Seat No.: _____ *Enrolment No._____*

(PH-11)

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. all Sem-I Examination December 08/January 09

PHYSICS (110011)

DATE: 26-12-2008, Friday **TIME: 12.00 to 2.30 p.m.** **MAX. 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 following in short.**	**14**
i	Define unit cell	
ii	State the properties of LASER	
iii	What is the life time of charge carrier in metastable state?	
iv	What is standard intensity? Give its value.	
v	Define reverberation time	
vi	Define piezoelectric effect	
vii	Define total internal reflection	
viii	State the main components of optical fiber communication system.	
ix	Define the transition temperature for superconductivity	
x	Define NDT	
xi	What do you mean by metallic glasses?	
xii	Give two examples of pentavalent impurities.	
xiii	Define lattice and basis.	
xiv	State the full form of LASER	
Q.2 (a)	**Answer the following in detail.**	
i.	Discuss the advantage of optical fiber communication system over the conventional coaxial communication system	**4**
ii.	Compare type-I and type-II superconductors	**3**
Q.2 (b)	**Answer the following in detail.**	
i.	Derive the expression for acceptance angle & Numerical aperture of an optical fiber.	**4**
ii.	Calculate the NA, the acceptance angle of the fiber having $n_1 =$ 1.48 and $n_2 = 1.43$.	**3**
	OR	
Q.2 (b)	**Answer the following in detail.**	
i.	Discuss the properties , types and applications of metallic glasses	**4**
ii.	The volume of the room is 600m^3 . the wall area of the room is 220 m^2 the floor area is 120 m^2 and ceiling area is 120 m^2 . The average sound absorption coefficient for wall is 0.03 , for ceiling is 0.8 and for floor it is 0.06 . calculate reverberation time.	**3**

Q.3	**Answer the following in detail.**	
i.	Describe the construction and working of Nd- YAG laser.	**5**
ii.	Derive the relation between Einstein 's 'A' and 'B' coefficients.	**5**
iii.	Calculate the frequency to which piezoelectric oscillator circuit should be tuned so that a piezoelectric crystal of thickness 0.1cm vibrates in its fundamental mode to generate ultrasonic waves. (Young's modulus and the density of material of crystal are 80 giga Pascal and 2654 kgm^{-3}).	**4**
	OR	
Q.3	**Answer the following in detail.**	
i.	Explain the terms magnetostriction and piezoelectric effect. Discuss any one method of production of ultrasonic waves	**5**
ii.	What is meant by time of reverberation? Discuss Sabine's Formula.	**5**
iii.	The Hall coefficient (R_H) of a semiconductor is 3.22×10^{-4} m^3 C^{-1} . Its resistivity is 9×10^{-3} ohm-m. Calculate the mobility and carrier concentration of the carriers	**4**
Q.4	**Answer the following in detail.**	
i.	Discuss in detail the ultrasonic flaw detection.	**5**
ii.	What are Miller indices ? Explain with proper example how to determine miller indices.	**5**
iii.	Calculate the inter planner spacing for a (3,1,1) plane in a simple cubic lattice whose lattice constant is 2.109×10^{-10} m.	**4**
	OR	
Q.4	**Answer the following in detail.**	
i.	Explain how the materials are classified into conductors, semiconductors and insulators with the help of energy band diagrams.	**5**
ii.	State any five factors affecting the acoustics of the building and give at least two remedies for each.	**5**
iii.	What is the resultant sound level when a 70 dB sound is added to a 80 dB sound?	**4**
Q.5	**Answer the following in detail.**	
i.	Explain the term Hall effect. Derive the relation between Hall voltage and Hall coefficient	**5**
ii.	Discuss the important postulates of free electron theory of metals	**5**
iii.	Short notes : (1.) LED (2) solar cell	**4**
	OR	
Q.5	**Answer the following in detail.**	
i.	Discuss the liquid penetrate method of NDT in detail	**5**
ii.	Discuss the properties of superconductors.	**5**
iii.	Short notes : (1) crystal system (2) Shape memory effect	**4**

———————