Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2023

Subject Code:3171919 Date:08-12-2023

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.**

Q.1	**(a)**	Explain Meissner effect with sketch.	**03**
	(b)	Write short note on "Properties of liquid Hydrogen".	**04**
	(c)	Explain with neat sketch Joule-Thomson refrigeration system	**07**
Q.2	**(a)**	Define superconductivity. What is Type-I and Type-II superconductors?	**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 application of cryogenics in food preservation	**07**
		OR	
	(c)	Discuss the Applications of cryogenics in superconducting devices.	**07**
Q.3	**(a)**	Explain in brief "Applications of cryogenics in biology and medicine".	**03**
	(b)	Explain the mechanism of insulation in (a) Opacified powder insulation (b) Evacuated powder and fibrous insulation	**04**
	(c)	Discuss the application of cryogenics in nuclear propulsions and chemical propulsions.	**07**
		OR	
Q.3	**(a)**	Write short note on Multilayer Insulation.	**03**
	(b)	Write note on Space simulation chamber	**04**
	(c)	With a neat sketch explain the construction and working of a cryotron	**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)	Enlist Air separation and purification systems. Explain any one system with diagram	**07**
		OR	
Q.4	**(a)**	List the types of insulations used in cryogenic equipments	**03**
	(b)	Explain general characteristics of mixtures and draw typical Temperature-composition diagram for binary mixture.	**04**
	(c)	Explain Linde-Bronn system for hydrogen separation.	**07**
Q.5	**(a)**	Draw a neat diagram of dewar vessel showing its elements.	**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

Q.5	**(a)**	Write short note on vacuum insulation	**03**
	(b)	write desirable features of regenerative heat exchanger of Philips refrigerator.	**04**
	(c)	Explain with neat sketch the different types of cryogenic heat exchangers	**07**

****