Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–1/2 EXAMINATION – WINTER 2017

Subject Code: 110011   **Date: 01/01/2018**

Subject Name: Physics

Time: 10:30 AM TO 01:00 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	**(a)**	List the assumptions made do derive the Sabine's formula for reverberation time? Derive the expression for growth of sound energy inside a hall.	**07**
	(b)	What is angle of acceptance? Derive an expression for angle of acceptance and numerical aperture of fiber in terms of refractive index of core and cladding.	**07**
Q.2	**(a)**	What is Magnetostriction? Explain with neat circuit the generation of ultrasonic wave by Magnetostriction oscillator method.	**07**
	(b)	What is superconductivity? List the properties of superconducting materials and explain each in detail.	**07**
Q.3	**(a)**	Explain the term optical pumping, population inversion, optical resonator and describe the construction and working of Nd:YAG Laser with suitable energy level diagram.	**07**
	(b)	**1)** A loudspeaker emits energy in all direction at the rate of $1.5 \, \text{j.s}^{-1}$. What is the intensity level at a distance of 20m? Standard intensity level of sound = $10^{-12} \, \text{w.m}^{-2}$.	**07**
		2) Differentiate bioactive and biodegradable materials, give two examples of it.	
Q.4	**(a)**	Calculate the coordination number, atomic radius and packing density for body centered cubic crystal structure.	**07**
	(b)	What are metallic glasses? Explain the melt spinning technique to prepare metallic glass.	**07**
Q.5	**(a)**	What are shape memory alloys? Explain shape memory effect and pseudo-elasticity.	**07**
	(b)	List the different methods for the production of nano particles through top-down mechanism. Explain one of the methods in detail with neat diagram.	**07**
Q.6	**(a)**	What is thermal conductivity? Derive the expression for thermal conductivity.	**07**
	(b)	What is meant by NDT? Explain briefly how the surfaces flaws are evaluated using liquid penetrate testing?	**07**
Q.7	**(a)**	Explain Hall effect. Derive the expression for Hall coefficient R_H in semiconductor.	**07**
	(b)	**1)** Calculate the acceptance angle and the critical angle of the fiber having core refractive index 1.50 and that of cladding 1.45.	**07**
		2) Explain Zener breakdown mechanism and avalanche multiplication.	

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