Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III(NEW) EXAMINATION – WINTER 2022

Subject Code:3132105 Date:24-02-2023

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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Explain Materials Thermodynamics.	**03**
	(b)	Explain heat and work in context to Materials Thermodynamics.	**04**
	(c)	Differentiate extensive and intensive properties of Materials.	**07**
Q.2	**(a)**	Explain close system and Open system.	**03**
	(b)	Explain Zeroth law of thermodynamics with its application.	**04**
	(c)	Explain specific heat and prove that Cp > Cv.	**07**
		OR	
	(c)	Explain 1st law thermodynamics with its significances.	**07**
Q.3	**(a)**	Explain enthalpy.	**03**
	(b)	Calculate standard entropy change for the following reaction at 25°C. Cr_2O_3 (s) + 3C (s) = 2Cr + 3CO (g). Given $S°_{298, Cr2O3(s)}$ = 81 J/K/mol, $S°_{298, C (s)}$ = 7 J/K/mol, $S°_{298, Cr (s)}$ =24 J/k/mol, $S°_{298, CO (g)}$ = 198 J/K/mol	**04**
	(c)	Explain Kirchhoff's law.	**07**
		OR	
Q.3	**(a)**	Explain 2nd Law thermodynamics.	**03**
	(b)	Calculate change of free energy for the following reduction reaction at 500 K. CuO (s) + H_2 (g) = Cu (s) + H_2 (g). Given $\Delta H°_{500}$ =88 kJ/mol and $\Delta S°_{500}$ =88 kJ/mol.	**04**
	(c)	Explain Hess' law with its salient features.	**07**
Q.4	**(a)**	Explain Thermodynamics equilibrium.	**03**
	(b)	Justify – Entropy of irreversible reaction is higher.	**04**
	(c)	Explain Henry's Law and Raoult's Law and Sievert's Law	**07**
		OR	
Q.4	**(a)**	Explain Gibb's free energy.	**03**
	(b)	Explain simple eutectic system.	**04**
	(c)	Derive Gibb's phase rule.	**07**
Q.5	**(a)**	Convert 1ppm into percentage.	**03**
	(b)	At Triple point in water vapor diagram, find the degree of freedom.	**04**
	(c)	Derive Gibb's Duhem equation.	**07**
		OR	
Q.5	**(a)**	Explain metallurgical solutions.	**03**
	(b)	A brass contain 60 wt. % of Copper and rest of Zinc. Calculate atom %. Atomic weights of Cu and Zn are 63.54 and 65.38.	**04**
	(c)	Discuss important features of Ellingham diagram.	**07**

****