Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– I & II (NEW) EXAMINATION – WINTER 2019

Subject Code: 2110011 Date: 02/01/2020

Subject Name: Physics

Time: 10:30 AM TO 01:00 PM Total Marks: 70

Instructions:

1. **Question No. 1 is compulsory. Attempt any four out of remaining Six questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 Objective Question (MCQ) **Mark**

(a) **07**

1. The polarization of a solid which contains N number of particles per unit volume is equal to
(a) $P_e = N\alpha E$ (b) $P_e = 2N\alpha E$
(c) $P_e = N\alpha^2 E$ (d) $P_e = N\alpha^2 E^2$

2. SQUID is an application of
(a) Semiconducting materials (b) Nano materials
(c) Superconducting materials (d) Bio materials

3. In Nd:YAG LASER _____ kind of pumping is used.
(a) inelastic atomic collision (b) optical pumping
(c) direct electron excitation (d) none of these

4. The following are the structure of CNT
(a) Chiral (b) Zigzag
(c) Armchair (d) all of these

5. Hysteresis loop for hard ferromagnetic substances is_____.
(a) broad (b) narrow
(c) cannot say (d) none of these

6. The high temperature stable phase of SMA is called
(a) Austenite (b) Martensite
(c) Nitiosite (d) None of these

7. SONAR means _____.
(a) Sound Negative and Ranging (b) Sound Navigation and Radiation
(c) Sound Negative and Radiation (d) Sound Navigation and Ranging

(b) **07**

1. Which Of the following is Weber-Fechner's Law?
(a) $L = K \log_{10} I$ (b) $I = K \log_{10} L$
(c) $L^2 = K \log_{10} I$ (d) $I^2 = K \log_{10} L$

2. The current require to destroy the superconductivity is equal to
(a) $I_C = 4\pi r^2 H_C$ (b) $I_C = 2\pi r H_C$
(c) $I_C = 2\pi H_C$ (d) $I_C = 2\pi r H_0$

3. Dielectric materials can also be termed as
(a) Conductors (b) Semiconductors
(c) Insulators (d) Superconductors

4. Which one is not having permanent dipoles in absence of magnetic field?
(a) Paramagnetic material (b) Ferromagnetic material
(c) Ferrimagnetic material (d) Diamagnetic material

5. LASER light consists of _____.
(a) Electron flow (b) Cosmic rays
(c) UV rays (d) Coherent photons

6. _____ is the process to synthesize Metallic Glass.
(a) ball milling (b) CVD
(c) plasma arching (d) melt spinning technique

7. NDT means _____.

(a) Nano Density Test (b) Nano Detection Test

(c) Non Demanding Test (d) Non Destructive Test

Q.2 **(a)** Calculate the electronic polarisability of an isolated Se atom. The atomic radius of a Se atom is 0.12 nm. Given $\varepsilon_0 = 8.85 \times 10^{-12}$ F/m. **03**

(b) Explain important properties of superconducting materials. **04**

(c) List various polarization mechanisms in dielectric materials. Derive an expression for atomic polarizability α_e. **07**

Q.3 **(a)** A magnetic material has a magnetization of 2300 Am^{-1} and produces a flux density of 0.00314 Wbm^{-2}. Calculate the magnetizing force and the relative permeability of the material. Given permeability of the free space = $4\pi \times 10^{-7}$ H/m. **03**

(b) Give the properties and applications of dielectric materials. **04**

(c) Write general properties of diamagnetic, paramagnetic and ferromagnetic materials. **07**

Q.4 **(a)** The ultrasonic pulse echo method is employed to detect possible defects in a steel bar of thickness 40 cm. If the pulse arrival times are 40 μs and 80 μs, find the distance of defect from the end of the bar at which the ultrasonic pulse enters the bar. **03**

(b) What is the principle of magnetic recording? Discuss magnetic storage in magnetic hard disk. **04**

(c) What are the factors affecting acoustics of the buildings and their remedies? **07**

Q.5 **(a)** The critical temperature for a metal with isotopic mass 199.5 is 4.185 K. Calculate the isotopic mass if the critical temperature falls to 4.133 K. **03**

(b) Explain the classification of optical fibres based on refractive index profile. **04**

(c) Describe the construction and working of Nd:YAG LASER with a suitable energy level diagram. **07**

Q.6 **(a)** An optical fibre has a numerical aperture of 0.20 and a cladding refractive index of 1.55. Determine the acceptance angle for the fibre in water which has a refractive index of 1.33. **03**

(b) Write short note on Lithium cell. **04**

(c) List out techniques used in synthesis of Nanomaterials. Discuss any two of them in detail. **07**

Q.7 **(a)** What should be the total absorption and average absorption coefficient in a hall of volume 10000 m^3 and total surface are of 1400 m^2 if it is required to have reverberation time of 1.4 seconds. **03**

(b) Write note on electron confinement. **04**

(c) Explain temperature induced and stress induced transformation in SMA in details. **07**

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