GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– III (New) EXAMINATION – WINTER 2019

Subject Code: 3132105   **Date: 30/11/2019**
Subject Name: Materials Thermodynamics
Time: 02:30 PM TO 05:00 PM   **Total Marks: 70**

Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			Marks
Q.1	**(a)**	Define system and give example.	**03**
	(b)	Classify system and explain with suitable example.	**04**
	(c)	Derive combined equation of 1st and 2nd law of thermodynamics in terms of internal energy, enthalpy and free energy.	**07**
Q.2	**(a)**	Which equation rules the state of system? State it.	**03**
	(b)	Compare extensive and intensive properties.	**04**
	(c)	Apply Hess law and importance with suitable example.	**07**
		OR	
	(c)	State 1st law of thermodynamics give its significance. Explain concept proposed by it.	**07**
Q.3	**(a)**	Based on which law temperature measuring equipment are designed? State it.	**03**
	(b)	Prove that Cp>Cv.	**04**
	(c)	Interpret Kirchoff's law and importance with suitable example.	**07**
		OR	
Q.3	**(a)**	Define Specific Heat (C).	**03**
	(b)	Define Cp and Cv.	**04**
	(c)	Derive relationship Cp – Cv = R.	**07**
Q.4	**(a)**	Identify enthalpy (H) and Heat (q).	**03**
	(b)	What is equilibrium? Explain different equilibrium.	**04**
	(c)	What is concept of free energy? Relate different type of free energy.	**07**
		OR	
Q.4	**(a)**	Interpret activity and fugacity.	**03**
	(b)	Examine possibility to pass on heat from lower temperature to higher temperature. Defend your answer.	**04**
	(c)	Contrast Raoult's, Henry's and Sievert's law.	**07**
Q.5	**(a)**	What is solution and ideal solution?	**03**
	(b)	Explain concept of entropy and 3rd law of thermodynamics.	**04**
	(c)	Demonstrate use of Ellingham diagram in metallurgy and discuss important characteristics.	**07**
		OR	
Q.5	**(a)**	Calculate free energy change at 500 K for following reaction: CuO (s) + H_2 (g) $\rightarrow$ Cu (s) +H_2O (g) ΔH^0_{500}= -87 kJ/mol and ΔS^0_{500}= 47 J/K/mol.	**03**

(b) Calculate standard enthalpy change for   **04**
Cu_2S (s) + 2 Cu_2O (s) → 6Cu (l) + SO_2 (g) where are

	Cu_2S (s)	Cu_2O (s)	Cu (l)	SO_2 (g)
ΔH^f_0 ₁₅₂₃K kJ/mol	-86.7	-176.4	0	-278.4

(c) Brass contains 70% Cu, 30% Zn with atomic weight   **07**
63.54 and 65.38 respectively. Calculate the
composition of brass in atom %. Also calculate the
atom fractions of Cu and Zn in above brass.

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