Enrolment No./Seat No_____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE- SEMESTER–VII (NEW) EXAMINATION – WINTER 2024**

**Subject Code:3171919 Date:30-11-2024**

**Subject Name:Cryogenics 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.**
4. **Simple and non-programmable scientific calculators are allowed.**

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| **Q-1** | **(a)** | Explain the significance of the strength to conductivity ratio as related to the properties of metals at cryogenic temperatures. | **03** |
| | **(b)** | Discuss the variations of ductility and hardness properties of material at cryogenic temperature. | **04** |
| | **(c)** | Discuss the constructions of Multi Layer Insulation. How all the modes of heat transfer would get controlled in MLI. State its application also. | **07** |
| **Q-2** | **(a)** | Discuss the Physiological hazards associated with cryogen. | **03** |
| | **(b)** | For helium-II discuss the phenomenon like fountain effect and roll-in effect. | **04** |
| | **(c)** | Describe the safty precautions to be taken during handling cryogen in industry. | **07** |
| | | **OR** | |
| | **(c)** | With neat sketch explain the horizontal dewar vessels for cryogenic fluid storage. | **07** |
| **Q-3** | **(a)** | Explain in detail about on cryotones. | **03** |
| | **(b)** | How cryogenic engineering is useful in the field of food preservation? | **04** |
| | **(c)** | Write note on space simulation chamber. | **07** |
| | | **OR** | |
| **Q-3** | **(a)** | What do you mean by superconductivity and superconductive material? | **03** |
| | **(b)** | How cryogenic engineering is useful in the field of metal forming and improving the properties of materials? | **04** |
| | **(c)** | Discus the application of cryogenics in nuclear propulsions and chemical propulsions. | **07** |
| **Q-4** | **(a)** | Write the important properties to be considered for selection of insulation. | **03** |
| | **(b)** | Explain the merits and demerits of Opacified powder cryogenic insulations along with their applications. | **04** |
| | **(c)** | Discus liquid level measurement in cryogenic range. | **07** |
| | | **OR** | |
| **Q-4** | **(a)** | Critically discuss the Vacuum alone as insulation. | **03** |
| | **(b)** | Compare the following insulations with their advantages and disadvantages.<br>1. Expanded form 2. Gas-filled powder and fibrous materials. | **04** |
| | **(c)** | How the pressure measurement at low temperature is differ from pressure measurement at room temperature? Briefly discuss how will you carry out the measurement at low temperature? | **07** |

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| **Q-5 (a)** | Explain transfer of cryogenic fluid. | **03** |
| **(b)** | What is COP and FOM in cryogenic refrigeration system? | **04** |
| **(c)** | Explain the precooled Linde Hampson system for gas liquefaction. | **07** |

**OR**

| | | |
|---|---|---|
| **Q-5 (a)** | Explain how critical the role of cryogenic heat exchangers is in cryogenic system. | **03** |
| **(b)** | Explain thermodynamic ideal isothermal and isobaric source system. | **04** |
| **(c)** | Explain with the neat sketch Claude system for gas liquefaction. | **07** |

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