

**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<sup>3</sup> (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 ( $0.69 \times 10^{-3}$  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). **07**
- OR
- Q.3 (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 cryogenics? **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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