Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

Subject code: 711004N **Date: 05-12-2014**

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 mark.**

Q.1	**(a)**	Explain the thermo electric material. Discuss the various properties and application of thermo electric material in cryogenic field.	**07**
	(b)	Explain the properties of hydrogen at low temperature.	**07**
Q.2	**(a)**	Discuss the comparison of Advantages and Disadvantages of Insulation used in cryogenic system.	**07**
	(b)	Determine the heat transfer through the insulation, supports and piping for a $106m^3$ (28000 gal U.S) liquid- oxygen storage vessel with the following characteristics. The insulation is evacuated perlite with an apparent thermal conductivity of 1.20mW/m-°K (0.69×10^{-3} Btu/hr-ft-°F). The inner shell has an OD of 3.070 m and the length of 14.0m, and the inner vessel hemispherical heads have an OD of 3.062m. The outer shell has an ID of 3.636 m and the length of 14.0m, and outer vessel hemispherical heads have an ID of 3.648m. All the support rods have a diameter of 20mm and are constructed of 304 stainless steel. There are 20 vertical rods, 1.905m long. The fill/drain line is 80mm nominal Sch.5 of 304 stainless steel pipe, 7m long; and vent line is 100mm nominal sch.5 of 304 stainless steel pipe, 8m long. The temperature of the outer vessel may be assumed to be 90.2 °K. Also take the heat transfer down the support rods = 34.49 W (117.7 Btu/hr).	
		OR	
	(b)	Explain opacified-powder insulations.	**07**
Q.3	**(a)**	Discuss about the measurement and calibration of thermometer based on thermocouple.	**07**
	(b)	Write note on liquid level measurement in cryogenic system.	**07**
		OR	
Q.3	**(a)**	Discuss the Applications of cryogenics in Industrial and Food Prevention.	**07**
	(b)	Explain the Biological and medicine applications of cryogenics? Explain how the cryosurgery is done? Also discuss its advantages.	**07**
Q.4	**(a)**	What is superconductivity? Explain meissner effect with neat sketch.	**07**
	(b)	List the various salient application of cryogenic system. Explain the application of cryogenic system in space technology.	**07**
		OR	
Q.4	**(a)**	Explain cryogenic application in Chemical propulsion.	**07**
	(b)	Discuss the familiarization with regulations of department of explosives.	**07**
Q.5	**(a)**	Discuss the effect of combustion hazard and oxygen hazards in cryogenic.	**07**
	(b)	What are the precautions to be taken for Safety in handling of cryogens?	**07**
		OR	
Q.5	**(a)**	Write a note on zero friction bearing and superconducting electrical motor.	**07**
	(b)	Discuss the effect of physiological hazards in cryogenic.	**07**

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