**Seat No.: _____** **Enrollment No._____**

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER– 1st / 2nd EXAMINATION (NEW SYLLABUS) – SUMMER 2016**

**Subject Code: 2110011** **Date:31/05/2016**

**Subject Name: Physics**

**Time:02:30 PM to 5:00 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 maximum operating temperature of class Y insulating materials is _____.
a) above $180^0$ C b) $155^0$ C c) $130^0$ C d) $90^0$ C

**2.** The unit of absorption coefficient is _____.
a) $W/m^2$ b) dB c) sabine d) Bel

**3.** _____ materials are used to make permanent magnets.
a) Diamagnetic b) Paramagnetic c) Soft magnetic d) Hard magnetic

**4.** The basic principle behind fibre optic communication is _____.
a) reflection b) refraction c) total internal reflection d) diffraction

**5.** The grain size of nanomaterials is in the range of
a) 0.1 to 1 nm b) 1 to 10 nm c) 1 to 100 nm d) 10 to 100 nm

**6.** Which of the following is not true for soft magnetic materials?
They have a) low coercivity b) low retentivity c) low permeability d) high susceptibility.

**7.** The life time of an atom in meta stable state is of order of _____ seconds.
a) $10^{-9} – 10^{-8}$ b) $10^{-8} – 10^{-6}$ c) $10^{-6} – 10^{-3}$ d) $10^{-3} – 10^{-2}$

**(b)** **07**

**1.** Weber Fechner law is given as_____.
a) $L = K / \log_{10}I$ b) $L = K\log_{10}I$ c) $I = K / \log_{10} L$ d) $I = K \log_{10}L$

**2.** _____ is a naturally available dielectric material.
a) air b) nitrogen c) sulphurhexafluoride d) inert gas

**3.** The general chemical formula for a ferrite is _____
a) $MOFe_2O_4$ or $MFe_2O_4$ b) $MOFe_2O_3$ or $MFe_2O_4$ c) $MOFe_3O_3$ or $MFe_3O_4$ d) $MOFe_2O_2$ or $MFe_2O_3$.

**4.** Unit of loudness is _____.
a) Hertz b) phon c) second d) sabine-$m^2$

**5.** The relation between transition temperature Tc of a superconductor and its isotopic mass M is given as_____.
a) $Tc \alpha M^{-1/2}$ b) $Tc \alpha M^{1/2}$ c) $Tc \alpha 2M^{-1/2}$ d) $Tc \alpha 2M^{1/2}$

**6.** For superconductors magnetic susceptibility $\chi_m$ = _____.
a) 0 b) 1 c) -1 d) $\infty$

7. Electrical pumping is adopted in _____laser.
a) Nd:YAG b) $CO_2$ c) Ruby d) Semiconductor

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|---|---|---|---|
| **Q.2** | **(a)** | Calculate the polarizability and the relative permittivity in Hydrogen gas with a density of $9.8 \times 10^{26}$ atoms/$m^3$. Given the radius of the hydrogen atom as 0.50 $^0$A. | **03** |
| | **(b)** | Derive an expression for magnetic moment in terms of orbital angular momentum. | **04** |
| | **(c)** | Discuss in detail advantages of fibre optic cable over metallic cable. | **07** |
| **Q.3** | **(a)** | Find the critical current for a superconducting wire of lead having a diameter of 1mm at 4.2 K . Critical temperature of lead is 7.18 K and Hc(0) = $6.5 \times 10^4$ A/m. | **03** |
| | **(b)** | How can the depth of sea be measured using ultrasonic waves? | **04** |
| | **(c)** | Compare properties of diamagnetic, paramagnetic and ferromagnetic materials. | **07** |
| **Q.4** | **(a)** | Briefly discuss the types of dielectric materials with examples. | **03** |
| | **(b)** | Derive Clausius Mossitti equation. | **04** |
| | **(c)** | Describe the construction and working of Nd:YAG laser with suitable energy level diagram. | **07** |
| **Q.5** | **(a)** | Find the frequency of the first and second modes of vibration for a quartz crystal of piezoelectric oscillator. The velocity of longitudinal waves in quartz crystal is $5.5 \times 10^3$ m/s. thickness of quartz crystal is 0.05m. | **03** |
| | **(b)** | Explain what quantum confinement is. | **04** |
| | **(c)** | What are superconductors? Discuss Type-I and Type-II superconductors. | **07** |
| **Q.6** | **(a)** | An optical fibre core and its cladding have refractive indices of 1.545 and 1.495 respectively. Calculate the critical angle $\phi_c$ , acceptance angle $\phi_{in(max)}$ and numerical aperture. | **03** |
| | **(b)** | Give some properties and applications of nanomaterials. | **04** |
| | **(c)** | Discuss Piezo electric method of producing ultrasonic waves. | **07** |
| **Q.7** | **(a)** | A hall has a volume of 12,500 $m^3$ and reverberation time of 1.5 sec. If 200 cushioned chairs are additionally placed in the hall what will be the new reverberation time of the hall? The absorption of each chair is 1 O.W.U. | **03** |
| | **(b)** | Define the following: i) dielectric constant ii) electric flux density iii) polarization vector iv) electric susceptibility | **04** |
| | **(c)** | Explain temperature induced and stress induced transformations in shape memory alloys in detail. | **07** |

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