

# KERALA AGRICULTURAL UNIVERSITY

B.Tech (Food.Engg) 2014 admission

II<sup>nd</sup> Semester Final Examination- June /July-2015

Cat. No: Meen.1203

Marks: 50

Title: Engineering Thermodynamics (2+1)

Time: 2 hours

## I. Fill up the blanks

(10x1 = 10)

1. The value of universal gas constant ( $R_u$ ) is \_\_\_\_\_.
2. The process which can be described approximately by the equation  $pV^n = \text{constant}$ , where 'n' is a constant is called \_\_\_\_\_.
3. The phenomenon of conversion of  $\text{CO}_2$  (dry ice) directly into vapour is called \_\_\_\_\_.
4. The entropy of water at  $0^\circ\text{C}$  is assumed to be \_\_\_\_\_.
5. The enthalpy of wet steam is given by 'h' = \_\_\_\_\_.
6. A type of reversible process, characterized by the fact that the system is at each instant arbitrarily close to equilibrium is \_\_\_\_\_.
7. Throttling process is a \_\_\_\_\_ type process.
8. Thermo couple is working based on the principle of \_\_\_\_\_ effect.
9. \_\_\_\_\_ cycle is most efficient, when operating between the same temperature limits.
10. The \_\_\_\_\_ is a point in P-V-T space where solid, liquid and gas phases can coexist.

## II. Write short notes on ANY FIVE

(5 x 2 = 10)

1. Steam at 10 bar and 0.95 dry expands isentropically to a pressure of 4 bars. Find the final dryness fraction of steam using Mollier chart.
2. What is the difference between universal gas constant and characteristic gas constant
3. Find the enthalpy and entropy of 2 kg steam at 14 bar,  $x = 75\%$
4. Differentiate intensive and extensive properties.
5. How constant dryness fraction lines are plotted on T-s diagram?
6. Explain Throttling process.
7. What do you understand by N.T.P and S.T.P? What are their values?

**III. Write short essays on ANY FIVE**

**(5 x 4 = 20)**

1. Explain briefly First law of thermodynamics with the help of Joule's experiment.
2. 85 kJ of heat is supplied to a system at constant volume. The system rejects 90 kJ of heat at constant pressure and 20 kJ of work is done on it. The system is brought to its original state by adiabatic process. Determine the adiabatic work. Determine also the values internal energies at all end states if initial value is 100 kJ.
3. Define Charli's law with neat sketch.
4. Plot Otto cycle on temperature-entropy diagram.
5. Write on constant pressure process with P-V-T relationship.
6. Explain subcooled and superheated steam.
7. 1 kg of gas expands adiabatically and its temperature is observed to fall from 240°C to 115°C while the volume is doubled. The gas does 89.947 kJ of work in the process. Determine the values of  $C_p$  and  $C_v$ .

**IV. Write essay on ANY ONE**

**(1 x 10 = 10)**

1. Explain the expression for efficiency of diesel cycle neat sketch.
2. In a steady flow apparatus, 135 kJ of work is done by each Kg of fluid. The specific volume of the fluid, pressure, and the velocity at the inlet are  $0.37 \text{ m}^3 \text{ Kg}^{-1}$ , 600 kPa and  $16 \text{ m s}^{-1}$ . The inlet is 32 m above the floor and the discharge pipe is at floor level. The discharge conditions are  $0.62 \text{ m}^3 \text{ Kg}^{-1}$ , 100 kPa and  $270 \text{ m s}^{-1}$ . The total heat loss between the inlet and discharge is  $9 \text{ kJ Kg}^{-1}$  of fluid. In flowing through this apparatus, does the specific internal energy increase or decrease and by how much?