Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME- SEMESTER–IV (NEW) EXAMINATION – SUMMER 2017

Subject Code:2741001 **Date:03/05/2017**

Subject Name: Applied Super Conductivity

Time: 02:30 pm to 05:00 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)**	Explain with necessary graphs the thermodynamics of the superconducting first order and second order phase transition.	**07**
	(b)	Describe the BCS theory and explain the Cooper pair with necessary figure.	**07**
Q.2	**(a)**	Explain briefly about magnetic behaviour of a perfect conductor and a superconductor with figure.	**07**
	(b)	Explain magnetic phase diagram in context to H_c and T_c with necessary plots. Also discuss about the magnetic phase diagram of Type-II superconductor.	**07**
		OR	
	(b)	Formulate the London equation in terms of the current density $\boldsymbol{j}$. What do you conclude from this equation?	07
Q.3	**(a)**	Define DC Josephson effect. Also describe contribution to the superconducting order parameter within the oxide barrier associated with the tunneling of Cooper pairs through the barrier with a plot.	**07**
	(b)	Differentiate between low temperature superconductors and high temperature superconductors.	**07**
		OR	
Q.3	**(a)**	Write functions of the main components of a commercial DC Superconducting QUantum Interference Device (SQUID) magnetometer.	**07**
	(b)	Describe the fabrication procedure of $Y_1Ba_2Cu_3O_{6+\delta}$ HTC superconductor.	**07**
Q.4	**(a)**	Draw the detailed schematic structure of the following cuprates. (a) $Ca_{0.85}Sr_{0.15}CuO_2$ (b) $LaSrCaCu_2O_6$.	**07**
	(b)	Write the important features of Superconducting Motors against the conventional motors.	**07**
		OR	
Q.4	**(a)**	Describe with figure the working of Laser Ablation System for preparation of superconducting films.	**07**
	(b)	Describe briefly the basic features of fullerenes and fullerene Superconductivity.	**07**
Q.5	**(a)**	Describe the significance of superconductivity as an application for energy storage.	**07**
	(b)	Explain briefly following. i). Matched filters ii). Electromagnetic shielding	**07**
		OR	
Q.5	**(a)**	Explain principle of magnetic levitation. Describe how the superconductivity helps to it.	**07**
	(b)	Describe the application of superconductivity for Nuclear magnetic resonance.	**07**

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