

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III • EXAMINATION – WINTER 2013

Subject Code: 132603

Date: 30-11-2013

Subject Name: Thermodynamics of Elastomers & 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)

- (i) Define the terms (1) Heat capacity (2) Heat of Reaction.
- (ii) Give difference between state function and path function.
- (iii) Explain the term flame temperature.
- (iv) Give difference between petrol and diesel.
- (v) Write any two applications of thermodynamics in Rubber Industry.
- (vi) Define the term 'Thermodynamics'.
- (vii) Write any two characteristics of thermodynamic equilibrium.

Q. 2 (a) Derive the expression of CARNOT'S THEOREM. (07)

Q. 2 (b) State the first law of thermodynamics and give limitations of it. (07)

OR

(b) Derive the expression of Maxwell's Thermodynamic Relation.(any three) (07)

Q. 3 (a) Derive the expression for Helmholtz function A. (07)

(b) 1 mole of an ideal gas expands isothermally and reversibly from 5dm^3 to 10dm^3 at 300 K. Calculate q, w, ΔU , ΔH , ΔG and ΔA . (07)

OR

Q. 3 (a) Derive the relationship between C_p and C_v for ideal gas. (07)

(b) 1 mole of an ideal gas ($C_v = 12.471\text{JK}^{-1}\text{mol}^{-1}$) is heated from 300 K to 600 K. Calculate entropy change when the: (i) volume is kept constant, and (ii) pressure is kept constant. (07)

Q. 4 (a) Explain in brief about the concept of ceiling temperature. (07)

(b) Define the term "phase rule" and. Explain in brief about the terms phase and component. (07)

OR

Q. 4 (a) Write a detailed note on Estimation of heat of polymerization. (07)

(b) Write down the merits and demerits of phase rule. (07)

-----P.T.O-----

Q. 5 (a) Write down the construction and working principle of bomb calorimeter with diagram. (07)

(b) Calculate the gross and net calorific value of coal having the following compositions:-
Carbon-75%
Hydrogen- 15%
Sulphur- 2%
Nitrogen- 2% (07)

Ash- 6%

Latent heat of steam=587cal/g.

OR

- Q. 5**
- (a)** Write down the construction and working principle of Junker's gas calorimeter with diagram. **(07)**
 - (b)** On burning 0.83gm of a solid fuel in a bomb calorimeter, the temperature of 3500gm of water increased from 26.5°C to 29.2°C . water equivalent of calorimeter and latent heat of steam are 385g and 587cal/g respectively. if the fuel contains 0.7% hydrogen, calculate its gross and net calorific value. **(07)**