B. Tech. Sem - III (Chemical Engg.) 2014 COURSE) (CBCS) :
WINTER - 2018
SUBJECT : CHEMICAL ENGINEERING THERMODYNAMICS - I

Day : Friday
Date : 23/11/2018

W-2018-2280

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) Draw neat and labeled diagram **WHEREVER** necessary.
4) Use of non-programmable calculator is **ALLOWED**.
5) Assume suitable data, if necessary.

Q. 1 Write statement of first law of thermodynamics and derive following expression. **(10)**

$$\Delta U + \Delta E_k + \Delta E_p = Q + W$$

OR

Q. 1 Derive following expression for steady state flow process **(10)**

$$\Delta H + \frac{\Delta u^2}{2} + g\Delta z = Q + W_s$$

Q. 2 Write statement of second law of thermodynamics and derive following expression for Carnot Engine **(10)**

$$\eta = 1 - \frac{Q_C}{Q_H}$$

OR

Q. 2 a) What is entropy? Derive following expression for entropy change of an ideal gas. **(10)**

$$\frac{\Delta S}{R} = \int_{T_0}^{T} \frac{C_p^{ig}}{R}\frac{dT}{T} - \ln\frac{P}{P_0}$$

Q. 3 Enumerate PV diagram with a neat sketch. **(10)**

OR

Q. 3 What is basic equation of state? Differentiate between ideal gas and real gas. **(10)**

P. T. O.

Q. 4 Derive the following expression **(10)**

$$\Delta H = -R \frac{d \ln P^{sat}}{d(1/T)}$$

OR

Q. 4 What is thermodynamic diagram? Enumerate Mollier diagram with neat sketch. **(10)**

Q. 5 What is Carnot refrigerator? Derive the following expression **(10)**

$$w = Coefficient\ of\ performance = \frac{T_C}{T_H - T_C}$$

OR

Q. 5 What are the ideal characteristics of refrigerator? Enumerate absorption refrigeration. **(10)**

Q. 6 Derive the following fundamental property relationship **(10)**

$$d(nG) = (nV)dP - (nS)dT + \sum_i \mu_i dn_i$$

OR

Q. 6 What is partial property? Derive the following expression **(10)**

$$\sum_i x_i d\overline{M_i} = 0$$

* * * * *