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B.E.(Full Time) DEGREE ARREAR EXAMINATIONS – NOV/DEC 2013
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? Give example.
2. Define the term Quasi-static process.
3. State zeroth law of thermodynamics.
4. Mention the significance of the combined first and second laws on thermodynamics.
5. State Le Chatelier's principle.
6. What is the significance of Van-Hoff's equation?
7. State Gibbs phase rule.
8. What is uphill diffusion?
9. What is 'solid electrolyte'?
10. What do you understand by 'polarisation'?

PART – B (5 X 16 = 80 MARKS)

11. Discuss the polarization effects on corrosion process and the significance of Butler-volmer equation.
12. a) i) State and Prove Second law of thermodynamics. (10)
ii) Obtain an expression for the maximum work derived from the system undergoing change of state. (6)

(OR)

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

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

(OR)

b) Explain Einstein's method of calculating heat capacity.

14. a) i) Derive Gibbs-Duhem equation and explain how it is useful in the determination of activity of a binary solution. (10)

ii) Determine the change in Gibbs free energy due to the formation of a solution. (6)

(OR)

b) i) Discuss in detail the effect of pressure on phase stability. (10)

ii) Briefly discuss the thermodynamics of point defects in solids.(Frenkel) (6)

15. a) Write a brief note on the kinetics involved in i) Heterogenous reaction and ii) compound formation.

(OR)

b) i) Explain why in a binary solution of copper and zinc, the lower melting component diffuses much faster than the other. (8)

ii) Prove that $K = -(2.303/t) \log (1-x/[a])$ (8)