

GUJARAT TECHNOLOGICAL UNIVERSITY
ME - SEMESTER- 2 • EXAMINATION – WINTER - 2023

Subject Code:3721002**Date: 06 Jan 2024****Subject Name:Cryogenic Plants and Equipments****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.

Q.1 (a) Explain the principal of rectification process for separation of gases in a mixture. Show it on temperature – mole fraction diagram. Hence explain Murphy efficiency of a plate and its use. **07**

(b) State the function of the following in relation to a dewar **07**

- | | |
|------------------------|---------------------------|
| (i) Vapour diffuser | (iii) Fill and Drain line |
| (ii) Antislosh baffles | (iv) Vent line |

Q.2 (a) Explain the following **07**

- (i) Why is ullage volume required in cryogenic fluid storage vessel?
- (ii) Why are stiffening rings provided on the inner shell and outer vessel of a large cryo container?

(b) How a distillation column in a petroleum industry is different from that used in cryogenics? Explain. Briefly mention the functions of the following parts of a gas separation system. **07**

- | | |
|---------------------------|---------------------|
| (i) Boiler | (iv) Heat Exchanger |
| (ii) Condenser – Reboiler | (v) Expansion valve |
| (iii) Plates | |

OR

(b) Write step by step method of McCabe-Thiele (graphical) used for separation of binary mixture of gases. **07**

Q.3 (a) Write a short note on testing of heat exchangers as per standards. **07**

(b) Explain briefly methods of forming transition joints. What precaution is necessary while using such a joint? **07**

OR

Q.3 (a) Explain various draining methods used for dewar vessel. Describe in brief with a neat sketch a practical self-pressurization technique to transfer a cryogenic liquid from a supply vessel to a storage vessel. **07**

(b) Describe welding of aluminum and stainless steels used in fabrication of cryogenic equipments. **07**

Q.4 (a) Write brief Overview of Modern Air Liquefaction Plant. **07**

(b) Explain and draw a neat sketch of Linde double column gas separation system. State its advantages over Linde single column system. **07**

OR

Q.4 (a) What is Cryostat? Explain Cryostat with their constructional features. **07**

(b) Describe the following typical butt weld preparations for 16 mm thick S.S.316L material with neat sketches : **07**
(i) Single 'V' (ii) Double 'V' (iii) Double 'U' (iv) Single 'U'

Q.5 (a) Explain with the help of neat sketch Xenon and Krypton purification system. **07**

(b) How is Helium obtained from natural gas? With the help of neat diagram explain U.S Bureau of Mines Helium separation system. **07**

OR

Q.5 (a) Discuss the contribution of Heylandt in gas-separation system. **07**

(b) Explain with a neat sketch Argon recovery subsystem. **07**
