams. **07**