Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

ME Semester –I Examination Feb. - 2012

Subject code: 711001N **Date: 11/02/2012**

Subject Name: Cryogenic Fundamentals

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)**	Explain following phenomenon for He II 1. Fountain effect 2.Roll-in-film 3.Second sound	**07**
	(b)	Explain following phenomenon of superconductivity 1. Meissner effect 2.Critical current 3. Critical flux density	**07**
Q.2	**(a)**	Explain the concept of ortho-hydrogen and para-hydrogen. Also Explain difference between ortho-hydrogen and para-hydrogen.	**07**
	(b)	Determine the thermal conductivity of air at 252 K and 101.3 kPa, if the mean free path of air at this condition is 50 nm, the gas constant for air is 287 J/kg-k, the specific heat ratio is 1.40, and the specific heat at constant volume is 716.5 J/kg-k.	**07**
		OR	
	(b)	Explain the applications of cryogenics in blood preservations and bio-cell preservation.	**07**
Q.3	**(a)**	What are the various types of Hazards relevant to the cryogenic industries? Discuss in brief.	**07**
	(b)	Explain in detail about cryotrons.	**07**
		OR	
Q.3	**(a)**	Discuss in detail about the applications of cryogenics in food preservations.	**07**
	(b)	Compare the following insulations with their advantages and disadvantages. 1. Expanded foam 2. Gas-filled powders and fiberous materials 3.Vacuum alone 4.Opacified powders 5.Evacuated powders and fibrous materials 6.Multilayer insulations.	**07**
Q.4	**(a)**	Explain in detail about Turbine flow meters with neat sketch.	**07**
	(b)	Explain in detail about Capacitance quality meter with neat sketch.	**07**
		OR	
Q.4	**(a)**	Explain in detail about Metallic resistance thermometers.	**07**
	(b)	Determine the total heat-transfer rate from the outer shell to the inner shell of a spherical dewar with a 1.55 m OD of inner shell and a 2.15 m I.D. of outer shell. The outer shell is at 300 K; it has an emissivity of 0.10 and an accommodation coefficient of 0.90. The inner shell is at 78 K; it has an emissivity of 0.05 and an accommodation coefficient of 1.00. The gas within the annular space is air at a pressure of 2 mPa measured at 300 K. The dewar is insulated by vacuum alone.	**07**

Q.5 **(a)** Explain the construction and working of a chemical rocket engine. **07**

(b) What are the various Safety criteria to be considered for handling of cryogens? Discuss in detail. **07**

OR

Q.5 **(a)** Discuss the following properties that change either abruptly or gradually when a material makes the transition from the normal to the superconducting state. **07**

1. Specific heat 2.Thermoelectric effects 3.Thermal conductivity 4.Electric resistance 5.Magnetic permeability

(b) Explain the applications of cryogenics in space simulation. Discuss in detail. **07**

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