

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER-VIII(NEW) EXAMINATION – SUMMER 2019**

**Subject Code: 2181917**
**Date: 09/05/2019**
**Subject Name: Cryogenic Engineering**
**Time: 10:30 AM TO 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.

**MARKS**

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|-----|-----|--|----|
| Q.1 | (a) | Explain the concept of ortho-hydrogen and para-hydrogen.   | 03 |
|     | (b) | Discuss variations of following properties of material at Cryogenic temperature. (a) Fatigue strength (b) Hardness (c) Ductility (d) Ultimate strength | 04 |
|     | (c) | Discuss the unusual properties of liquid Helium-II.  | 07 |
| Q.2 | (a) | Explain Joule Thompson expansion.  | 03 |
|     | (b) | Explain the mechanism of insulation in (a) Opacified powder insulation (b) Evacuated powder and fibrous insulation                                     | 04 |
|     | (c) | Explain role of heat exchanger in cryogenic systems. List various configuration of heat exchangers used in cryogenics.                                 | 07 |
| OR  |     |  |    |
|     | (c) | Write comparison between G-M and Philips refrigerator. Also write desirable features of regenerative heat exchanger of Philips refrigerator.           | 07 |
| Q.3 | (a) | Explain in brief vacuum insulated transfer lines.  | 03 |
|     | (b) | Write a note on Applications of cryogenics in biology.   | 04 |
|     | (c) | Write short note on Magnetic refrigerator.   | 07 |
| OR  |     |  |    |
| Q.3 | (a) | Explain in brief Multi layer insulation.   | 03 |
|     | (b) | Explain general characteristics of mixtures and draw typical Temperature-composition diagram for binary mixture.                                       | 04 |
|     | (c) | Enlist Air separation and purification systems. Explain any one system with diagram.   | 07 |
| Q.4 | (a) | Discuss payoff functions and performance parameters for gas liquefaction systems.  | 03 |
|     | (b) | Explain Metallic resistance thermometer used for cryogenic temperature measurement.  | 04 |
|     | (c) | Explain Linde-Bronn system for hydrogen separation.  | 07 |
| OR  |     |  |    |
| Q.4 | (a) | Draw a neat diagram of dewar vessel showing its elements.  | 03 |
|     | (b) | Explain construction and working of Turbine flow meter with figure.  | 04 |
|     | (c) | Explain working of capacitance liquid level probe with figure.   | 07 |
| Q.5 | (a) | What is superconductivity? Briefly explain Type-I and Type-II superconductors.   | 03 |
|     | (b) | Discuss in brief hazard due to (a) flammability (b) high pressure gas (c) material of construction (d) personal exposure hazard.                       | 04 |
|     | (c) | Discuss the Applications of cryogenics in superconducting devices.   | 07 |
| OR  |     |  |    |
| Q.5 | (a) | Briefly describe space simulation chamber.   | 03 |
|     | (b) | Discuss safety criteria to be considered while handling cryogens.  | 04 |
|     | (c) | Discuss application of cryogenics in food preservation.  | 07 |

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