

B. TECH. SEM - III (CHEMICAL ENGG.) 2014 COURSE) (CBCS) :
WINTER - 2017

SUBJECT: CHEMICAL ENGINEERING THERMODYNAMICS-I

Day : **Friday**
Date : **12/01/2018**

W-2017-2016

Time **10.00 AM TO 01.00 PM**
Max. Marks : 60

N. B. :

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non-programmable **CALCULATOR** is allowed.
- 4) Draw neat and labeled diagrams **WHEREVER** necessary.
- 5) Assume suitable data if **NECESSARY**.

Q.1 a) A car weighing 1400 kg riding downhill at a speed of 20m/s was applied brake when it was at a height of 30m vertically above the bottom of a hill. When the car comes to a halt at the bottom of the hill, how much energy as heat must be dissipated by the brakes, if wind and other frictional effects are neglected? **[05]**

b) Elaborate the significance of Joule's experiments in the formulation of the first law of thermodynamics. **[05]**

OR

Q.1 a) What do you mean by degrees of freedom? What is the number of degrees of freedom when a binary liquid mixture is in equilibrium with its vapor. **[04]**

b) Explain the terms: **[06]**
i) Intensive Property - Extensive Property.
ii) Open system – Closed System.
iii) Reversible Process – Irreversible Process.

Q.2 Explain Carnot principle and derive the Carnot's equations. **[10]**

OR

Q.2 a) Elaborate the concept of entropy and drive the general expression for entropy changes of an ideal gas. **[06]**

b) Explain various statements of second law of thermodynamics. **[04]**

Q.3 Explain the PVT behavior of pure fluid (Water) using P-T and P-V diagram. **[10]**

OR

Q.3 a) What do you mean by equation of state? Write the equations of states for ideal and real gases. **[05]**

b) What is theorem of corresponding states? Define acentric factor. **[05]**

Q.4 Derive Clausius-Clapeyron equation for two phase system. How Antoine equation is arised from Clausius-Clapeyron equation. **[10]**

OR

Q.4 What do you mean by thermodynamic diagram? Explain the construction T-S diagram for water. **[10]**

- Q.5** a) Define refrigeration. Compare various refrigeration cycles. [05]
b) Explain Claude process for the liquefaction of gases. [05]

OR

- Q.5** a) Explain absorption refrigeration cycle in detail. [06]
b) What are the characteristics of an ideal refrigerant, which are to be considered for its choice and why? [04]

- Q.6** a) Define the terms: [06]
i) Fugacity
ii) Activity
iii) Partial molar property
iv) Residual property.

- b) Explain the effect of temperature and pressure on fugacity. [04]

OR

- Q.6** Elaborate the concept of partial molar property and give physical interpretation of partial molar volume. [10]

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