Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER 1st / 2nd EXAMINATION (NEW SYLLABUS) – SUMMER - 2017

Subject Code: 2110011 Date:30/05/2017

Subject Name: Physics

Time: 2:30 PM to 05:00 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) **MARKS**

(a) **07**

1. The magnetic susceptibility is equals to _____
(a) $\chi = mH$ (b) $\chi = mH/B$
(c) $\chi = m/H$ (d) $\chi = mB/H$

2. The internal or Lorentz field equals to_____
(a) $E_i = E + E_c$ (b) $E = (P/ 3\varepsilon_0)$
(c) $E = E + (P^2/ 3\varepsilon_0)$ (d) $Ei = E + (P/ 3\varepsilon_0)$

3. _____dB is the sound level for the threshold of pain.
(a) 0 dB (b) 120 dB
(c) 110 dB (d) 10^{-12} dB

4. Magnetostriction effect is obtained from _____ material.
(a) Dia (b) Pera
(c) Ferro (d) Ferri

5. The resistivity of liquid helium drops to zero at _____ K
(a) 3.8 K (b) 4.2 K
(c) 6 K (d) 0 K

6. From the following , Soft magnetic materials are used in _____
(a) transformer cores (b) dc meters
(c) microphones (d) compass needles

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

(b) **07**

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

2. The dimensional formula for frequency of ultrasonic sound is
(a) $M^0L^0T^0$ (b) $M^0L^{-1}T^0$
(c) $M^0L^0T^{-1}$ (c) $M^0L^{-1}T^{-1}$

3. Curie - Weiss law is _____
(a) $\chi = C/ (T-\Theta)$ (b) $\chi = C/ (2T-\Theta)$
(c) $\chi = C/ (T+\Theta)$ (d) none of this

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

5. The mathematical expression for existence of stimulated emission is proposed by _____
(a) Newton (b) Ohm
(c) Pascal (d) Einstein

6. The electronic polarization of a solid material which contains N number of atoms are

(a) $P_e = N\ 2\ \pi\ \varepsilon_0\ R^3\ E$ (b) $P_e = N\ \pi\ \varepsilon_0\ R^3\ E$

(c) $P_e = N\ 4\ \pi\ \varepsilon_0\ R^3\ E$ (d) $P_e = N\ 4\ \pi\ \varepsilon_0\ R^3$

7. According to Snell's law

(a) $n_1/n_2 = \sin \varphi_1 / \sin \varphi_2$ (b) $n_1/n_2 = \sin \varphi_2 / \sin \varphi_1$

(c) $n_1/n_2 = \sin \varphi_1 + \sin \varphi_2$ (d) $n_1/n_2 = \sin^2 \varphi_1 / \sin^2 \varphi_2$

Q.2 **(a)** What do you understand by refractive index profile? Draw the sketch of step index & graded index fibers? Also give one example of each fiber in real world application. **03**

(b) What is superconductivity? Compare Type-1 and Type-2 superconductors. Which of these two has wider application? Why? **04**

(c) (i) Give difference between NDT and DT. Explain general objectives of NDT. **04**

(ii) In one of the quality testing lab ion slab with thickness 40 cm is tested with the help of ultrasound echo method. If the two passing pulses through specimen returns after 30 μs and 80 μs respectively Find the physical distance (depth) of the defect in specimen. **03**

Q.3 **(a)** What is isotopic effect for superconducting material? **03**
The critical temperature for a metal with isotopic mass of 199.5 is 4.185 K. Calculate the isotopic mass if the critical temperature falls to 4.133 K.

(b) Explain briefly Polarization phenomenon and types of Polarization with definition and equation in dielectric material. **04**

(c) Define bio material? Which characteristics are desirable in ideal bio materials? List out types and application of biomaterials in medical field. **07**

Q.4 **(a)** Define absorption coefficient and its unit. **03**
A hall has a volume of 1,20,000 m^3 It has a reverberation time of 1.5 seconds. What is the average absorbing power of the surface if the total absorbing surface area is 25,000 m^2 ?

(b) Explain with suitable examples applications of SMA in different fields. **04**

(c) (i) What are ferromagnetic domains? Draw B-H curve for hard and soft ferromagnetic materials and define remnant and coercive fields on the curve. **04**

(ii) Give difference between soft and hard magnetic material. Also give their applications. **03**

Q.5 **(a)** Define numerical aperture for optical fiber and give its equation. **03**
Calculate the refractive indices of core and cladding materials of an optical fiber if its numerical aperture is 0.22 and relative refractive index difference is 0.012.

(b) If an Ultrasonic welding machine uses frequency 10 MHz. Explain with neat sketch diagram principle, working, merits and demerits of traducer which will be used to generate this high frequency. **04**

(c) (i) Define Metallic Glasses. Give synthesis and applications of Metallic Glasses. **04**

(ii) List out properties and application of CNT's. **03**

Q.6 **(a)** Magnetic field of 2×10^{5} A/m is applied to a paramagnetic material with relative permeability of 1.01 Calculate the value of B and M ($\mu_0 = 4\ \pi \times 10^{-7}$ H/m) **03**

(b) List out techniques used in Synthesis of Nanomaterial. **04**
Briefly explain sole - gel techniques of preparing Nanomaterial and mention its advantage.

(c) Explain basic component of laser generation. Also give types of laser. Give applications of laser in various fields. **07**

Q.7 **(a)** Define polar and nonpolar dielectric materials. **03**
Calculate electronic polarisability of argon atom given $\varepsilon_r = 1.0024$ at NTP and $N = 2.7 \times 10^{25}$ atoms/m^3 ($\varepsilon_0 = 8.85 \times 10^{-12}$ F/ m)

(b) Explain Josephson Junction and its application. Also explain application of superconductor in Cryotron. **04**

(c) Describe the construction of fiber optical cable and compare the advantage of fiber optic cable over metallic cable. **07**

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