Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (New) EXAMINATION – WINTER 2018

Subject Code: 2132102 Date: 01/12/2018

Subject Name: Metallurgical Thermodynamics

Time: 10:30 AM TO 01:00 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)**	Explain basic terms in thermodynamics: 1) Isolated system, 2) Closed system, 3) Open System.	**03**
	(b)	What is the significance of first law of thermodynamics?	**04**
	(c)	What is Free Energy? Explain concept of Gibb's Free Energy.	**07**
Q.2	**(a)**	Multiple Choice Questions: 1) In Ellingham diagram, ΔG vs. T plot for $2C+O_2 \rightarrow 2CO$ with negative gradient intersects the plot of $2Fe + 3O_2 \rightarrow Fe_2O_3$ with positive gradient at 700 degree C. This implies that a. It is feasible to oxidize iron using C at temperature above 700 degree C b. It is feasible to reduce Fe_2O_3 using C at temperature below 700 degree C c. It is feasible to sinter iron powder with C packing at temperature below 700 degree C d. It is feasible to sinter iron powder with C packing at temperature above 700 degree C 2) With regard to enthalpy, which one of the following is true? a. Enthalpy is the total heat content b. $H = E + PV$ c. $dH = dq + VdP$ d. All of the above 3) Which one of the following sentence is true? a. A reaction is feasible if ΔG is positive b. A reaction is feasible if ΔG is zero c. A reaction is feasible if ΔG is negative d. Can't predict the feasibility of reaction from ΔG	**03**
	(b)	Compare and contrast Extensive properties and Intensive properties.	**04**
	(c)	Compare and contrast Hess' law and Kirchhoff's law.	**07**
		OR	
	(c)	Explain reversible and irreversible processes.	**07**
Q.3	**(a)**	Explain Quasi- static process.	**03**
	(b)	Explain temperature composition diagram for binary alloy system.	**04**

	(c)	Define and explain the terms specific heat at constant pressure (Cp) and specific heat at constant volume (Cv) and derive the thermodynamics relationship between them.	**07**
		OR	
Q.3	**(a)**	What are objectives of thermodynamics and give applications of thermodynamics.	**03**
	(b)	Write a short note on Sievert's law.	**04**
	(c)	State & derive Maxwell's equation from combined statement of first & second law.	**07**
Q.4	**(a)**	State zeroth law of thermodynamics and give its importance.	**03**
	(b)	State & define second law of thermodynamics & its significance.	**04**
	(c)	Explain thermodynamic solution and differentiate between ideal and non ideal solutions.	**07**
		OR	
Q.4	**(a)**	Write a short note on Van't Hoff equation	**03**
	(b)	What is equilibrium? Explain different type of equilibrium.	**04**
	(c)	State & explain Ellingham diagram for various metal oxides?	**07**
Q.5	**(a)**	What are functions of slag?	**03**
	(b)	Explain the concept of basicity index.	**04**
	(c)	Briefly explain thermodynamics of Slag – Metal reaction.	**07**
		OR	
Q.5	**(a)**	Explain Phase, component & Degrees of Freedom?	**03**
	(b)	What is Gibb's phase rule? Explain the importance of phase rule. Derive Gibb's phase rule	**04**
	(c)	Explain Raoult's law and Henry's law.	**07**

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