

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-III • EXAMINATION – SUMMER-2014

Subject Code: 132603**Date: 28-05-2014****Subject Name: Thermodynamics of elastomers and Polymers****Time: 02.30 pm - 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.

- Q.1** Answer the following. **14**
- 1 Define the terms: - i Thermodynamics. ii Heat of Formation.
 - 2 Write the statement of Lechatlier's principle.
 - 3 Give difference between petrol fuel and gasoline fuel.
 - 4 How the proximate analysis of air dried coal is done?
 - 5 List any two important properties of a refrigerant.
 - 6 Define the term: - Heat of polymerization and write the factors affecting it.
 - 7 Write down any two limitations of first law of thermodynamics.
- Q.2a** Prove that: $PV^\gamma = \text{Constant}$ for adiabatic process. **07**
- b** Describe in brief about Carnot cycle and derive the expression for it. **07**
- OR**
- b** Answer the following.
- i** A man circling the earth in a spaceship weighed 200 N at location there the local gravitational acceleration was 4.4 m/s^2 . calculate the mass of the man and his weight on the earth. **04**
- Derive the formula for work done w in reversible isothermal process involving ideal gas. **03**
- ii**
- Q.3a** Derive Maxwell Thermodynamic relations. **07**
- b** The latent heat of vaporization of benzene at its boiling point 80°C is 7400 cal/mol . What is vapour pressure of benzene at 27°C ? **07**
- OR**
- Q.3a** Derive the expression for Helmholtz function A . **07**
- b** 1 mole of an ideal gas $c_v = 12.471 \text{ J K}^{-1} \text{ mol}^{-1}$ is heated from 300K to 600K . Calculate entropy change when the : i volume is kept constant. **07**
- ii Pressure is kept constant.
- Q.4a** Explain the concept of ceiling temperature. List four important possibilities of polymerization. **07**
- b** Write down the advantages and disadvantages of phase rule. **07**
- OR**
- Q.4a** Explain the properties required for choice of refrigerant. **07**
- b** Describe in brief about eutectic system **07**
- Q.5a** Write down the characteristics of a good fuel. **07**
- 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 $8,490.5 \text{ kcal/kg}$. Calculate the percentage of hydrogen and higher calorific value of coal. **07**
- OR**
- Q.5a** Explain in detail about construction and working of Junker's gas calorimeter. **07**
- b** 10 moles of HI were produced by the interaction of 15 moles of H_2 and 5.2 moles of I_2 vapour at 444°C .calculate the equilibrium constant for the reaction : $\text{H}_2 + \text{I}_2 \rightleftharpoons 2\text{HI}$. **07**
