CBCS SCHEME

18AU32

Third Semester B.E. Degree Examination, July/August 2021
Engineering Thermodynamics

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions.
2. Use of thermodynamic data handbook and steam table is permitted.

1   a.   Define a thermodynamics system, cycle, process, property and thermal equilibrium.
         (10 Marks)
    b.   Using zeroth law of thermodynamics, explain the temperature concept.   **(10 Marks)**

2   a.   Define work and heat. Mention the sign convention for both. Also give the comparison between them.   **(10 Marks)**
    b.   Explain the following with sketch
         (i)   electrical work
         (ii) paddle wheel work   **(10 Marks)**

3   a.   Derive an expression for work done in a steady flow process.   **(08 Marks)**
    b.   State Clausius and Kelvin Plank statements of second law of thermodynamics and prove that they are equivalent.   **(12 Marks)**

4   a.   Explain the following applications of SFEE
         (i)   steam turbine
         (ii) nozzle   **(08 Marks)**
    b.   Distinguish between reversible and irreversible process. Also explain the factors that make process irreversible.   **(12 Marks)**

5   a.   Explain the principle of increase of entropy.   **(10 Marks)**
    b.   With the help of TS diagram, derive an expression for work done for available and unavailable energy.   **(10 Marks)**

6   a.   With the help of a neat sketch, explain how dryness fraction of a wet steam is measured by using combined separating and throttling calorimeter.   **(10 Marks)**
    b.   Define a pure substance with example. Also draw a P-T diagram for pure substance and indicate all necessary points on it and also mention its importance.   **(10 Marks)**

7   a.   With neat sketches (including T-S and p-h diagrams), explain vapour compression refrigeration system.   **(10 Marks)**
    b.   What is a refrigerant? Explain the desirable properties of refrigerants.   **(10 Marks)**

8   a.   The conditions of atmospheric air is 40°C DBT and 40% RH. The air is cooled to 25°C DBT. If the air supply to the system is 200 m³/min, find :
         (i)   Heat removed from air per minute
         (ii) RH of air
         Take air pressure to be 1.01325 bar.   **(10 Marks)**
    b.   With the help of schematic diagram and appropriate psychrometric chart, explain winter air conditioning system.   **(10 Marks)**

9   a. Derive an expression for work done in a two stage compressor.   **(10 Marks)**

     b. Explain multi-stage compression with PV diagram. Also mention the advantages of multistage compressor over single stage compressor.   **(10 Marks)**

10 a. A gas turbine set takes in air at 15°C and 1 bar, pressure ratio is 5. The maximum temperature is 600°C and it develops 220 KW. The turbine and compressor efficiencies are 0.85, determine:

        (i)   Actual overall efficiency

        (ii) The weight of air circulated/min

        (iii) Useful power developed per kg of air   **(10 Marks)**

     b. Explain the following with suitable sketch:

        (i)   Pulse jet

        (ii) Rocket propulsion   **(10 Marks)**

* * * * *