

II B.Tech II Semester Supplementary Examinations, April/May 2005
CHEMICAL ENGINEERING THERMODYNAMICS-I
(Chemical Engineering)

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. State and explain the four laws of Thermodynamics. Why it became necessary to propose second and third law.
2. (a) Define internal energy of a system and show that it is a property of the system.
(b) A tank containing a fluid is stirred by a paddle-wheel, the work input to the paddle wheel is 5000kJ. The heat transfer from the tank is 1500kJ. Considering the tank and the fluid as a system, determine the change in the I.E of the system.
3. Show that the internal energy is a function of temperature only for the following cases:
 - (a) an ideal gas, and
 - (b) an incompressible substance.
4. (a) Find the compressibility factor for ethane at 15 MPa and 275 K.
(b) 0.25 kg/s of hydrogen is compressed isothermally in a steady flow process from 1 bar to 17 bar at 45 K. Find the heat transfer rate and power required using the compressibility charts. Explain whether the above process can be carried out adiabatically.
5. (a) State Clausius statement of second law.
(b) State both carnot principles and prove any one of them.
(c) Prove entropy is a property.
6. A metal block of specific heat $0.09 \text{ Kcal/kg}^{\circ}\text{C}$ and mass of 10kg is initially at 50°C .
 - (a) 2 kg of water at 35°C is used to quench the block, what is the total entropy change?
 - (b) Repeat if 2 kg of water at 15°C is used. Comment on the above process.
7. (a) Explain the Sensible Heat Effects with Homogeneous substance of constant composition.
(b) Evaluate the Sensible-Heat Integral. Derive the expression for it.
8. (a) Derive an expression, from clapeyron equation, for finding the heat latent heat when volumetric data is not available.

- (b) Write three expression used for rough estimation of latent heat, clearly mentioning the notation for which it stands.

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