Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– 1st / 2nd • EXAMINATION – SUMMER • 2014

Subject Code: 110011 **Date: 21-06-2014**

Subject Name: Physics

Time: 02:30 pm - 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.***
4. ***Each question carries equal marks.***

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

1. Classify the sound based on frequency.
2. What is a primitive cell?
3. Define: Density of packing.
4. Define: Forbidden band.
5. What is called a conventional radiograph and Xero-radiograph.
6. Define: Biomaterial.
7. What is a Kevlar?

(b) Obtain expression for electrical conductivity in terms of k_BT. [04]

(c) Calculate the critical current for a superconducting wire of lead having a diameter of 1mm at 4.2K. Critical temperature for lead is 7.18K and $H_c(0)=6.5\times10^4$A/m. [03]

Q.2 **(a)** 1. Define: Low-Temperature Superconductor, High-Temperature Superconductor, Maglev [03]

2. What is SQUID? Explain with diagram. [04]

(b) Discuss the various factors affecting the acoustics of buildings and give their remedies. [04]

(c) Calculate the electrical conductivity of copper. The atomic weight, density and relaxation time are 63.5,8.9×10^3kg/m^3 and 2.48×10^{-14}s, respectively. [03]

Q.3 **(a)** 1. Give brief account of temperature induced transformation. [03]

2. Discuss the types, properties and applications of metallic glasses. [04]

(b) Describe the principle and the method of producing of ultrasonic waves by magnetostriction method. [04]

(c) An optical fiber has a numerical aperture of 0.20 and a cladding refractive index of 1.55. Determine the acceptance angle for the fiber in water which has a refractive index 1.33. [03]

Q.4 **(a)** 1. What is NDT? Discuss the objectives of NDT. [02]

2. Explain Liquid Penetrant Method for NDT. [05]

(b) Define: Atomic radius. Derive atomic radius for BCC and FCC structure. [04]

(c) A rectangular plane sheet of doped silicon has dimension of 1cm along Y-direction, and 0.5mm along Z-direction. Hall probes are attached on its two surfaces parallel to X-Z plane and a magnetic field of flux density $0.7 Wb/m^2$ is applied along Z-direction. A current of 1mA is flowing in it in X-direction. Calculate the Hall voltage measured by the probes if the Hall coefficient of the material is $1.25 \times 10^{-3}\ m^3\ C^{-1}$. [03]

Q.5 **(a)** 1. Write short note on: Laser cutting [03]
2. Discuss the construction of Nd: YAG and CO_2 Laser with proper sketch. [04]

(b) Discuss the construction and working of (1) LED (2) Solar cell. [04]

(c) Calculate the atomic radius of Fe which has BCC structure. Given the density of iron $7.86 gm/cm^3$ and atomic weight 55.85. [03]

Q. 6 **(a)** 1. What is threshold intensity? Give its value. [01]
2. What are ultrasonic waves? [01]
3. Explain the term Hall Effect. Derive the relation between Hall voltage and Hall coefficient. [05]

(b) 1. Give the Differences between stimulated and spontaneous emission. [02]

2. Define the terms: (1) Population Inversion (2) Lasing (3) Pumping (4) Metastable State

[02]

(c) An ultrasonic source of 0.09 MHz sends down a pulse towards the seabed which returns after 0.55 seconds. Assuming the velocity of sound in sea water is 1800 m/s; calculate the depth of sea and the wavelength of pulse. [03]

Q. 7 **(a)** 1. The Bragg angle corresponding to the first order reflection from plane (111) in a crystal is 30^0 when X-rays of wavelength $1.75 A^0$ are used. Calculate the interatomic spacing.

[03]

2. Discuss the properties of superconductors. [04]

(b) Derive the expression for Acceptance angle and Numerical aperture of an optical fiber. [04]

(c) The sound from a drill gives a noise level 90 dB at a point short distance from it. What is the noise level at this point if four such drills are working simultaneously at the same distance from it? [03]

****