Code No. D-2364/N/AICTE

FACULTY OF ENGINEERING

B. E. (MECH) III – Semester (AICTE) (Main) Examination, March / April 2022

Subject: Thermodynamics

Time: 3 hours **Max. Marks: 70**

Note: ***i) First question is compulsory and answer any four questions from the remaining six questions. Each question carries 14 marks.***
ii) Answers to each question must be written at one place only and in the same order as they occur in the question paper.
iii) Missing data, if any, may suitable be assumed.

1. a) What are intensive and extensive properties, give examples.
   b) What do you understand by the term quasi static process?
   c) Define first law of thermodynamics.
   d) Define available and unavailable energy.
   e) What is Clapeyron equation?
   f) Sketch T-S and P-H diagram of vapour compression system and mention the processes.
   g) What is an air standard cycle?
2. a) Define Thermometry.
   b) Explain the working of constant volume gas thermometer.
3. a) Show that enthalpy is a property of the system.
   b) Determine the change in internal energy of gas when it is compressed at constant pressure form 0.4 m^3 and 105 kPa to final state of 0.2 m^3, during the process 42.5 kJ of heat is transferred from the gas.
4. a) Derive Clausius Inequality and state its significance.
   b) A carnot engine operates between two heat reservoirs at 300°C and -5°C. If the engine receives 120kJ of heat from the source, find the net work done and heat rejected to the sink. Also calculate the thermal efficiency of the heat engine.
5. a) Explain T-V diagram for water.
   b) Calculate the enthalpy and internal energy of steam at pressure of 12 bar
      (i) When the steam is having a dryness fraction of 0.8
      (ii) When the steam is saturated.

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6. In an air-standard Bryaton cycle, the air enters the compressor at 1 bar and 25°C. The pressure after compression is 3 bar. The temperature at turbine inlet is 625°C. Calculate per kg of air
   (i) Heat supplied
   (ii) Heat rejected
   (iii) Work available at the shaft
   (iv) Temperature of air leaving the turbine, and
   (v) Cycle efficiency

7. a) Derive expression for work done in adiabatic process.
   b) Compare Otto cycle and Diesel cycle.

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