Reg. No. : | | | | | | | | | | |

Question Paper Code: 54091

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Fourth Semester

Chemical Engineering

15UCH401 - CHEMICAL ENGINEERING THERMODYNAMICS - I

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. 1 Joule is equivalent to

   (a) 1 kg.m^2/s^2 (b) 0.1 kg m^2/s^2 (c) 0.01 kgm^2/s^2 (d) None of these

2. A closed system exchanges

   (a) nothing with its surroundings
   (b) both mass and energy with its surroundings
   (c) mass but not the energy with its surroundings
   (d) energy but no the mass with its surroundings

3. Value of R gas constant in KJ/ kg mole. K is

   (a) 846 (b) 8314.4 (c) 0.846 (d) 8.314

4. The reduced pressure of a substance is the ratio of

   (a) partial pressure to vapour pressure
   (b) actual pressure to the critical pressure
   (c) critical pressure to the actual pressure
   (d) vapour pressure to critical pressure

5. Change on internal energy equals heat supplied for

   (a) Isochoric process (b) Iso baric process
   (c) Adiabatic process (d) none of these

6. The third law of thermodynamics deals with

   (a) chemical reactions
   (b) quantitative equivalence between heat and work
   (c) rate of change of a process
   (d) absolute entropy of perfect crystalline substances

7. The change in work function A for a constant temperature process is

   (a) Heat supplied
   (b) Reversible work done
   (c) Irreversible work done
   (d) none of these

8. The difference between the heat supplied and the work extracted in a steady flow process in which the kinetic and potential energy changes are negligible, is equal to

   (a) the change in kinetic energy
   (b) the change in enthalpy
   (c) the change in work function
   (d) the change in Gibbs free energy

9. Steam power plant is based on

   (a) Diesel Cycle
   (b) Brayton Cycle
   (c) Rankine cycle
   (d) Atkinson Cycle

10. The work required for an isothermal compression is

   (a) greater than the work required for isentropic compression
   (b) less than the work required for isentropic compression
   (c) equal to the work required for isentropic compression
   (d) may be greater or less than the work required for isentropic compression depending on the other conditions

PART - B (5 x 2 = 10 Marks)

11. Define intensive.

12. Tabulate the characteristics of an ideal gas.

13. State the Carnot theorem.

14. Define residual properties and give examples.

15. Define Sonic velocity.

PART - C (5 x 16 = 80 Marks)

16. (a) Elucidate the three types of equilibrium states. (16)

Or

(b) Properties of a closed systems change according to the relation p.v= 3.0 (p= bar, v= m^3)Calculate the work done when the pressure is increased from 1.5 to 7.5 bar. (16)

17. (a) Write a note on generalized equation of state. (16)

Or

(b) Describe the importance of PVT behavior of fluids and also describe the mathematical representation in detail. (16)

18. (a) Analyze the limiting conditions for an equation of state. (16)

Or

(b) Explain the concept of thermodynamics temperature follow from the carnot principle? (16)

19. (a) Derive the various forms of Maxwell's equations. (16)

Or

(b) Identify different types of thermodynamic diagrams. Explain any one of them. (16)

20. (a) Discuss on the effect of clearance on the work required for compression and on the volumetric efficiency of the compressor. (16)

Or

(b) Carbon dioxide at 1 bar and 300 K is is to be compressed (adiabatically) to a pressure of 10 bar in a single – stage compressor at a rate of 100 m^3 / h . Assuming that CO_2 behaves as an ideal gas, calculate the temperature of the gas after of the gas after compression and the work required. Take γ = 1.3. (16)

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