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Total No. of Questions: 18

Total No. of Pages : 02

B.Tech. (Food Technology) (Sem.-3) THERMODYNAMICS

Subject Code : BTFT-217-19

M.Code:78734

Time : 3 Hrs.

Max. Marks : 60

## INSTRUCTIONS TO CANDIDATES :

- 1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- 2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
- 3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

## **SECTION-A**

- 1. Define a thermodynamic system.
- 2. Draw a p-T (pressure-temperature) diagram for a pure substance.
- 3. Does wet steam obey laws of perfect gases ?
- 4. Explain clearly the difference between a non-flow and a steady flow process.
- 5. Why only in constant pressure non-flow process, the enthalpy change is equal to heat transfer?
- 6. What do you mean by 'Thermodynamic temperature'?
- 7. What are the characteristics of entropy?
- 8. What is the difference between an ideal and a perfect gas?
- 9. What is Joule-Thomson coefficient?
- 10. Explain the importance of Maxwell relations in thermodynamics.

## **SECTION-B**

11. Derive the following relations :

i) 
$$u = a - T \left(\frac{\partial a}{\partial T}\right)_{v}$$
 ii)  $h = g - T \left(\frac{\partial g}{\partial T}\right)_{p}$ 

*Where a* = *Helmholtz function* (*per unit mass*), *and* 

g = Gibbs function (per unit mass).

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- 12. Derive the relationship between the two principal specific heats and characteristic gas constant for a perfect gas.
- 13. Prove that all reversible engines operating between the same heat reservoirs have the same efficiency.
- 14. Determine the entropy change of 4kg of a perfect gas whose temperature varies from 127°C to 227°C during a constant volume process. The specific heat varies linearly with absolute temperature and is represented by the relation :

 $c_{v} = (0.48 + 0.0096 \text{ T}) \text{ kJ} / \text{kg K}.$ 

15. Describe the process of formation of steam and give its graphical representation also.

## **SECTION-C**

- 16. 0.45 kg of carbon monoxide (28) and 1 kg of air at 15°C are contained in a vessel of volume 0.4 m<sup>3</sup>. Calculate the partial pressure of each constituent and the total pressure in the vessel. The gravimetric analysis of air is to be taken as 23.3% oxygen (32) and 76.7% nitrogen (28).
- 17. a) Prove that the rate of change of hat interchange per unit change of volume when gas is compressed or expanded is given by  $\frac{\gamma n}{\gamma 1} \times \frac{pd\upsilon}{J}$ 
  - b) For isothermal flow and non-flow steady processes, prove that

$$\int_{1}^{2} p dv = -\int_{1}^{2} v dp$$

Also state the assumptions made.

- 18. Write short notes on the following :
  - i) Perpetual motion machine of second kind.
  - ii) Claperyon equation and its applications.
  - iii) Helmholtz and Gibbs function.
  - iv) Measurement of dryness fraction.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

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