

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E.I Sem-II Examination June 2010

Subject code:110011

Subject Name:Physics

Date: 15 /06 /2010

Time: 02.30 pm – 05.30 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** Answer the followings: **14**
- (a) What is radiography?
 - (b) Give four factors which affect acoustics of building.
 - (c) Frequency range of audible sound wave is _____.
 - (d) What is piezoelectric method?
 - (e) The total number of atoms per unit cell in SC structure is _____.
 - (f) The atoms or molecules in a solid are arranged in some regular fashion known as _____ solid.
 - (g) What is population inversion?
 - (h) The active medium in Nd:YAG laser is _____.
 - (i) Define fiber optic system.
 - (j) Define NDT.
 - (k) Give any two applications of biomaterials.
 - (l) The relation between electrical conductivity of material and mobility of charge carriers is given by _____.
 - (m) A semiconductor behaves as a perfect insulator at _____.
 - (n) _____ is the formula which gives the relation of critical magnetic field and critical temperature.
- Q.2**
- (a) i Explain the Hall effect and derive an expression of Hall coefficient. **04**
ii Show that $d = a / \sqrt{h^2 + k^2 + l^2}$ of a plane. **03**
 - (b) i An optical fiber has refractive index of core and cladding is 1.514 and 1.48 respectively. Calculate the acceptance angle and the fractional index change **04**
ii In carbon dioxide laser, the energy difference between two levels is 0.121 eV. Calculate the wavelength of radiation. **03**
- OR**
- (b) i Find the miller indices of a plane which intercepts at $a/2$, $b/2$ along X and Y – axis respectively and parallel to Z-axis in a simple cubic unit cell. Draw a (011) plane in a cubic system. **04**
ii Calculate the frequency at which piezoelectric oscillator circuit should be tuned so that a piezoelectric crystal of thickness 0.1 cm vibrates in its fundamental mode to generate ultrasonic waves. Given, Young's modulus = 80GPa and density of crystal material = 2654 kgm^{-3} . **03**
- Q.3**
- (a) Explain the construction and working of CO₂ laser with a suitable energy level diagram. **05**
 - (b) Establish the relation between Einstein's coefficients. **05**
 - (c) Give the differences between type I and type II superconductor. **04**

OR

Q.3

- (a) Derive an expression for electrical conductivity. State and deduce Wiedeman-Franz law. **05**
- (b) Describe the construction of fiber optic cable. **05**
- (c) Give the differences between step index fiber and graded index fiber. **04**

Q.4

- (a) Mention any five properties and applications of nanomaterials. **05**
- (b) Define the term atomic radius and packing fraction. Calculate the above for SC, FCC and BCC structures. **05**
- (c) Give the success and drawbacks of classical free electron theory. **04**

OR

Q. 4

- (a) Explain the types, properties of metallic glasses and melt spinning technique to prepare the metallic glasses. **05**
- (b) Discuss the dye penetrant method of NDT in detail. **05**
- (c) Draw a block diagram of an ultrasonic flaw detector and explain its actions. **04**

Q.5

- (a) Explain Josephson effect and its applications. **05**
- (b) Derive the Sabine's formula for reverberation time. **05**
- (c) What are the characteristics of musical sound? Explain them in detail. **04**

OR

Q.5

- (a) Write a short note on (i) LED and (ii) Photo diode. **05**
- (b) What is acoustic grating? Explain the acoustic grating method to determine the velocity of ultrasonic waves in liquids. **05**
- (c) Describe the various properties of ultrasonic. **04**
