

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER- 1st / 2nd • 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 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 \AA . **2**
 - (iii) The area of interior surface of an auditorium is 3340 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. **3**
- 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 ϕ_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, $8.9 \times 10^3 \text{ Kg m}^{-3}$ 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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