

# B. Tech. Third WWW First Ranker and Maineering www. First Ranker.com

# 10986: Chemical Engineering Thermodynamics - I 3 CH 04/3 PP 04

P. Pages: 2
Time: Three Hours

AW - 2997

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Max. Marks: 80

Notes: 1. Answer three question from Section A and three question from Section B.

- Due credit will be given to neatness and adequate dimensions.
- 3. Assume suitable data wherever necessary.
- 4. Diagrams and chemical equations should be given wherever necessary.
- 5. Retain the construction lines.
- 6. Illustrate your answer necessary with the help of neat sketches.
- Use of slide rule logarithmic tables, Steam tables, Moller's Chart, Drawing instrument, Thermodynamic table for moist air, Psychrometric Charts and Refrigeration charts is permitted.
- 8. Discuss the reaction, mechanism wherever necessary.
- 9. Use of pen Blue/Black ink/refill only for writing the answer book.

#### SECTION - A

- 1. a) Explain in detail the concept of Reversible and Irreversible process.
  - b) State and explain the phase rule. Compute the degree of freedom if.
    - i) liquid water in equilibrium with its vapour.
      - ii) liquid water in equilibrium with a mixture of water vapour and nitrogen.
      - iii) A liquid solution of alcohol in water in equilibrium with its vapour.
      - iv) System is made by partial decomposition of NH<sub>4</sub>Cl.

## OR

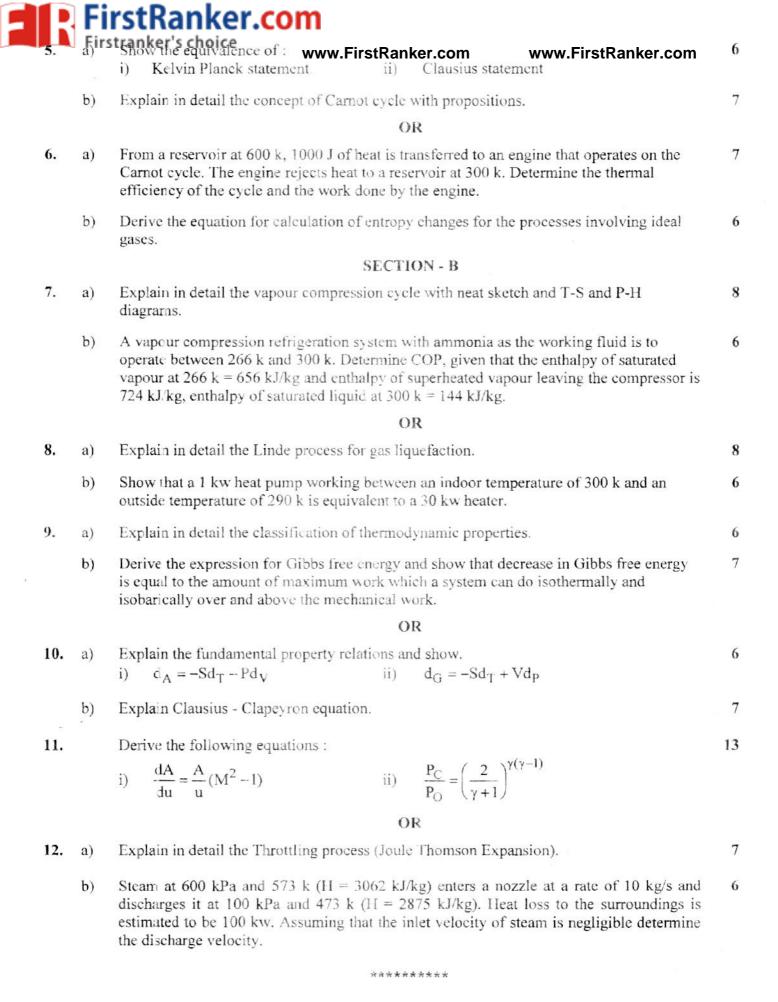
- **2.** a) Explain the following:
  - i) Heat Reservoir

ii) Heat Engine

- iii) Heat Pump
- b) Explain with example state and path functions.
- 3. a) Explain the first law of thermodynamics for non flow process. What are its limitations?
  - b) Calculate ΔU and ΔH for 1 kg of water when it is vaporized at the constant pressure of 101.325 kPa. The specific volume of liquids and vapour water at these conditions are 0.00104 and 1.673 m³/kg for this change, heat in the amount of 2256.9 kJ is added to the water.

## OR

- 4. a) One Kilomole of gas for which PV = nRT (R = 8.31 kJ/kmol k) is originally at 320 k of 1 bar. It is then heated at constant pressure to a temperature of 420 k and compressed isothermally to volume equal to its initial volume. Assume C<sub>P</sub> = 25 kJ/kmol k. Find ΔV, ΔH, Q & W.
  - b) Show that  $\Delta E = q_V$  of  $\Delta H = q_P$  in this equation  $q_V & q_P$  are state function.



AW - 299'