

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 7500m³. 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 \AA . 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**
