B.Tech. (ME) 3th Semester (G-Scheme)

Examination, December-2024

THERMODYNAMICS

Paper -PCC-ME-213-G

Time allowed : 3 hours] *[Maximum marks : 75*

Note : *Attempt any **five** questions in all, selecting one question from each unit. **Question No. 1 is compulsory.** All questions carry equal marks.*

1. Explain the following:

(a) Intensive and extensive properties

(b) First law of thermodynamics

(c) Entropy

(d) Thermal efficiency and COP

(e) Thermodynamic system

(f) Saturation State. 6×2.5=15

Unit-I

2. (a) What is quasi-static process? 5

(b) A piston cylinder device with air at initial temperature of 30°C undergo an expansion process for which pressure and volume are related given below- 10

P(KPa)	100	37.9	14.4
$V(m^3)$	0.1	0.2	0.4

Calculate the work done by the system.

3. (a) Define the terms state, path, process and cycle. 7

(b) Explain first law of thermodynamics for cycle and non-cyclic processes. 8

Unit-II

4. Explain the use of steam table and Mollier's chart. 15

5. Find the internal energy of 1 kg of steam at 20 bar when

(i) It is superheated, its temperature being 400°C.

(ii) It is wet, its dryness being 0.9.

Specific heat for steam = 2 kJ/kg K. 15

Unit-III

6. Write the steady flow energy equation for stead flow. Apply it to expansion valve and compressor. 15

7. A reversible heat engine operates between two reservoirs at temperatures of 600°C and 40° C. The engine drives a reversible refrigerator which operates between reservoirs at temperatures of 40° C and –20° C. The heat transfer to the heat engine is 2000kJ and the net work output of the combined engine transfer plant is 360kJ. Evaluate the heat transfer to the refrigerant and the net heat transfer to the reservoir at 40° C. 15

Unit-IV

8. Explain the Clausius inequality. A Carnot engine operates between 4° C and 280° C. If the engine produces 300 kJ of work, Determine the entropy change during heat addition and heat rejection. 15

9. Draw line diagram of Brayton cycle represent on p-v diagram and derive expression for efficiency of Brayton cycle. 15