

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-1/2 EXAMINATION – WINTER 2021

Subject Code:2110011

Date:22/03/2022

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.
4. Simple and non-programmable scientific calculators are allowed.

Q.1 (a) Objective Question (MCQ)

Marks

7

1. LASER light consists of _____.
(a) Electron flow (b) Cosmic rays (c) UV rays (d) Coherent photons
2. Photovoltaic cell converts energy from
(a) Mechanical into Electrical (b) Light into Electrical (c) Hydro into Mechanical
(d) None of these
Polarization is defined as
3. (a) dipole moment per unit volume (b) dipole moment per unit area
(c) surface charge density (d) none of above
4. SQUID is an application of
(a) Semiconducting materials (b) Nano materials (c) Superconducting materials
(d) Bio materials
5. The population inversion takes place at ____medium.
(a) active (b) steady (c) unsteady (d) None of these
6. If the grain size of materials is then they are known as nano materials.
(a) 1 to 100 cm (b) 1 to 100 mm (c) 1 to 100 km (d) 1 to 100 nm
7. NDT means _____.
(a) Nano Detection Test (b) Non-Destructing Test (c) Non Demanding Test (d)
Nano Density Test

Objective Question (MCQ)

7

(b)

1. Dielectrics are the substances which are
(a) conductors (b) insulators (c) semi-conductors (d) none of above
2. Ferromagnetic substances have
(a) high permeability, low susceptibility (b) high permeability, high
susceptibility
(c) low permeability, low susceptibility (d) low permeability, high
susceptibility
3. Optical Fiber works on the principle of _____of light.

- (a) Scattering (b) Refraction (c) Dispersion (d) Total Internal Reflection
4. A junction formed by two superconductors with a very thin strip of an insulator is called _____.
- (a) P-N Junction (b) Transistor Junction (c) Josephson Junction (d) Bipolar Junction
5. Super elasticity is observed by
- (a) Biomaterials (b) Shape Memory Alloys (c) Metallic glasses (d) None of the above
6. Piezoelectricity is observed in
- (a) quartz crystal (b) NaCl crystal (c) Nickel rod (d) iron rod
7. Bucky ball is the name of
- (a) C₁₂₀ structure (b) C₇₀ structure (c) C₆₀ structure (d) none of these
- Q.2** (a) Explain polar and nonpolar dielectric materials. 4
- (b) Calculate the NA, the acceptance angle of the fiber having $n_1 = 1.48$ and $n_2 = 1.43$. 3
- (c) Write general properties of diamagnetic, paramagnetic and ferromagnetic materials. 7
- Q.3** (a) Derive Clausius-Mossotti equation. 4
- (b) 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 GPa and 2654 kg m⁻³). 3
- (c) (i) Explain the construction and working of Nd-YAG laser. 4
- (ii) Explain the classification of optical fibres based on refractive index profile. 3
- Q.4** (a) What is the principle of magnetic recording? Discuss magnetic storage in magnetic hard disk. 4
- (b) The critical temperature of Nb is 9.15 K. At zero Kelvin the critical field is 0.196 tesla. Calculate the critical field at 6K. 3
- (c) Describe the piezoelectric method for production of ultrasonic waves with its merits and demerits. 7
- Q.5** (a) Explain important properties of superconductors. 4
- (b) Explain: Meissner effect. Prove that a superconductor exhibits perfect diamagnetism. 3
- (c) (i) Give the properties and applications of dielectric materials. 4
- (ii) List out properties and application of CNT's. 3
- Q.6** (a) Write a short note on solar cell. 4
- (b) A cinema hall has a volume of 7500 m³. What should be the total absorption in the hall if the reverberation time of 1.5 second is to be maintained? 3
- (c) List out the techniques used in synthesis of Nanomaterial's. Discuss any two of them in detail. 7
- Q.7** (a) Write any two applications of nanomaterials and Biomaterials. 4

- (b) Determine the magnetization and flux density in silicon, if its susceptibility is -4.2×10^{-6} and magnetic field strength in it is $1.19 \times 10^5 \text{ Am}^{-1}$. 3
- (c) What are Shape Memory Alloys? Explain temperature-induced and stress-induced transformations in detail. 7
