Total No. of Questions : 12]

SEAT No. :

P2680

[Total No. of Pages : 3

[5154]-50
B.E. (Mechanical)
CRYOGENIC ENGINEERING
(2008 Course) (Semester - II) (402050DA) (Open Elective)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each Section.***
2) ***Answers to the two sections should be written separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicates full marks.***
5) ***Use of logarithmic tables, Mollier charts, electronic pocket calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain the working and thermodynamic analysis of Linde system with the help of neat diagram and develop the expression for liquid yield. **[10]**

b) Explain, briefly the variation of thermal properties of solids in cryogenic range of temperature. **[6]**

OR

Q2) Write Short Notes on: **[16]**

a) Meissner Effect.

b) Collins Heat Exchanger.

c) Vacuum shielded vessels.

d) Kapitza System.

Q3) a) State the different landmarks in the history of Cryogenics since its inception. **[4]**

b) Explain the concept of Superconductivity observed at Cryogenic temperature. **[6]**

c) State with neat sketch Super-fluidity phenomena observed in case of liquid Helium. **[6]**

OR

P.T.O.

Q4) a) What are the system performance parameters in liquefaction systems. **[6]**

b) Explain the Simple Linde Hampson system. **[6]**

c) Explain effect of Cryogenic temperature on thermal properties of gases in detial. **[4]**

Q5) a) Determine the ideal work requirement for the liquefaction of nitrogen begenning at 101.3 kPa and 300K. From the T-s chart of nitrogen, following property values are given: **[10]**

h_l = 46.2 J/g at 101.3 kPa and 300K

h_f = 29 J/g at 101.3 kPa and Sat. Liquid,

s_l = 4.42 J/g K at 101.3 kPa and 300K

s_f = 0.42 J/g K at 101.3 kPa and Sat. Liquid.

Derive the expression you use.

b) Represent Stirling Cycle on P-V and T-s diagram. Develop an expression for C.O.P. of the Stirling Cycle. When used as a liquefier. What is its efficiency? **[8]**

OR

Q6) a) Explain the working of Gifford McMahon Cryorefrigerator with neat diagram. **[8]**

b) Explain the difference between high performance vessels and low performance vessels, with a neat sketch. Explain the features of a typical cryogenic storage vessel. Outline the desing procedure of outer and inner vessel and support systems. **[10]**

SECTION - II

Q7) a) Name and explain the instruments used for measuring strain in cryogenic temperature range. Also discuss the effect of low temperature on strain measurements. **[8]**

b) Discuss: **[8]**

i) Cryogenic fluid Storage vessel piping arrangements.

ii) Methods of draining the vessels.

OR

Q8) a) Discuss the statements: **[10]**

i) One of the most critical components in any liquefaction system is the heat exchanger - Why?

ii) Heat exchanger effectiveness should be always more than 0.869 why? Explain.

b) Explain in detail, what is meant by J-T effect and Inversion Curve. **[6]**

Q9) a) Explain, briefly the variation of thermal properties of solids in cryogenic range of temperature. **[8]**

b) Explain in detail, what is meant by J-T effect and Inversion Curve. **[8]**

OR

Q10)a) Explain different present day applications in the field of Cryogenics. **[8]**

b) Explain the cryogenics principle used in recycling of automobiles tyres. **[8]**

Q11)Discuss the problems and scope of cryogenic instrumentation. Explain with neat sketches the instruments used for cryogenic measurements of **[18]**

a) Strain,

b) Flow

c) Liquid level

d) Temperature.

OR

Q12)a) Explain with neat sketches the working of different compressors and expanders used in cryogenic practice. **[12]**

b) Discuss the effect of compressor and expander efficiency on system performance. **[6]**