Code No: NR221801 **NR**

**II B.Tech II Semester Supplementary Examinations, April/May 2005**
**THEMODYNAMICS AND KINETICS**
**(Metallurgy & Material Technology)**

**Time: 3 hours** **Max Marks: 80**

**Answer any FIVE Questions**
**All Questions carry equal marks**

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1. (a) Derive equations relating critical temperatures, critical pressure and critical volume with vanderwaal's constants.
   (b) How is the most probable macrostate determined with in a given system?
2. (a) Explain the limitations of first law of Thermodynamics.
   (b) How is irreversibility explained by classical thermodynamics?
   (c) Derive an expression for work done in a process in which PV=constant.
3. (a) Discuss the second law of thermodynamics using classical viewpoint. How is entropy defined in this approach? Can the entropy of a system decrease? Explain.
   (b) Calculate standard entropy of a metal at $650^0C$ if its entropy at $27^0C$ = 5 $Cal/gm/mole$ and $C_p = 5.4 + 1.2 \times 10^{-3}T\ Cal/gm/mole$.
4. (a) What is statistical thermodynamics.
   (b) Explain the basic postulates of statistical thermodynamics.
   (c) Differentiate between microstate, macro state and most probable macrostate.
   (d) 'According to statistical thermodynamics each macrostate consists of a very large number of quantum states'. Explain.
5. (a) Explain the differences between Gibb's -Duhem equation and Gibb's - Helmholtz equation.
   (b) What is the purpose of free energy functions and give the significance of these functions.
6. (a) Derive the following equation $\Delta\ G = RT\ ln\ (J/K)$ when $\Delta\ G$ is the free energy change J is activity Quotient and K is equillibrium constant.
   (b) Calculate the equillibrium constant for the following reaction at 298 k. $C(graphite)+ 2H_2(g) = CH_4(g)$ Use the following data for the reaction at 298 K.
   $\Delta H^o : -74.85 \times 10^3 j/mol; \quad \Delta \overset{o}{S} : -80.25 J/mol/k$
7. (a) i. Does the Clapeyron equation involve any approximation, or is it exact?
   ii. What approximation are involved in the Clapeyron -clasius equation.
   (b) What is Clapeyron equation? What assumptions are made in obtaining the Classius-Clapeyron equation from Clapeyron equation?

8. (a) Explain the steps involved in the determination of order of a reaction.
   (b) Explain the theory of absolute reaction rates.

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