G 1741   (Pages : 2)   Reg. No.................................

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B.TECH. DEGREE EXAMINATION, MAY 2016

Eighth Semester

Branch : Mechanical Engineering / Aeronautical Engineering

ME 010 804 L03/AN 010 805 G03—CRYOGENICS (Elective III (ME)/Elective IV(AN)

(New Scheme—2010 Admission onwards)

[Regular/Supplementary]

Time : Three Hours   Maximum : 100 Marks

Use of refrigeration charts and tables, heat and mass transfer data book and
steam tables are permitted.

Part A

Answer all questions.
Each question carries 3 marks.

1. Discuss the application of cryogenics in food processing.

2. Explain super conductivity.

3. What are limitations of simple Linde-Hampson system ?

4. What is the influence of regenerator effectiveness in Philips refrigerator ?

5. Write notes on Cryo pumping.

                                                         (5 × 3 = 15 marks)

Part B

Answer all questions.
Each question carries 5 marks.

6. Explain the variation of Fatigue strength and impact strength of materials in cryogenic temperature range. Support with suitable graphs.

7. Describe different molecular forms of hydrogen.

8. What are the heat exchanger configurations of Liquefaction system ?

9. Explain the working of Vuillemier refrigerator.

10. Derive an expression for COP of Carnot Refrigerator.

                                                         (5 × 5 = 25 marks)

Turn over

Part C

Answer all questions.
Each full question carries 12 marks.

11. (a) Discuss the application of cryogenics in rocket propulsion application.

    (b) Explain Cryosurgery and Cryopreservation.

Or

12. (a) Discuss the chronology of cryogenic technology.

    (b) What are the application areas of cryogenic engineering ?

13. (a) Explain Joule-Thomson effect.

    (b) Discuss thermal properties of engineering materials at low temperature.

Or

14. (a) Discuss the properties of Helium isotopes at cryogenic range.

    (b) What are the electrical and magnetic properties of materials at cryogenic range ?

15. (a) Describe Claude system with neat sketch. Explain the TS diagram.

    (b) Explain Collins Helium liquefaction system.

Or

16. (a) Explain ortho-para hydrogen conversion in liquefier with figure.

    (b) Determine the liquid yield, the amount of nitrogen boiled away per unit mass of hydrogen liquefied and the work required per unit mass of hydrogen liquefied for a pre cooled Linde-Hampson system operating from 101.3 kPa (1 atm) and 300 K to 5.066 MPa (50 atm). The nitrogen bath is at temperature of 70 K corresponding to a saturation pressure 38.5 kPa.

17. What do you mean by magnetic cooling ? Explain adiabatic demagnetization process with the help of neat sketch.

Or

18. Describe Gifford-McMahon refrigerator with neat sketches and explain the TS diagram.

19. Explain cryogenic fluid storage vessels with neat sketches.

Or

20. Discuss different types of insulations used in cryogenics.

(5 × 12 = 60 marks)