



CBCS SCHEME

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15MA33

Third Semester B.E. Degree Examination, Aug./Sept.2020 Thermodynamics

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define open, closed and isolated thermodynamic systems. Give one example for each. (06 Marks)
b. Define intensive and extensive properties. Give one example for each. (04 Marks)
c. Explain how heat and work energies are inter-convertible. Give one real world example for each. (06 Marks)

OR

- 2 a. Explain macroscopic and microscopic approaches of thermodynamics. (06 Marks)
b. Define adiabatic wall and diathermic wall with an example. (04 Marks)
c. The e.m.f. in a thermocouple with the test junction at $t^{\circ}\text{C}$ on gas thermometer scale and reference junction at ice point is given by $e = 0.20t - 5 \times 10^{-4}t^2$ mV. The millivoltmeter is calibrated at ice and steam points. What will this thermometer read in a place where the gas thermometer reads 50°C ? (06 Marks)

Module-2

- 3 a. Define first law of thermodynamics. State its limitations. (04 Marks)
b. Define internal energy, enthalpy and specific heats. (06 Marks)
c. A stationary mass of gas is compressed without friction from an initial state of 0.3 m^3 and 0.105 MPa to a final state of 0.15 m^3 and 0.105 MPa , the pressure remaining constant during the process. There is a transfer of 37.6 kJ of heat from the gas during the process. How much does the internal energy of the gas change? (06 Marks)

OR

- 4 a. State the Kelvin-Planck and Clausius statement of second law of thermodynamics. (06 Marks)
b. Define the following: PMM1, PMM2, Reversible and Irreversible processes. (04 Marks)
c. A cyclic heat engine operates between a source temperature of 800°C and a sink temperature of 30°C . What is the least rate of heat rejection per kW net output of the engine? (06 Marks)

Module-3

- 5 a. What do you mean by reversible gas power cycle? Explain with PV and TS diagrams. (06 Marks)
b. Compare Otto, Diesel and dual cycles. (06 Marks)
c. A diesel engine has a compression ratio of 14 and cut-off takes place at 6% of the stroke. Find the air standard efficiency. (04 Marks)

OR

- 6 a. Explain the role of evaporator and superheater in a simple Rankine cycle with TS diagram. (06 Marks)
b. What do you mean by Carnot vapour power cycle? Explain with TS diagram. (06 Marks)
c. Explain why Carnot vapour power cycle is not practically possible. (04 Marks)

Module-4

- 7 a. Define entropy. Prove that is a property. (08 Marks)
b. Explain the principle of increase of entropy. (04 Marks)
c. The latent heat of fusion of water at 0°C is 335 kJ/kg . How much does the entropy of 2 kg of ice change when the ice melts into water in each of the following cases:
(i) Heat is supplied to ice in a reversible process to a mixture of ice and water at 0°C .
(ii) A mixture of ice and water at 0°C stirred by a paddle wheel. (04 Marks)

OR

- 8 a. Explain PV and PT diagrams of pure substance. (08 Marks)
b. Define the following: pure substance, triple point of water, critical point and dryness fraction of steam. (08 Marks)

Module-5

- 9 a. With a neat diagram, explain vapour compression refrigeration system. (08 Marks)
b. Define the following: COP, units of refrigeration and refrigerant. (06 Marks)
c. List any four properties of refrigerants. (02 Marks)

OR

- 10 a. Define the following: Specific Humidity, Dew Point Temperature, Relative Humidity, Wet and Dry Bulb Temperature and Sensible heating or cooling. (12 Marks)
b. Explain how air conditioning system is different from refrigeration system. (04 Marks)
