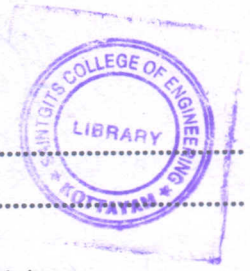


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Reg. No.....

Name.....



B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Fifth Semester

Branch : Mechanical Engineering/Automobile Engineering

ME 010 506/AU 010 506 : THERMODYNAMICS (ME, AU)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours

Maximum : 100 Marks

Use of steam tables and Psychometric chart are permitted.

Part A

Answer all questions.

Each question carries 3 marks.

1. What is pressure transducer ?
2. Does heat transfer inevitably cause a temperature rise ?
3. Write Kelvin Planck statement.
4. Define volume expansivity.
5. What is pure substances ?

(5 × 3 = 15 marks)

Part B

Answer all questions.

Each question carries 5 marks.

6. What is the scope of classical thermodynamic ?
7. What is indicator diagram ?
8. Establish the equivalence of Kelvin Planck and Clausius statement.
9. Discuss Helmholtz function.
10. What is the critical state ? Explain the terms critical pressure, critical temperature.

(5 × 5 = 25 marks)

Part C

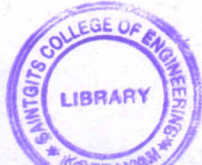
Answer all questions.

Each full question carries 12 marks.

11. Prove that $C_p - C_v = R$. (6 marks)
Explain different types of system in brief. (6 marks)

Or

Turn over



12. (a) Discuss the concept of continuum. Define density and pressure using the concept. (6 marks)
- (b) Write down the Van der Waals equation of state. (6 marks)
13. (a) Explain different types of work transfer. (6 marks)
- (b) Show that enthalpy of a fluid before throttling is equal to that after throttling. (6 marks)

Or

14. (a) Explain specific heat, internal energy and enthalpy. (6 marks)
- (b) 1.5 kg. of liquid having a constant specific heat of 2.5 kJ/kg. K is stirred in a well-insulated chamber causing the temperature to rise by 15° C. Find ΔE and W for the process. (6 marks)
15. (a) Explain third law of thermodynamics. (6 marks)
- (b) Explain clausius inequality. (6 marks)

Or

16. (a) Explain Entropy. (6 marks)
- (b) An ice-making plant produces ice at atmospheric pressure and at 0° C from water. The mean temperature of the cooling water circulating through the condenser of the refrigerating machine is 18° C. Evaluate the minimum electrical work in kWh required to produce 1 tonne of ice (The enthalpy of fusion of ice at atmospheric pressure is 333.5 kJ/kg). (6 marks)

17. Derive Maxwell equation.

Or

18. Derive :

$$C_p - C_v = T \left(\frac{\partial V}{\partial T} \right)_p \cdot \left(\frac{\partial P}{\partial T} \right)_v$$

19. Draw the phase equilibrium diagram for a pure substance on p - T coordinates. Why does the fusion line for water have negative slope ?

Or

20. A rigid vessel contains 1 kg. of a mixture of saturated water and saturated steam at a pressure of 0.15 MPa. When the mixture is heated, the state passes through the critical point.

Determine :

- (a) The volume of the vessel.
- (b) The mass of liquid and vapour in the vessel initially.
- (c) The temperature of the mixture when the pressure has risen to 3 MPa.
- (d) The heat transfer required to produce the final state.

(5 × 12 = 60 marks)