Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. Sem – IV Examination May 2011

Subject code: 741001

Subject Name: Advanced Cryogenics & Applied Super Conductivity

Date: 16/05/2011 **Time: 10.30 a.m. -01.00 p.m.**

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)** Discuss the behaviour of resistivity versus temperature for pure copper and impure copper material with neat plot. **07**

(b) Describe with Ω-T plot the phenomenon of superconductivity termed by Kamerlingh Onnes. Also give reasons for selecting Mercury as metal by Onnes for the same. **07**

Q.2 **(a)** Explain with figure the magnetic behaviour of a superconductor inferred by Meissner and Ochsefeld. **07**

(b) Explain briefly the following terms related to superconductors. **07**
(i) Perfect Diamagnetism (ii) Supercurrents

OR

(b) Describe Type II Superconductivity with magnetic phase diagram. **07**

Q.3 **(a)** Explain the phenomenon of Flux Quantization in superconducting components like hollow cylinders and rings with figure. **07**

(b) Write short note on Superconductivity and Superfluidity. **07**

OR

Q.3 **(a)** Define Josephson effect. Describe the Tunnelling in superconductors based on this effect. **07**

(b) Draw the structure diagram of $YBa_2Cu_3O_7$ cuprate. Explain its superconducting transition phenomenon with necessary plot. **07**

Q.4 **(a)** Describe construction of a typical SQUID system for sensing external magnetic fields with neat figure. **07**

(b) Describe with figure the working of High Pressure Oxygen Sputtering System for preparation of superconducting films. **07**

OR

Q.4 **(a)** State the London Hypothesis. Also derive the following equation with usual notations. **07**

$$j_s = -\frac{n_s e^2}{m} A$$

(b) Describe with figure the working of Laser Ablation System for preparation of superconducting films. **07**

Q.5 **(a)** Give the various uses of Superconducting Magnets. Also explain working of a magnetic separator using the superconducting magnets. **07**

(b) Explain briefly the preparation method for superconducting cuprate tape with silver sheath. **07**

OR

Q.5 **(a)** Explain concept of magnetic field penetration inside a superconductor with figure. **07**

(b) Write short note on BCS theory applied to superconductivity. **07**

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