Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (New) EXAMINATION – WINTER 2015

Subject Code:2132603 Date:21/12/2015

Subject Name: Thermodynamics of Elastomers and Polymers

Time: 02:30pm to 05:00pm Total Marks: 70

Instructions:

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

Q.1		**Answer the following:**	**14**
	1	Define the term: "Degree of freedom"	
	2	What do you mean by Combustion?	
	3	Give the difference between gasoline fuel and diesel fuel.	
	4	Define the term: "Heat of neutralization"	
	5	State the Phase Rule.	
	6	Give the difference between State function & Path function.	
	7	What do you mean by Solubility Parameter?	
	8	State the zeroth law of thermodynamics.	
	9	Write any two characteristics of good fuel.	
	10	What do you mean by Calorific value?	
	11	What percent of T1/T2 gives heat engine an ideal efficiency of 10%?	
	12	What are the factors responsible for spontaneity of a reaction?	
	13	Give the basic types of Heat Capacity.	
	14	Write any two characteristics for thermodynamic equilibrium state.	
Q.2	**(a)**	Explain the configuration & conformation of molecules with respect to polymer chain flexibility.	**03**
	(b)	Explain the Rotation barrier of polymer chain flexibility.	**04**
	(c)	Write down the merits and demerits of Phase rule.	**07**
		OR	
	(c)	Describe in detail about Eutectic system.	**07**
Q.3	**(a)**	Explain in brief about the concept of ceiling temperature.	**03**
	(b)	Explain the working principle of Boy's calorimeter with figure.	**04**
	(c)	Derive the Flory–Huggins Equation with respect to Entropy of mixing and thermal solution.	**07**
		OR	
Q.3	**(a)**	Explain the effect of cross linking on solubility.	**03**
	(b)	A coal has the following composition by weight: C=90%; O=3.0%; S=0.5%; N=0.5% and ash=2.5% .Net calorific value of the coal was found to be 8,490.5kcal/kg. Calculate the percentage of hydrogen and higher calorific value of coal.	**04**
	(c)	Write a detailed note on Estimation of heat of polymerization.	**07**
Q.4	**(a)**	Explain following criteria in brief: (i) Entropy and disorder (randomness) (ii) Entropy and probability.	**03**

……..P.T.O…….

	(b)	Calculate ΔS, Δ A & ΔG for the vaporization of 2 moles of liquid benzene at its boiling point of **80.2^{0}C**.Assume ideal gas behavior for benzene vapour. Given the latent heat of vaporization (Lv) =101 cal g -1 and mol. of weight of benzene = **78.**	**04**
	(c)	Derive any three Maxwell's relations.	**07**

OR

Q.4	**(a)**	Derive the Expression for relation between pressure –volume and work.	**03**
	(b)	The free energy change (ΔG) accompanying a given process is **-85.77** kj at 25^{0}c and **-83.68** at 35^{0}c. Calculate the change in enthalpy (ΔH) for the process at 30^{0}c.	**04**
	(c)	Derive an expression for Carnot's theorem.	**07**
Q.5	**(a)**	Give the statement of HESS law & explain it by giving example.	**03**
	(b)	List the basic types of equilibrium & Explain it in brief.	**04**
	(c)	Short note on Thermodynamic investigation of polymer-polymer systems for three component systems.	**07**

OR

Q.5	**(a)**	Write any six limitations of first law of thermodynamics.	**03**
	(b)	Explain the term chemical equilibrium & write its characteristics.	**04**
	(c)	Explain in detail about enthalpy of mixing of two polymers & free energy of mixing of polymers for binary polymer-polymer systems.	**07**

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