Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III(New) EXAMINATION – SUMMER 2016

Subject Code:2132102 **Date:31/05/2016**

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		**Short Questions**	**14**
	1	Define Thermodynamic System.	1
	2	What is meant by Phase?	1
	3	Temperature is intensive property. True or False.	1
	4	Define: Specific heat capacity at constant pressure.	1
	5	Entropy is measure of _____.	1
	6	State the first law of thermodynamics.	1
	7	What is meant by Point and Path function?	1
	8	Define the term Enthalpy.	1
	9	Out of Diamond and graphite which one has zero value of standard free energy of formation.	1
	10	If no of phases in thermodynamic system is three than based on phase is _____ system.	1
	11	Element having lower position of line in Ellingham diagram is poor reducing agent. True or False.	1
	12	If value of dH is positive than the reaction is endothermic or exothermic.	1
	13	Define Solution.	1
	14	Explain concept of 1 wt% standard state.	1
Q.2	**(a)**	Compare intensive and extensive properties.	**03**
	(b)	State zeroth law of thermodynamics and give its importance.	**04**
	(c)	State 1st and 2nd Law of thermodynamics and give its significance.	**07**
		OR	
	(c)	Explain Raoult's law and Sievert's law.	**07**
Q.3	**(a)**	Define Atom fraction. Write conversion from weight % to atom % or vice-versa.	**03**
	(b)	Write a short note on Van't Hoff equation.	**04**
	(c)	Using combine statements of 1st & 2nd law of thermodynamics, derive all Maxwell's relation and hence prove that, $(\partial T/\partial P)s = T/Cp\ (\partial V/\partial T)p$	**07**
		OR	
Q.3	**(a)**	State 3rd law of thermodynamics.	**03**
	(b)	Give Maxwell's relations.	**04**
	(c)	Standard Enthalpy change of combustion of 298º K for $H_{2(g)}$, $CO_{(g)}$ and $CH_3OH_{(l)}$ are -286, -283, -714 KJ/mol respectively. Calculate the value of change of enthalpy	**07**

for following reactions:

$$CO_{(g)} + 2H_{2\,(g)} = CH_3OH_{(l)}$$

Q.4	**(a)**	Explain heat of formation with example.	**03**
	(b)	Write a short note on Hess's law.	**04**
	(c)	State Gibb's phase rule and derive it.	**07**

OR

Q.4	**(a)**	Define fugacity.	**03**
	(b)	Explain Kichhoff's law.	**04**
	(c)	Calculate the standard heat of formation of $WO_{3(s)}$ from $W_{(s)}$ And $O_{2(g)}$ at 25 °C and 1 atm pressure from the following data: $\langle W\rangle + \{O_2\} = \langle WO_2\rangle$ $\Delta H°_{298}$= -560.66 KJ/mole $3\langle WO_2\rangle + \{O_2\} = \langle W_3O_8\rangle$ $\Delta H°_{298}$= - 550.2 KJ/mole $\langle W_3O_8\rangle + 1/2\ \{O_2\} = 3\langle WO_3\rangle$ $\Delta H°_{298}$= - 92.75 KJ/mole	**07**
Q.5	**(a)**	Explain the function of slag.	**03**
	(b)	Write a short note on Clausius-Clapeyron equation.	**04**
	(c)	What is Free Energy? Explain concept of Gibb's Free Energy.	**07**

OR

Q.5	**(a)**	Explain the term activity and mole fraction.	**03**
	(b)	What is equilibrium? Explain different types of equilibrium.	**04**
	(c)	Write note on Ellingham Diagram.	**07**

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