

**GUJARAT TECHNOLOGICAL UNIVERSITY****B.E. Sem-I/II Examination June-July 2011****Subject code: 110011****Subject Name: PHYSICS****Date:06/07/11****Total Marks: 70****Time:10:30 am to 1:00pm****Instructions:**

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

- Q.1** (a) Differentiate loudness and intensity of sound. Explain Weber-Fechner law. **06**  
 (b) Compare Hard and Soft superconductors. **04**  
 (c) State the properties of LASER. **04**
- Q.2** (a) A hall has volume of  $13000 \text{ m}^3$  and reverberation time 1.6 sec. If 300 chairs are additionally placed in the hall, what will be the new reverberation time of the hall? (Absorption of each chair is 1.0 OWU) **05**  
 (b) What is acoustical grating? **02**  
 (c) Explain the principle, construction and working of magnetostriction method of producing ultrasonic waves. **07**
- OR**
- (c) Derive the expression for rate of absorption of sound energy inside a hall in terms of energy density. **07**
- Q.3** (a) Define lattice and basis. Derive the expression for the interplanar distance 'd' for a cubic lattice. **06**  
 (b) Explain the construction, working and application of LED. **05**  
 (c) Calculate the interplanar distance for (321) plane in simple cubic lattice with interatomic spacing equal to  $4.12 \text{ \AA}$ . **03**
- OR**
- Q.3** (a) Define Miller indices. Explain the procedure for finding Miller indices of a plane. **07**  
 (b) Describe the Quantum Mechanical treatment of free electron theory to explain electrical conductivity. **07**
- Q.4** (a) A silica optical fiber has a core of refractive index 1.55 and a cladding of refractive index 1.47. Determine (i) the critical angle at the core-cladding interface (ii) the numerical aperture for the fiber and (iii) the acceptance angle in the air for the fiber. **06**  
 (b) Establish the relation between Einstein's coefficients A and B **04**  
 (c) Define (i) superconductivity and (ii) total internal reflection **04**
- OR**
- Q.4** (a) Explain the High  $T_c$  superconductor by giving one example. **07**  
 (b) Explain Hall effect. Derive the expression for Hall coefficient  $R_H$  in semiconductors. **07**
- Q.5** (a) Explain the method of x-ray radiography to detect the exact location of the flaws. **07**  
 (b) What are shape memory alloys? Explain shape memory effect and pseudo-elasticity. **07**

**OR**

- Q.5 (a)** What are nanomaterials? Mention the methods of producing nanomaterials and explain any one of them. **07**
- (b)** Describe the pulse echo system to detect flaws in the materials by giving advantages and limitations. **07**

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