

Exam.Code:1029

Sub. Code: 7543

2023

M. Tech. (Material Science and Technology)

First Semester

MT-103: Thermodynamics of Materials

Time allowed: 3 Hours

Max. Marks: 50

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

x-x-x

I. Write brief notes on: -

- a) Entropy
- b) 3<sup>rd</sup> law of thermodynamics
- c) Clapeyron equation
- d) Quasi-chemical model
- e) Binary phase diagrams

(5x2)

#### UNIT - I

II. What is heterogeneous equilibria? Write the equations for the enthalpy, H and Gibbs free energy, G in terms of partial molar properties. Explain how entropy is defined statistically? What are the interaction parameters of a multicomponent dilute solutions?

(10)

III. What is a thermodynamic system and what are its variables? What is a spontaneous reaction? Explain with an example how the equilibrium constant depends on temperature and pressure. Write the equation for Gibbs free energy.

(10)

IV. What is a spontaneous reaction? Explain. What are the state variables of a thermodynamic system? Briefly explain. Write the Gibbs-Duhem equation and explain its significance.

(10)

#### UNIT - II

V. Write the Clausius-Clapeyron equation and explain its application in solid-liquid equilibria. Write a note on stability of phases. What is Landau theory? Explain. (10)

P.T.O.

(2)

- VI. Which technique can be used to measure the phase transition temperature? Explain. Explain the energetics of refrigeration process. Explain the phase diagram of water. What is sublimation? (10)
- VII. What is a eutectics mixture? Explain it for sodium chloride and water. Briefly explain what is adiabatic demagnetization? Explain the significance of Ellingham diagram. (10)

x-x-x