



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech III Semester End Examinations (Regular), February – 2021

Regulation: IARE-R18

ENGINEERING THERMODYNAMICS

Time: 3 Hours

(AE)

Max Marks: 70

Answer any Four Questions from Part A

Answer any Five Questions from Part B

PART – A

1. List down the thermodynamic properties with respective unit in SI system. [5M]
2. Discuss the significance of Clausius inequality. [5M]
3. List out the significant psychrometric properties and explain briefly. [5M]
4. State the processes in Otto cycle and represent on P-V and T-S. [5M]
5. State the conditions which lower the volumetric efficiency. [5M]
6. State the irreversible work and explain state properties with suitable diagram. [5M]
7. Differentiate between heat engines and reversed heat engines. [5M]
8. State 'Dalton's law of partial pressure'. [5M]

PART – B

9. Compare and contrast between closed system, isolated system and open system with simple sketch. [10M]
10. A system comprising of a gas of 5 kg mass undergoes expansion process from 1MPa and 0.5 m^3 to 0.5MPa. Expansion process is governed by, $p.v^{1.3} = C$. The internal energy of gas is given by, $u = 1.8pv + 85$, kJ/kg. Here 'u' is specific internal energy, 'p' is pressure in kPa, 'v' is specific volume in m^3/kg . Determine heat and work interaction and change in internal energy. [10M]
11. Describe Carnot cycle and obtain expression for its efficiency as applied to a heat engine. [10M]
12. An inventor claims that a new heat cycle will develop 0.4 kW for a heat addition of 32.5kJ/min. The temperature of heat source is 1990 K and that of sink is 850 K. Is his claim possible? [10M]
13. Discuss generation of steam from ice at -20°C at 1 atm with the help of T-H diagrams [10M]
14. 0.004 kg of water vapour per kg of atmospheric air is removed and temperature of air after removing the water vapour becomes 20°C . Assume that condition of atmospheric air is 30°C and 55% R.H. and pressure is 1.0132bar. Determine the following: i) Relative humidity ii) Dew point temperature [10M]
15. What is an air standard cycle? What are the limitations of air standard cycle? State the assumptions to be taken for its analysis. [10M]
16. An engine of 250 mm bore and 375 mm stroke works on Otto cycle. The clearance volume is 0.00263 m^3 . The initial pressure and temperature are 1 bar and 50°C . If the maximum pressure is limited to 25bar, find the following: i) The air standard efficiency of the cycle. ii) The mean effective pressure for the cycle. Assume the ideal conditions [10M]
17. What is LMTD? List the assumptions made to derive LMTD for heat exchanger [10M]
18. An exterior wall of a house may be approximated by a 0.1 m layer of common brick ($k = 0.7\text{W}/\text{m}^\circ\text{C}$) followed by a 0.04 m layer of gypsum plaster ($k = 0.48\text{W}/\text{m}^\circ\text{C}$). What thickness of loosely packed rock wool insulation ($k = 0.065\text{W}/\text{m}^\circ\text{C}$) should be added to reduce the heat loss or (gain) through the wall by 80 per cent? [10M]