# II B.Tech II Semester Examinations,APRIL 2011 CHEMICAL ENGINEERING THERMODYNAMICS-I <br> Chemical Engineering 

Time: 3 hours

## Answer any FIVE Questions <br> All Questions carry equal marks

1. (a) Define entropy. Is it a path function?
(b) What is irreversibility?
2. It is proposed that solar energy be used to warm a large collector plate. This energy would, in turn, be transferred as heat to a fluid within a heat engine, and the engine would reject energy as heat to the atmosphere. Experiments indicate that about $1880 \mathrm{~kJ} / \mathrm{m}^{2} \mathrm{hr}$ of energy can be collected, when the plate is operating at $90^{\circ} \mathrm{C}$. Estimate the minimum collector area that would be required for a plant producing 1 kW of useful shaft power. The atmospheric temperature may be assumed to be $20^{\circ} \mathrm{C}$.
3. (a) Mention a few common refrigerants.
(b) What are different methods for the liquefaction of gases? Discuss any one of them.

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[6+10]
$$

4. (a) What is a continuous system and how do we describe the state of such a system?
(b) Conpare and contrast the characteristics of control mass and control volume.

$$
[8+8]
$$

5. The fundamental relation of a particular thermodynamic system is given by $S=(\mathrm{KUVN})^{1 / 3}$. Determine the relation among the intensive parameters for the above fundamental relation.
6. Compute the degrees of freedom if,
(a) System is made up of liquid water in equilibrium with its vapour and helium.
(b) System consists of liquid water and liquid touene (immiscible) in equilibrium with its vapours.
(c) System is consisting of solid carbon, $\mathrm{CO}, \mathrm{CO}_{2}$ and $\mathrm{O}_{2}$ in chemical equilibrium.

$$
[5+5+6]
$$

7. (a) What is sub cooled or compressed liquid?
(b) State the law of corresponding states that can be deduced from the equation of state.
8. The pressure of gas in a pipe line is measured with a mercury manometer having one limb open to the atmosphere. If the difference in the height of mercury in the two limbs is 540 mm , calculate the gas pressure. The barometer reads 760 mm Hg , the acceleration due to gravity is $9.79 \mathrm{~m} / \mathrm{s}^{2}$, and the density of mercury is $13,640 \mathrm{~kg} / \mathrm{m}^{3}$.


# II B.Tech II Semester Examinations,APRIL 2011 CHEMICAL ENGINEERING THERMODYNAMICS-I <br> Chemical Engineering 

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Max Marks: 80

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