Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY
M.E. SEM-I Examination January 2010

Subject code: 711001 **Subject Name: Cryogenic Fundamentals**
Date: 20 / 01 / 2010 **Time: 12.00 – 2.30 pm.**
Total Marks: 60

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of properties Chart and tables permissible**
5. **Draw neat sketches, wherever necessary.**

Q.1	**(a)**	Write relative merits and demerits of following cryogenic insulations, along with their applications. 1. Foam insulation 2. Evacuated powder and fibrous insulation.	**06**
	(b)	A multilayer insulation has an apparent thermal conductivity of 0.4 μ W/m-K between 77 L and 290 K at a layer density of 25 layers/cm. If effective emissivity of the shield material is 0.05, determine apparent thermal conductivity of the insulation for same layer density when hot side temperature is increased to 313 K.	**06**
Q.2	**(a)**	Discuss the phenomenon of super conductivity. Explain 1. Meissener effect 2. Critical flux density 3. Critical current.	**06**
	(b)	Explain the construction and working of super conducting motor.	**06**
		OR	
	(b)	Explain the use of cryogenics in blood and bio-cell preservations.	**06**
Q.3	**(a)**	Mention different six properties which can be used to measure temperature. Give measurement ranges for various types of thermometer.	**06**
	(b)	With a neat sketch explain the construction and working of space simulation chamber.	**06**
		OR	
Q.3	**(a)**	Compare the constant volume gas thermometer and vapour pressure thermometer. State different corrections made for high precision of the thermometers. What are precautions that must considered for use of such thermometers.	**06**
	(b)	Explain the construction and working of Kooper's general surgery probe.	**06**
Q.4	**(a)**	Briefly explain the variation in thermal conductivity of Helium with temperature cryogenic range.	**06**
	(b)	Compare and explain lattice specific heats and electronic specific heats for solids.	**06**
		OR	
Q.4	**(a)**	Explain Eye surgery Probe.	**06**
	(b)	With a neat sketch explain the construction and working of a chemical rocket engine.	**06**
Q.5	**(a)**	Briefly describe any one cryogenic liquid level measuring device.	**06**
	(b)	Prove that the calibration curve of a capacitance type cryogenic liquid-level indicator is a straight line of the type $Y= m*x +C$	**06**
		OR	
Q.5	**(a)**	With a neat sketch explain the method of fluid quality measurement.	**06**
	(b)	Explain following phenomenon for He II, 1. Fountain effect 2. Roll-in film 3. Second sound.	**06**

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