C **165B1** **Total pages: 2**

Register No: …… Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

EIGHTH SEMESTER B.TECH. DEGREE EXAMINATION(R), MAY 2024

Mechanical Engineering

(2020 SCHEME)

Course Code : 20MET474

Course Name : Cryogenic Engineering

Max. Marks : 100 **Duration:3 Hours**

Scientific calculator and statistical table is allowed in the examination hall.

PART A

(Answer all questions. Each question carries 3 marks)

1. Explain why the fatigue strength increases in the cryogenic temperature range.
2. Differentiate between Type 1 and Type 2 superconductors.
3. Draw the schematic diagram for liquid nitrogen precooled Linde Hampson liquefaction system for hydrogen.
4. Draw the schematic diagram for Linde dual pressure liquefaction system.
5. Describe the priciple for working of refrigerators with solid media.
6. Differentiate between an ideal isothermal source and ideal isobaric source refrigerator.
7. List the fluid flow patterns in a two phase flow region.
8. List any three methods for draining the cryogenic vessel.
9. Describe the principle of thermocouple.
10. List any three liquid level measurement devices.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. With help of phase diagram explain in detail the properties of Helium 4. 14

OR

12. (a) Describe in detail, the variation of any three mechanical properties of materials at cryogenic temperatures. 9
    (b) Explain the applications of cryogenic engineering in electronics and Manufacturing processes . 5

MODULE II

13. (a) Explain the production of low temperatures using Joule-Thomson effect. 7
    (b) Prove that an ideal gas will not experience a temperature change upon isenthalpic expansion. 7

OR

14. With a schematic diagram, explain Claude liquefaction system. How does it differ from Kapitza System. 14

MODULE III

15.	(a) Explain magnetic cooling with the help of a schematic diagram and TS plot (b) With neat sketch, describe any one gas purification methods	10 4

OR

16.	Explain the working of Philips refrigerator with the help of schematic diagrams and TS plot .	14

MODULE IV

17.	Explain the various types of cryogenic fluid transfer lines.	14

OR

18.	With the help of a neat sketch explain a typical cryogenic liquid storage vessel.	14

MODULE V

19.	Explain any one pressure measurement system and one flowrate measurement system used in cryogenic applications.	14

OR

20.	Explain the general safety precautions in cryogenic fluid handling, storage and use.	14

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