Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE SEM- I / II Winter Examination-Dec.-2011

Subject code: 110011   **Date: 24/12/2011**
Subject Name: Physics
Time: 10.30 am -1.00 pm   **Total marks: 70**

Instructions:
1. **Attempt any five questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** One mark each.   **07**
   (i) Name characteristics of musical sound.
   (ii) The frequency of ultrasonic waves is _____.
   (iii) Define unit cell.
   (iv) Give one-one example of pentavalent impurity and trivalent impurity.
   (v) What is the life time of charge carriers in metastable state?
   (vi) Total internal reflection occurs when a light ray travels from _____ to _____.
   (vii) What is persistent current?

   (b)(i) Give brief account of temperature induced transformation.
   (ii) What is SQUID? Explain with diagram.   **03**
   (iii) Define X-Ray fluoroscopy. Also name its applications.   **02**
                                                                                        02

Q.2 **(a)** Define and explain thermal conductivity. Also derive the equation for   **07**
thermal conductivity K. Write its units.
   (b)(i) Calculate packing fraction for FCC and BCC.   **03**
   (ii) In a Hall coefficient experiment a current of 0.25A is sent through a   **04**
metal strip having thickness 0.2mm and width 5mm.The Hall voltage
is found to be 0.15mV, When a magnetic field of 0.2T is applied.
Find: (1) Carrier concentration and (2) Drift velocity of the carrier.

Q.3 **(a)(i)** What do you understand by the term acceptance angle and acceptance   **05**
cone? Derive an expression for acceptance angle in terms of
refractive indices of the core and the cladding.
The wavelength of light transmitted through a liquid is $6000A^0$. The
   (ii) first order angle of diffraction is 0.046^0. Calculate the velocity of
ultrasonic waves in the liquid. The frequency of the ultrasonic waves
produced by the transducer is 2MHz.

                                                                                        02
   (b)(i) How does a laser beam differ from a point source of light? Mention   **03**
any two engineering applications of laser.
   (ii) What is an optical resonator cavity? What role does it play in a laser?
   (iii) What is active medium in Nd:YAG laser and CO_2 laser?   **02**
                                                                                        02

1

Q.4 **(a)(i)** What is an LDR? Explain the working and applications. **05**

(ii) What is zener diode? How zener diode does operates in reverse bias condition. **02**

(b)(i) X-rays of unknown wavelength give first order Bragg's reflection at glancing 20^0 with (212) planes of copper having FCC structure. Find wavelength of X-Rays ,if the lattice constant for copper is $3.615A^0$. **04**

(ii) A Hall has a volume of $2265m^3$.Its total absorption is equivalent to $94.85m^2$ of open window. What will be effect on reverberation time if audience fills the hall and there by increases the absorption by another $94.85m^2$. **03**

Q.5 **(a)** Discuss magnetic field effect and diamagnetic property of superconductor. Prove that $\Psi_m = -1$ for superconductor. **07**

(b)(i) Discuss at least three of the engineering applications of ultrasound. **03**

(ii) Draw circuit diagram of magnetostriction oscillator and explain the working. **04**

Q.6 **(a)(i)** Classify the fibres on the basis of refractive index profile, on the basis of modes of propagation and on the basis of materials. **05**

(ii) What is the numerical aperture of an optical fibre cable with a clad index of 1.378 and a core index of 1.546? **02**

(b)(i) A uniform silver wire has a resistivity of 1.54×10^{-8} ohm.metre at room temperature. For an electric field along the wire of 1volt/cm. Calculate (1)drift velocity ,(2) Mobility, (3)relaxation time of electron assuming that there are 5.8×10^{28} conduction electron per metre3 of the material. Given $M_e = 9.1 \times 10^{-31}$kg and e = 1.6×10^{-19} coulomb. **05**

(ii) Mention any four names of NDT methods. **02**

Q.7 **(a)** What are metallic glasses? How to prepare them? Write also the names of other techniques. **07**

(b)(i) State and explain Weber-Fechner law. **03**

(ii) What are Miller indices? Draw crystal planes having Miller indices (210),(101) and (010) for simple cubic structure **04**

****