GUJARAT TECHNOLOGICAL UNIVERSITY
B.E. Sem- 1ˢᵗ Regular Examination January 2011

Subject code:110011
Subject Name: PHYSICS

Date: 03/ 01 /2011   **Time: 10.30 am - 01.00 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 following in short**	**14**
(a)	State the characteristics of Laser.	
(b)	Define reverberation time	
(c)	Define piezoelectric effect	
(d)	What do you mean by primitive cell	
(e)	Give the full form of NDT	
(f)	Give two examples of tri-valent impurities for semiconductors	
(g)	Explain the term lattice and basis	
(h)	State the types of the optical fibers.	
(i)	What is the transition temperature for mercury.	
(j)	Define superconductivity.	
(k)	Define shape memory effect	
(l)	Give two examples solid lasers	
(m)	State the main components of the optical fiber	
(n)	Define sound intensity.	

Q.2	**(a)**	**Answer the following in detail**	
	1	Explain the construction and working of Nd:YAG laser	**05**
	2	Compare type-I and type-II superconductors**.**	**02**
	(b)	**Answer the following in detail**	
	1	Discuss the advantages of optical fiber communication system over the conventional system.	**05**
	2	Calculate the NA , the acceptance angle of the fiber having $n_1 = 1.52$ and $n_2 = 1.45$.	**02**

OR

	(b)	**Answer the following in detail**	
	1	Discuss the properties , types and applications of metallic glasses	**05**
	2	A hall has volume of 7500 m³ . What should be the total absorption in the hall if the reverberation time of 1.5 sec is to be maintained ?	**02**
Q.3		**Answer the following in detail**	
	(a)	Derive the relation between Einstein's coefficients A and B .	**05**
	(b)	State the characteristics of laser light .Explain the terms stimulated emission, spontaneous emission, population inversion, optical resonators and active medium	**05**
	(c)	An ultrasonic source of 0.09 MHz sends down a pulse towards the seabed which returns after 0.55 sec. The velocity of sound in water is 1800 m/s .Calculate the depth of the sea and wavelength of the pulse .	**04**

OR

Q.3   **Answer the following in detail**

(a) Explain the terms magnetostriction and piezoelectric effect. Discuss any one method of production of ultrasonic waves **05**

(b) What is meant by time of reverberation? Discuss Sabine's Formula. **05**

(c) Calculate the capacitance required to produce ultrasonic waves of 10^6 Hz with an inductance of 1 henry. **04**

Q.4   **Answer the following in detail**

(a) What do you mean by Miller indices ? Explain with proper example how to determine Miller indices. **05**

(b) Define atomic radius and packing fraction for the crystal system. Calculate atomic radius and packing fraction for simple cubic structure and face centered cubic structure. **05**

(c) Sodium metal with bcc structure has two toms/ unit cell. The radius of sodium atom is 1.85 A. Calculate the electrical resistivity at $0\,^{\circ}C$ if the classical value of mean free time at this temperature is $3X10^{-14}$ sec **04**

OR

Q. 4   **Answer the following in detail**

(a) Deduce expression for electrical conductivity of conducting material and hence obtain Wiedemann Franz law. **05**

(b) Discuss the properties of superconductors. **05**

(c) Calculate the inter planner spacing for a (3,1,2) plane in a simple cubic lattice whose lattice constant is $1.909 X10^{-10}$ m. **04**

Q.5   **Answer the following in detail**

(a) What is a varactor diode. Explain its working and applications **05**

(b) Discuss the liquid penetrant method of NDT in detail **05**

(c) A silicon plate of thickness 1mm, breadth 1 cm and length 10 cm is placed in a magnetic induction 0.5 weber/m^2 acting perpendicular to its thickness. If 1 A current flows along its length, calculate the Hall voltage developed if the Hall coefficient is 3.66 x 10^{-4} m^3/C. **04**

OR

Q.5   **Answer the following in detail**

(a) Explain the term Hall effect. Derive the relation between Hall voltage and Hall coefficient **05**

(b) Short notes : (1) shape memory effect (2) LED **05**

(c) Find the relaxation time of conduction electron in a metal having resistivity 1.54 x 10^{-8} ohm-m and electron density 5.8 x 10^{28} electrons/m^3. **04**

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