Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–III(New) • EXAMINATION – WINTER 2016**

**Subject Code:2132603 Date:09/01/2017**

**Subject Name:Thermodynamics of Elastomers & Polymers**

**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.**

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| **Q.1** | | **Answer the following:** | **14** |
| | **1** | Define the term: "Thermodynamics". | |
| | **2** | Give the difference between Solid fuel and Liquid fuel. | |
| | **3** | Why Solid fuels create High Pollution? | |
| | **4** | Write down any one limitation of first law of Thermodynamics. | |
| | **5** | What do you mean by Heat of polymerization? | |
| | **6** | Give any one difference between reversible process & irreversible process. | |
| | **7** | Mention the units of energy. | |
| | **8** | Find out percent of T1/T2 which gives heat engine an ideal efficiency of 10%. | |
| | **9** | Write the full name of C.H.U. | |
| | **10** | Give an example of Eutectic System. | |
| | **11** | Write the equation for Gross Calorific Value (GCV). | |
| | **12** | List the advantage of gaseous fuel. | |
| | **13** | Define the term: "Flame temperature" | |
| | **14** | Write any two applications of Thermodynamics in Rubber Industry. | |
| **Q.2** | **(a)** | The potential energy of a body of mass 10kg is 1.5 KJ. What is the height of the body from the ground if a body of mass 10 kg is moving at a velocity of 50 m/sec. what is the kinetic energy? | **03** |
| | **(b)** | Define the following terms : (i) Heat of Reaction (ii) Heat of Formation (iii) Heat (iv) Entropy | **04** |
| | **(c)** | State the first law of Thermodynamics and derive the equation for it. | **07** |
| | | **OR** | |
| | **(c)** | Derive the relationship between $C_p$ & $C_v$ for Ideal gas. | **07** |
| **Q.3** | **(a)** | Write about any three characteristics of Good fuel. | **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. | **04** |
| | **(c)** | Describe in detail about construction & working of Junker's Calorimeter. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Write down the disadvantages of Solid fuels. | **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)** | Discuss about construction & working of Bombshell Calorimeter in detail. | **07** |

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| **Q.4** | **(a)** | Derive the relation between pressure volume and work. | **03** |
| | **(b)** | Explain the concept of Ceiling temperature. | **04** |
| | **(c)** | Derive the Flory–Huggins Equation with respect to Entropy of mixing and thermal solution. | **07** |

**OR**

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|---|---|---|---|
| **Q.4** | **(a)** | Give difference between state function and path function. | **03** |
| | **(b)** | Define the following terms:<br>(i) Solvent (ii) Solution (iii) Solute (iv) Combustion. | **04** |
| | **(c)** | Write a detailed note on Estimation of heat of polymerization. | **07** |
| **Q.5** | **(a)** | Explain the concept of free energy. | **03** |
| | **(b)** | Write in brief about the advantages of Phase rule. | **04** |
| | **(c)** | Explain in detail about Thermodynamic investigation of polymer-polymer systems for three component systems. | **07** |

**OR**

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|---|---|---|---|
| **Q.5** | **(a)** | Explain the Basic concept of Phase rule. | **03** |
| | **(b)** | Discuss about physical significance of free energy. | **04** |
| | **(c)** | Short note on enthalpy of mixing of two polymers & free energy of mixing of polymers for binary polymer-polymer systems. | **07** |