

**GUJARAT TECHNOLOGICAL UNIVERSITY****B.E. Sem-II Remedial Examination September 2009****Subject code: 110011****Subject Name: Physics****Date: 09/09/2009****Time: 03:00pm- 05:30pm****Total Marks: 70****Instructions:**

1. Write seat no. and enrolment no. at given location on question paper.
2. Attempt all questions.
3. Make suitable assumptions wherever necessary.
4. Figures to the right indicate full marks.

- Q.1**
- (a) Define (i) Loudness (ii) Echo (iii) crystalline materials (iv) unit cell (v) Total internal reflection **05**
- (b) Explain Magnetostriction and piezoelectric effect. **05**
- (c) Briefly explain spontaneous and stimulated emission. **04**
- Q.2**
- (a) i The reverberation time is found to be 1.5 sec for an empty hall and it is found to be 1.0 sec when a curtain cloth of  $20 \text{ m}^2$  is suspended at the centre of the hall. If the dimension of the hall are  $10 \times 8 \times 6 \text{ m}^3$ , calculate the coefficient of absorption of curtain cloth. **04**
- ii The Bragg angle corresponding to the first order reflection from plane (111) in a crystal is  $30^\circ$  when x-rays of wavelength  $1.75 \text{ \AA}$  are used. Calculate the interatomic spacing. **03**
- (b) Explain the terms (i) reflection (ii) reverberation (iii) absorption of sound energy and then show graphically only the nature of growth and decay of sound energy in a hall due to reverberation. **07**
- OR**
- (b) What is laser? How does it differ from an ordinary source of light? Describe the construction and working of  $\text{CO}_2$  laser with diagrams. **07**
- Q.3**
- (a) What is an acoustic grating? Describe an experimental method of determining the velocity of ultrasonic waves in liquids. **05**
- (b) Deduce a relation between an interlinear distance 'd' and the Miller indices of the planes for cubic crystals. **05**
- (c) An ultrasonic source of 0.09 MHz sends down a pulse towards the seabed which returns after 0.55 sec. The velocity of sound in water is 1800 m/s. Calculate the depth of the sea and wavelength of pulse. **04**
- OR**
- Q.3**
- (a) What do you mean by acceptance angle and numerical aperture of a fiber? Derive expression for them. **07**
- (b) Derive the equation for Ohm's law explaining the free electron theory of metals. **07**
- Q.4**
- (a) What are Type-I and Type-II superconductors? **05**
- (b) Explain Josephson effect and its application. **05**
- (c) Give few important applications of superconductors. **04**
- OR**
- Q.4**
- (a) What are metallic glasses? Explain the melt spinning technique to **07**

prepare metallic glasses.

- (b) What is Shape Memory Alloys (SMA)? Explain the temperature induced and stress induced transformations in detail. **07**

- Q.5** (a) Describe the ultrasonic testing method of flaw detection. List the limitations of the method. **07**

- (b) Describe briefly the radio-graphical methods for non-destructive examination of engineering components. How will you decide the exact location of the flaw. **07**

**OR**

- Q.5** (a) What is Hall effect? Derive an expression for Hall coefficient. Describe an experimental set up for the measurement of the Hall coefficient. **07**

- (b) Explain the different types of fibers based on (i) material (ii) mode and (iii) index profile. **07**

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