Seat No_____ Enrollment No _____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**B.E. Sem-I Examination January 2010**

**Subject code: 110011** **Subject Name: Physics**
**Date: 01 / 01 / 2010** **Time: 11.00 am – 1.30 pm**
**Total Marks: 70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

**Q-1** Answer the following questions.

| | | |
|---|---|---|
| **i** | Explain the various factors affecting the acoustics of building and give their remedies. | **04** |
| **ii** | Briefly explain stimulated emission. | **02** |
| **iii** | What is the absorption coefficient? Explain how to determine the absorption coefficient. | **03** |
| **iv** | A cinema hall has a volume of 7500$m^3$. What should be the total absorption in the hall if the reverberation time of 1.5sec is to be maintained? | **02** |
| **v** | Give the properties of ultrasonic wave. | **02** |
| **vi** | What is a Kevlar? | **01** |

**Q-2** **(a)** Answer the following questions.

| | | |
|---|---|---|
| **i** | Describe the principle and the method of producing of ultrasonic waves by magnetostriction method. | **04** |
| **ii** | What is the resultant sound level when a 70dB sound is added to an 85dB sound? | **02** |
| **iii** | What are intrinsic semiconductors? | **01** |

**(b)** Answer the following questions.

| | | |
|---|---|---|
| **i** | Calculate the thickness of a quartz plate needed to produce ultrasonic waves of frequencies (i) 2MHz (ii) 30KHz. (Given $\rho = 2650 Kg/m^3$ and Young's Modulus = $8 \times 10^{10} N/m^2$). | **02** |
| **ii** | What are Miller Indices? Draw the plane from given Miller Indices; (i) (1 1 0) (ii) ($\bar{1}$ 0 0) (iii) (1 1 2). | **05** |

**OR**

**(b)** Answer the following questions.

| | | |
|---|---|---|
| **i** | What are extrinsic semiconductors? Explain the term Hall Effect. | **03** |
| **ii** | Explain LED (principle and application). | **04** |

**Q-3** **(a)** Answer the following questions.

| | | |
|---|---|---|
| **i** | Explain (i) population inversion (ii) pumping (iii) optical resonator. | **03** |
| **ii** | Describe the construction and working of Nd: YAG Laser with a suitable energy level diagram. | **04** |

**(b)** State the characteristics of LASER. Explain the method of construction and reconstruction of a hologram. **07**

**OR**

**Q-3** **(a)** Describe the construction of fiber optic cable and compare the advantage of fiber optic cable over metallic cable. **07**

**(b)** Answer the following questions.

| | | |
|---|---|---|
| **i** | Give the conditions to be satisfied for total internal reflection for the optical fiber. | **04** |

**ii** The Hall Coefficient ($R_H$) of a semiconductor is $3.22 \times 10^{-4} m^3 C^{-1}$. Its resistivity is $9 \times 10^{-3}$ Ω-m. Calculate the mobility and carrier concentration of the carriers. (Given e = $1.6 \times 10^{-19}$ C). **03**

**Q-4** **(a)** Answer the following questions.

**i** Explain the classical free electron theory of metal. **04**

**ii** An optical fiber core and its cladding have refractive indexes of 1.545 and 1.495 respectively. Calculate the critical angle $ø_c$, acceptance angle $ø_{in(max)}$ and Numerical aperture. **03**

**(b)** Answer the following questions.

**i** What are the success and drawbacks of classical free electron theory? **04**

**ii** Compare Type-I and Type-II superconductor. **03**

**OR**

**Q-4** **(a)** What is superconducting material? List the properties of superconducting materials and explain in detail. **07**

**(b)** Answer the following questions.

**i** Give the application of superconductor. **04**

**ii** Write the properties of metallic glasses. **03**

**Q-5** **(a)** What is nano technology? Write the application of nano technology. **07**

**(b)** Answer the following questions.

**i** What is biomaterial? Write the type of biomaterials. **04**

**ii** Mention the name of the various NDT methods. **03**

**OR**

**Q-5** **(a)** What are the objectives of NDT? Discuss about the ultrasonic inspection method-pulse echo system. **07**

**(b)** Answer the following questions.

**i** Explain X-ray Radiography. **03**

**ii** Draw only the material phase transformation diagrams for shape memory effect (Temp Vs Load) and pseudo-elasticity (Stress Vs Strain). **04**

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