

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE SEM-III Examination-Dec.-2011**

**Subject code: 132603****Date: 17/12/2011****Subject Name: Thermodynamics of Elastomers & Polymers****Time: 2.30 pm -5.00 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** (a) State Zeroth and First law of Thermodynamics. **03**  
 (b) A man whose weight is 500 N takes 2 min. for climbing up a staircase. What is the power developed in him if the staircase is made up of 20 stairs, each 0.18 m in height. **03**  
 (c) Derive the relation between pressure volume and work. **03**  
 (d) Define the following terms: Intensive property, Heat of reaction, Heat of neutralization. **05**
- Q.2** (a) Prove that:  $PV^\gamma = \text{constant}$  for adiabatic process. **07**  
 (b) (i) Explain Joule-Thomson Effect. **05**  
 (ii) Define Carnot Engine. State Carnot's theorem. **02**
- OR**
- (b) (i) A Carnot cycle working between  $0^\circ\text{C}$  and  $100^\circ\text{C}$  takes up 840 joules from the high temperature reservoir. Calculate the work done, heat rejected and the efficiency. **04**  
 (ii) How the entropy change of mixing of 2 or more ideal gases is calculated? **03**
- Q.3** (a) Explain the concept of free energy and also discuss physical significance of free energy. **07**  
 (b) Derive Maxwell Thermodynamic relations. **07**
- Q.3** (a) Derive Clapeyron-Clarius equation and discuss its application in detail. **07**  
 (b) Define chemical potential. Compute decrease in chemical potential of benzene at 298 K when a solute of mole fraction 0.1 is added to it. **07**
- Q.4** (a) Explain the effect of steric strain on heat of polymerization with suitable example. **05**  
 (b) Write the characteristics of chemical equilibrium. **04**  
 (c) 2 moles of HI were heated in a sealed tube at  $440^\circ\text{C}$ , till the equilibrium state was reached. HI was found to be 22% dissociated. Calculate the equilibrium constant for the dissociation reaction. **05**
- OR**
- Q.4** (a) Explain the ceiling temperature concept with regard to polymerization. **07**  
 (b) Give the thermodynamic derivation of law of mass action. **07**
- Q.5** (a) Describe the water system with the help of phase diagram. **07**  
 (b) List the important properties of refrigerant. **07**
- OR**
- Q.5** (a) What is meant by Eutectic system? Discuss Lead Silver system-simple eutectic system. **07**  
 (b) List the characteristics of a good fuel. **07**

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