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B.E.(Full Time) DEGREE END SEMESTER EXAMINATIONS – APR/MAY 2012

MATERIALS SCIENCE AND ENGINEERING

THIRD SEMESTER (REGULATION 2008)

ML 9202 – THERMODYNAMICS AND KINETICS OF MATERIALS

Time : 3 Hours

Max. Marks : 100

Answer ALL Questions

PART – A (10 X 2 = 20 MARKS)

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1. What do you understand by state function?
2. Mention any one method for graphical representation of equilibrium state of existence of a system.
3. What do you understand by Specific heat capacity of a system?
4. Mention the significance of the combined first and second laws on thermodynamics.
5. What do you understand by the term Einstein crystal?
6. Define the term Chemical potential.
7. State Kirchhoff's law.
8. What is 'solid electrolyte'?
9. State Dulong and Pettit's rule.
10. What do you mean by 'activity coefficient'?

PART – B (5 X 16 = 80 MARKS)

11. Explain Einstein's method of calculating the heat capacity.
12. a) Explain why the specific heat capacity at constant pressure is always greater than specific heat capacity at constant volume. Discuss the contribution of inter-atomic forces to specific capacity.

(OR)

- b) Prove that the absolute thermodynamic scale of temperature is identical with ideal gas temperature scale.

13. a) i) State and Prove second law of thermodynamics. (8)
ii) Derive an expression for the maximum work that can be obtained from the system during change of state (8)

(OR)

- b) Determine the most probable microstate within a single macro state by fixing the independent variables of the system.

14. a) i) State 3rd Law of thermodynamics and prove that at absolute Zero, the coefficient of thermal expansion of any substance vanishes. (8)
ii) Explain the incompleteness in Nernst's theorem with an example and the proposed correction. (8)

(OR)

- b) i) Derive Maxwell's equation and explain how its is useful in determining the internal energy and entropy of a closed system of fixed composition. (10)
ii) Calculate the change in Gibbs free energy in mixing of Ideal gases. (6)

15. a) Briefly discuss the thermodynamics of point defects in solids.

(OR)

- b) i) Discuss briefly Raoult's Law and Henry's Law as they apply to the behaviour of solutions (8)
ii) Determine the change in Gibbs free energy due to the formation of a solution. (8)