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Reg. No. : .....

Name : .....

Eighth Semester B.Tech. Degree Examination, November 2015
(2008 Scheme)
Branch : Mechanical Engineering
08.805.13 : CRYOGENIC ENGINEERING (MPU)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer **all** questions in Part **A**, **each** carries **4** marks.*
*2) Answer **one full** question from **each** Module in Part **B**, each carries **20** marks.*
*3) **Use** of approved charts and tables are **permitted**.*

PART – A

1. Explain the variation of impact strength of engineering materials at cryogenic temperatures.
2. Explain the terms i) transition temperature ii) critical field and iii) critical current of superconductors.
3. Sketch and explain the variation of specific heat of liquid helium 4 at near absolute temperatures.
4. Explain the use of cryogenic technology in electric power transmission.
5. Sketch the cascade system for the liquefaction of nitrogen.
6. Explain the differences between He I and He II.
7. Name four pressure and flow level measurement systems used for cryogenic applications.
8. What are the different types of powder insulations used in cryogenic applications ?
9. Draw the schematic of a Joule Thompson liquid helium refrigerator.
10. What is a thermal valve ?

P.T.O.

PART – B

Module – I

11. a) Sketch and explain the p-T diagram for helium 4. Indicate lambda line, lambda point and critical point and explain their significance.

    b) Discuss the variation of different properties of materials during transition from normal to superconducting state.

OR

12. a) Give an account of the historical development of cryogenic technology.

    b) Briefly explain the application of cryogenics in electronics.

Module – II

13. a) In an ideal claude liquefaction system for nitrogen, the gas enters the compressor at 101.3 kPa and 20°C and is compressed to 4.05 MPa. Determine the expander flow rate ratio required for a liquid yield of 0.2, if the gas enters the reversible adiabatic expander at 4.05 MPa and 240 K.

    b) Explain the different losses which occurs in the different components of gas liquefaction systems.

OR

14. a) Determine the ideal work requirement for the liquefaction of neon beginning at 101.3 kPa and 300 K. Also determine the heat rejected per unit mass in the ideal isothermal compressor.

    b) Explain the simple Linde-Hampson system for the liquefaction of nitrogen gas.

Module – III

15. a) With a neat sketch and T-s diagram explain the working of a magnetic refrigeration system.

    b) Explain the importance of regenerators in cryogenic refrigeration system.

OR

16. a) With a suitable schematic and T-s diagram explain the working of a Phillips refrigerator.

    b) With the help of a neat sketch explain a cryogenic liquid storage vessel.