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 carbondioxide 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 CO_2 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**

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