Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–IV • EXAMINATION – SUMMER 2013

Subject Code: 741001 **Date: 14-05-2013**

Subject Name: Advanced Cryogenics and Applied Super Conductivity

Time: 10.30 am - 01.00 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	**(a)**	Describe construction and working of a typical SQUID system for sensing external magnetic field.	**07**
	(b)	Explain rigidity of the wave function in context to flux quantization with necessary figures.	**07**
Q.2	**(a)**	Describe the important issues to design a good superconducting magnet.	**07**
	(b)	Explain following terms with relevant theories. (i) BCS gap (ii) BCS ground state	**07**
		OR	
	(b)	Explain construction of Optoisolator with figure. Also write about its applications.	**07**
Q.3	**(a)**	Write Hamiltonian with usual notations to describe the electronic states of CuO_2 lattice of cuprates. Also explain one-band and two-band electronic model from it.	**07**
	(b)	Describe the properties of Oxyhalides and Oxycarbonates along with their stoichiometry.	**07**
		OR	
Q.3	**(a)**	Discuss about the Gibbs free energy difference between the normal and the superconducting phases per unit volume using necessary diagram.	**07**
	(b)	Describe Type-II superconductivity with magnetic phase diagram.	**07**
Q.4	**(a)**	Explain with figure the magnetic behavior of a superconductor inferred by Meissner and Ochsenfeld.	**07**
	(b)	Discuss the behavior of resistivity versus temperature for pure copper and impure copper materials with neat plot.	**07**
		OR	
Q.4	**(a)**	Explain working of a magnetic separator using superconducting magnets.	**07**
	(b)	Describe construction and working of High pressure oxygen sputtering system with figure.	**07**
Q.5	**(a)**	Write the important features of Superconducting Motors against the conventional motors.	**07**
	(b)	Write down short note on Energy Gap	**07**
		OR	
Q.5	**(a)**	Describe with ? -T plot the phenomenon of superconductivity termed by Kamerlingh Onnes. Also give reasons for selecting Mercury as metals by Onnes.	**07**
	(b)	Describe about Josephson effect and Tunneling with neat figures.	**07**

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