

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**
- Q.2 (a)** Define and explain thermal conductivity. Also derive the equation for thermal conductivity K. Write its units. **07**
- (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 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. **04**
- Q.3 (a)(i)** What do you understand by the term acceptance angle and acceptance cone? Derive an expression for acceptance angle in terms of refractive indices of the core and the cladding. **05**
- The wavelength of light transmitted through a liquid is 6000\AA . The first order angle of diffraction is 0.046° . Calculate the velocity of ultrasonic waves in the liquid. The frequency of the ultrasonic waves produced by the transducer is 2MHz.
- (ii)** **02**
- (b)(i)** How does a laser beam differ from a point source of light? Mention any two engineering applications of laser. **03**
- (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 CO₂ laser? **02**
- 02**

- 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° with (212) planes of copper having FCC structure. Find wavelength of X-Rays ,if the lattice constant for copper is 3.615\AA .
A Hall has a volume of 2265m^3 .Its total absorption is equivalent to **04**
(ii) 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 $M_e = 9.1 \times 10^{-31}\text{kg}$ and $e = 1.6 \times 10^{-19}$ 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**
