Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2013

Subject code: 711004N **Date: 06-06-2013**

Subject Name: Elements of Cryogenic Engineering

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.**
4. **Use of chart for Nitrogen is permissible.**

Q.1	**(a)**	Discuss the use of Multilayer insulation for cryogenic application. Explain the variation of apparent mean thermal conductivity of MLI with residual gas pressure.	**07**
	(b)	Differentiate between evacuated powders and opacified powder insulation. Discuss the effect of variation of thermal conductivity with percentage of opacifier for an opacified powder insulation.	**07**
Q.2	**(a)**	Write note on Space simulation chamber.	**07**
	(b)	Explain following phenomenon of superconductivity 1. Meissner effect 2.Critical current 3. Critical flux density	**07**
		OR	
	(b)	Write a short note on microsphere insulation	**07**
Q.3	**(a)**	What are the different types of thermometer used for low temperature? Describe working of any one thermometer with neat sketch.	**07**
	(b)	Explain capacitance level probe. Derive an expression for liquid level L_f and its sensitivity. Discuss about the parameters affecting the sensitivity.	**07**
		OR	
Q.3	**(a)**	List the Pressure measurement devices and explain thermal conductivity gauge with neat sketch	**07**
	(b)	What are the different flow measuring instruments? Describe working of any with neat sketch.	**07**
Q.4	**(a)**	Why is it necessary to study the physical properties of some engineering materials commonly used in cryogenic engineering?	**07**
	(b)	Explain the fountain effect, rolling effect and second sound phenomenon for helium II.	**07**
		OR	
Q.4	**(a)**	Define thermal conductivity of materials. Explain the effect of low temperature on thermal conductivity of following materials. (i) Pure Copper (ii) Titanium (iii) SS-304 (iv) Beryllium Copper	**07**
	(b)	Discuss the thermal properties of liquid and gaseous hydrogen.	**07**
Q.5	**(a)**	Write a short note on the cryo-freezing and food preservation.	**07**
	(b)	Discuss the safety criteria to be considered while handling the cryogens.	
		OR	
Q.5	**(a)**	Write note on Application of cryogenics in biology and medicine.	**07**
	(b)	Discuss in brief hazards on account of (i) flammability (ii) high pressure gas (iii) materials of construction (iv) personal exposure hazards.	

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