Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER– 1st / 2nd • EXAMINATION – SUMMER 2016

Subject Code:110011 **Date: 31/05/2016**

Subject Name: Physics

Time:02:30 pm to 05:00 pm **Total Marks: 70**

Instructions:

1. **Attempt any five questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Answer the following questions. [One mark each] **07**

1. Frequency range of audible sound waves is _____.
2. What is population inversion?
3. A semiconductor behaves as a perfect insulator at _____.
4. Define reverberation time.
5. Explain the term lattice.
6. What is the transition temperature for mercury ?
7. Define sound intensity.

(b) Answer the following questions. [One mark each] **07**

1. Define critical temperature.
2. Expand the term 'LASER'
3. State the working principle of fiber optics.
4. Define unit cell.
5. Write one-one example of pentavalent impurity and trivalent impurity.
6. What is the life time of charge carriers in metastable state ?
7. Total internal reflection occurs when a light ray travels from _____ to _____ medium.

Q.2 **(a)** Explain the terms Magnetostriction and piezoelectric effect. Discuss any one method of production of ultrasonic waves. **07**

(b) 1. Describe the characteristics of Laser. **04**

2. The refractive indices of the core and the cladding materials are 1.55 and 1.51 respectively. Calculate the numerical aperture of the optical fibre made from these materials. **03**

Q.3 **(a)** Explain the construction and working of Nd: YAG Laser with a suitable energy level diagram. **07**

(b) 1. Compare Type-I and Type-II superconductor. **04**

2. 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**

Q.4 **(a)** State any five factors affecting the acoustics of the building and give at least two remedies for each. **07**

(b) 1. Describe any four applications of Laser. **04**

2. A cinema hall has a volume of $7500m^3$. What should be the total absorption in the hall if the reverberation time of 1.5sec is to be maintained ? **03**

Q.5 **(a)** What is metallic glass? Explain melt-spinning method for the preparation of metallic glass (with diagram). **07**

(b) 1. Explain liquid penetrant method for NDT. **04**

2. What is SQUID ? Explain with diagram. **03**

Q.6	**(a)**	What are superconductors ? Explain few important properties of Superconductors.	**07**
	(b)	1. Compare single mode and multi mode optical fiber.	**04**
		2. Copper has FCC structure and its lattice parameter is 3.6 Å. Find the atomic radius.	**03**
Q.7	**(a)**	What is Hall effect ? Derive equations for Hall voltage, Hall co-efficient and mobility for n-type semiconducting material.	**07**
	(b)	1. What is Zener diode ? Explain with circuit diagram how a Zener diode operates in reverse bias condition.	**04**
		2. Calculate the frequency to which piezoelectric oscillator circuit should be tuned so that a piezoelectric crystal of thickness 0.1cm vibrates in its fundamental mode to generate ultrasonic waves.(Young's modulus and the density of material of crystal are 80 GPa and 2654 kgm^{-3}).	**03**

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