

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subject code: 711001N**Date: 08-01-2013****Subject Name: Cryogenic Fundamentals****Time: 02.30 pm – 05.00 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 the significance of the following terms as related to the properties of metals at cryogenic temperatures. **07**
i) Strength to weight ratio
ii) Strength to thermal conductivity ratio
- (b) Explain the fountain effect, rollin effect and second sound phenomenon for helium II. **07**

- Q.2** (a) Discuss the points to be considered while selecting the insulation for cryogenic engineering. Analyze vacuum alone as insulation. A vacuum flask 5 liter capacity has been purchased. Its performance is required to be evaluated. How will you proceed to do in the laboratory? **07**
- (b) Write note on Multi Layer Insulation. **07**

OR

- (b) Describe the mechanism of insulation in case of each of the following and state the modes of heat transfer against which they are not effective (i) Opacified powder (ii) evacuated powder and fibrous insulation. (iii) expanded foam insulations. Give their specifications. **07**
- Q.3** (a) Discuss the resistance properties of substance which is used for measurements of cryogenic temperature. Compare the metallic resistance thermometer with nonmetallic thermometer. **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) Discuss fluid quality measurement. **07**
- (b) Compare how the pressure measurement at low temperature is differ from the pressure measurement at room temperature. Briefly discuss how you will carry out the measurement? **07**

- Q.4** (a) Discuss in brief hazards on account of (i) flammability (ii) high pressure gas (iii) materials of construction (iv) personal exposure hazards. **07**

(b) Discuss the thermal properties of liquid and gaseous hydrogen. **07**

OR

Q.4 (a) In regard to specific heats of solids explain the difference between lattice specific heat and electronic specific heat. **07**

(b) Discuss the safety criteria to be considered while handling the cryogens. **07**

Q.5 (a) Write note on Space simulation chamber. **07**

(b) Write note on Application of cryogenics in biology and medicine. **07**

OR

Q.5 (a) Discuss the application of cryogenics in superconducting devices. **07**

(b) Discuss the application of cryogenics in nuclear propulsions and chemical propulsions. **07**
