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Exam.Code:1029  
Sub. Code: 7854

1128

M. Tech. (Material Science and Technology)  
First Semester  
MST-104: Thermodynamics

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.

x-x-x

I. Write brief notes on:-

- a) Gibbs-Duhem equation
- b) 3<sup>rd</sup> law of thermodynamics
- c) Partial molar volume
- d) Quasi-chemical model
- e) Ellingham diagrams

(5x2)

UNIT - I

- II. a) Explain why a partial molar property is an intensive property. Write the equations for the enthalpy, H and Gibbs free energy, G in terms of partial molar properties.
- b) Briefly explain how entropy is defined statistically? (5,5)
- III. a) What is heterogeneous equilibria? Explain with an example.
- b) What is a spontaneous reaction? Explain with an example how the equilibrium constant depends on temperature and pressure. (5,5)
- IV. a) Derive the polynomial expressions of Gibbs energy of mixing for higher order solutions. Write the equation for Raoult's law.
- b) What are the state variables of a thermodynamic system? Briefly explain. (5,5)

UNIT - II

- V. a) Write the Clausius-Clapeyron equation and explain its application in solid-vapor equilibria.
- b) Give an example of a ternary phase diagram and explain. (5,5)

P.T.O.

(2)

- VI. a) Which technique can be used to measure the phase transition temperature? Explain.  
b) Write a note on first and second order phase transitions. (5,5)
- VII. a) What is eutectics mixture? Briefly explain what is zone refining method.  
b) What is adiabatic demagnetization? Explain. (5,5)

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