



(Pages : 3)



E – 2384

Reg. No. :

Name :

**Eighth Semester B.Tech. Degree Examination, May 2018
(2013 Scheme)**

13.805.8 : CRYOGENIC ENGINEERING (MPU) (Elective – IV)

Time : 3 Hours

Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **2** marks.

1. Sketch the variation of liquid specific heat with temperature for He-4.
2. What is superconductivity and superfluidity ?
3. Write down four breakthroughs in the developmental history of cryogenics.
4. What are the pay-off functions in gas liquefaction systems ?
5. Why simple Linde-Hampson cycle cannot be used to liquefy gases such as He, Ne, H₂ etc. ?
6. Discuss classification of cryocoolers.
7. Draw schematic representation of a magnetic refrigerator and T-s diagram.
8. Name two cryogenic liquid level gauges and cryogenic flow measuring devices.
9. What are the factors to be considered for selecting insulation for a particular application ?
10. Why multilayer insulations must be evacuated to very low pressure (below 10 mPa) to be effective ?

P.T.O.



PART – B

Answer **any one full** question from **each** Module. **Each** question carries **20** marks.

Module – I

11. A) Explain the electrical and magnetic properties of materials at cryogenic temperatures. **10**
- B) Explain applications of cryogenic engineering in space, superconductivity and medicine. **10**

OR

12. A) Explain the properties of the following liquids (1) Nitrogen (2) Oxygen (3) Hydrogen (4) Helium. **10**
- B) Explain variation of specific heat of solids with temperature. **10**

Module – II

13. A) Sketch the isenthalpic curves for a gas and show the inversion curve. What is the significance of Joule – Thomson coefficient ? **10**
- B) Prove that Joule – Thomson coefficient is equal to zero for an ideal gas. **10**

OR

14. A) Compare adiabatic expansion and isenthalpic expansion. Show that adiabatic expansion will always lead to temperature reduction. **10**
- B) Explain Cascade system for liquefaction of nitrogen. What is the advantage and disadvantage of this system over other liquefaction systems. **10**

Module – III

15. A) With a neat sketch explain the working of precooled simple Linde-Hampson gas liquefaction system. Derive expressions for liquid yield and work done per unit mass of gas compressed. **15**
- B) Distinguish between Ortho hydrogen and Para hydrogen. **5**

OR



- 16. A) Explain with sketches working of Gifford-McMahon (GM) Cryocooler. **10**
- B) Explain about Collin's helium gas liquefaction system with neat sketches. **10**

Module – IV

- 17. A) Explain the different types of cryogenic fluid transfer system using pipe lines. **10**
- B) Explain with a neat sketch basic cryogenic storage vessel (Dewar vessel). **10**

OR

- 18. A) Explain different types of cryogenic insulation materials and compare their performance. **15**
 - B) Explain different types of temperature measurement techniques used in cryogenic systems. **5**
-