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 flaoroscopy. Also name its applications.	**02**
			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**
	(ii)	The wavelength of light transmitted through a liquid is $6000A^0$. The 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 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 CO_2 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 20^0 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 $1.54x10^{-8}$ 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 $5.8x10^{28}$ conduction electron per metre3 of the material. Given $M_e = 9.1x10^{-31}$kg and e = 1.6 x 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**

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