

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE - SEMESTER- 1<sup>st</sup> / 2<sup>nd</sup> • EXAMINATION – SUMMER 2013**

**Subject Code: 110011****Date: 14-06-2013****Subject Name: Engineering 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.

- Q.1** Answer the following in short. (One mark each) **14**
- (a) Define reverberation time.
  - (b) Give four factors which affect acoustics of building.
  - (c) What is SONAR?
  - (d) Give statement of Hall effect.
  - (e) Define: unit cell.
  - (f) What is high temperature super conductor?
  - (g) Name the most commonly used methods for preparing nanomaterials.
  - (h) Mention the names of any four NDT methods.
  - (i) Define photovoltaic effect.
  - (j) Give two conditions for TIR.
  - (k) State the main components of the optical fiber.
  - (l) What is magnetic levitation?
  - (m) Give full form of LASER.
  - (n) Give unit of thermal conductivity.
- Q.2** (a) Explain I-V characteristics of PN junction diode in forward and reverse bias with respective circuits and graphs. **6**
- (b) Solve the following problems:
- (i) A silicon plate of thickness 1mm, breadth 10mm and length 10cm is placed in a magnetic field of  $0.5 \text{ Wb/m}^2$  acting perpendicular to its thickness. If 10 mA current flows along its length, calculate the Hall voltage developed if the Hall coefficient is  $3.66 \times 10^{-4} \text{ m}^3/\text{C}$ . **3**
  - (ii) Calculate the inter planner spacing for a (3, 1, 1) plane in a simple cubic lattice whose atomic radius is  $0.91 \text{ \AA}$ . **3**
  - (iii) The area of interior surface of an auditorium is  $3340 \text{ m}^2$ . Its reverberation time is 1.5 second. If the average absorption coefficient of interior surface is 0.4 sabine, find the volume of an auditorium. **2**
- Q.3** (a) Explain in detail:
- (i) Nd: YAG Laser **5**
  - (ii) Ultrasonic flow detector with its advantages and limitations **4**
  - (iii) A liquid column subjected to ultrasonic waves constitutes an acoustical grating. **2**
- (b) An ultrasonic source of 1 MHz sends down a pulse towards the seabed which returns after 0.55 second. The velocity of sound in water is 1800 m/s. Calculate the depth of the sea and wavelength of the ultrasonic sound. **3**

- Q.4** (a) List and explain the characteristics of musical sound. **3**  
 (b) Define the terms atomic radius and packing fraction. Calculate the packing fraction for SC, FCC and BCC structures. **5**  
 (c) Explain isotopic effect, critical magnetic field and Meissner effect for superconductors. **6**
- Q.5** (a) Discuss properties and applications of metallic glasses. **4**  
 (b) Explain X-ray radiography and its advantages and disadvantages for NDT. **5**  
 (c) (i) List applications of nanomaterials. **3**  
 (ii) What are population inversion and optical pumping? **2**
- Q. 6** (a) Write short notes on (i) Zener diode (ii) Applications of LASER. **6**  
 (b) Derive the expression for acceptance angle & Numerical aperture of an optical fibre. **4**  
 (c) Discuss the important postulates of free electron theory of metals. **4**
- Q.7** (a) Solve the following problems:  
 (i) An optical fiber core and its cladding have refractive indexes of 1.545 and 1.495 respectively. Calculate the critical angle  $\phi_c$ , acceptance angle  $\phi_{in(max)}$  and Numerical aperture. **3**  
 (ii) Calculate the electrical conductivity of copper. Given atomic weight, density and relaxation time as 63.5,  $8.9 \times 10^3 \text{ Kgm}^{-3}$  and  $2.48 \times 10^{-14} \text{ sec}$  respectively. **3**
- (b) List the differences between step index and graded index optical fiber. **4**  
 (c) Discuss the piezoelectric method of production of ultrasonic waves with necessary circuit diagram. **4**

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