

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-1/2 EXAMINATION – WINTER 2021****Subject Code:3110011****Date:22/03/2022****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.

		<b>Marks</b>
<b>Q.1</b>	(a) Define Hooke's law, stress and strain.	<b>03</b>
	(b) Explain various properties of LASER beam.	<b>04</b>
	(c) Describe Stress-Strain diagram in detail.	<b>07</b>
<b>Q.2</b>	(a) Define wave motion. Discuss different types of waves.	<b>03</b>
	(b) (i) A cinema hall has a volume of $9,500 \text{ m}^3$ . What should be the total absorption in the hall if the reverberation time of 1.7 s is to be maintained?	<b>02</b>
	(ii) An ultrasonic source of 0.075 MHz sends down a pulse towards the seabed, which returns after 0.95 s. The velocity of ultrasound in sea water is 1800 m/s. Calculate the depth of the sea and wavelength of pulse.	<b>02</b>
	(c) Discuss in detail the different types of elasticity. List different factors affecting elasticity.	<b>07</b>
	<b>OR</b>	
	(c) What are the factors affecting acoustics of the building and give their remedies.	<b>07</b>
<b>Q.3</b>	(a) A brass bar having a cross-section of $1 \text{ cm}^2$ is supported on two knife-edges 1.5 m apart. A load of 2 kg at the center of the bar depresses that point by 2.75 mm. What is the Young's Modulus for brass?	<b>03</b>
	(b) Describe viscosity. How the comparison of viscosities of two liquids can be done?	<b>04</b>
	(c) Establish the relation between Einstein's coefficients.	<b>07</b>
	<b>OR</b>	
<b>Q.3</b>	(a) In the acoustic grating experiment, the wavelength of light transmitted through a liquid is $5970 \text{ \AA}$ . The 1 <sup>st</sup> order angle of diffraction is $0.195^\circ$ . Calculate the velocity of ultrasound in the liquid having frequency 2.7 MHz.	<b>03</b>
	(b) Expand SQUID. How is it formed and give its applications.	<b>04</b>
	(c) Explain in detail the production of ultrasonic waves through piezoelectric oscillator method.	<b>07</b>
<b>Q.4</b>	(a) Calculate the frequency to which piezoelectric oscillator circuit should be tuned so that a piezoelectric crystal of thickness 0.2 cm vibrates in its fundamental mode to generate ultrasonic waves. Young's modulus is 80 Gpa and density of material is $2654 \text{ kg/m}^3$	<b>03</b>
	(b) Define Cooper pair. Explain BCS theory for superconductors.	<b>04</b>
	(c) What are the applications of Ultrasound? Discuss them in detail.	<b>07</b>

**OR**

- Q.4 (a) The critical current density equal to  $1.71 \times 10^8 \text{ A/m}^2$  is required to change a superconducting wire of radius 0.5 mm at 4.18 K. If the critical temperature of the material is 7.5 K, calculate the maximum value of the critical magnetic field. 03
- (b) Explain NDT with it's objectives. 04
- (c) Explain in detail construction and working of He-Ne Gas LASER with necessary schematic and energy level diagrams. 07
- Q.5 (a) A voltage of  $6.7 \mu\text{V}$  is applied across a Josephson junction. What is the frequency of the radiation emitted by the junction in GHz? 03  
Planck's constant =  $6.626 \times 10^{-34} \text{ J.s}$
- (b) Define Optical resonator, life time, metastable state and pumping mechanism for LASER. 04
- (c) Define Superconductor. Discuss it's properties in detail. 07
- OR**
- Q.5 (a) A hall has a volume of  $2790 \text{ m}^3$ . It's total absorption is equivalent to  $98.80 \text{ m}^2$  of open window. What will be the effect on reverberation time if the audience fill the hall and thereby increase the absorption by another  $98.80 \text{ m}^2$  of open window. 03
- (b) What is ultrasonic waves? Give properties and detection methods for ultrasonics. 04
- (c) Give applications of LASER in various fields in detail. 07

\*\*\*\*\*