Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
B. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

Subject code: 110011   **Date: 02-01-2015**
Subject Name: Physics
Time: 10:30 am - 01:00 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. Define: Loudness
   2. What is acoustical grating?
   3. Define: Unit cell
   4. What are metallic glasses?
   5. How is an energy band formed?
   6. What is a depletion layer?
   7. Name the main components of LASER system.

   (b) Answer the following questions [One mark each]   **07**
   1. Define: Acceptance angle
   2. Define mobility of a charge carrier. Give its unit.
   3. State Wiedemann – Franz law.
   4. What is a SQUID?
   5. Define: Motif
   6. What are shape memory alloys?
   7. What is meant by NDT?

Q.2 **(a)** Discuss various factors affecting the acoustics of buildings and their remedies.   **07**

   (b) 1. Discuss photovoltaic effect.   **04**
   2. Calculate the refractive index of the core and cladding material of an optical   **03**
      fibre with numerical aperture 0.11 and relative refractive index difference
      0.015.

Q.3 **(a)** Explain inverse-piezoelectric effect to produce ultrasonic waves with proper   **07**
   diagram. What are the advantages and disadvantages of this method?

   (b) 1. What is biomaterial? Write the types of biomaterials.   **02**
   2. Write the advantages of ultrasonic inspection method.   **02**
   3. Calculate the Lorentz number when the thermal and electrical conductivity of   **03**
      copper at 26ºC are 420 $Wm^{-1}K^{-1}$ and 5.60×10^7 $\Omega^{-1}m^{-1}$ respectively.

Q.4 **(a)** What is Hall effect? Derive equations for Hall voltage, Hall coefficient and mobility   **07**
   for n-type semiconductor material.

   (b) 1. List any four properties of superconducting materials and explain in detail.   **04**
   2. Draw the following planes: (101), (020) and (112).   **03**

Q.5 **(a)** Establish the relation between Einstein's coefficients A and B.   **07**

   (b) 1. Discuss the advantages of optical fibre communication system over the   **04**
      conventional coaxial communication system.
   2. The critical temperature of mercury with isotopic mass 202 is 4.2 K. Calculate   **03**
      its critical temperature when its isotopic mass is 200.

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Q.6 **(a)** Explain the principle of X-ray radiography and describe the technique to detect the location of the flaws by X-rays. **07**

(b) 1. What are the success and drawbacks of classical free electron theory? **04**
2. Write short note on SONAR. **03**

Q.7 **(a)** What are nanomaterials? Explain the methods of preparing nanomaterials. **07**

(b) 1. Derive the relation between the interplanar distance and cube edge. **04**
2. Show that a change in intensity level of 1 dB alters the intensity by 26%. **03**

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