

II B.Tech I Semester (R18) Regular Examinations November 2019
THERMODYNAMICS

Time : 3 hours

Max. Marks: 70

PART- A

(Compulsory Question 10*2= 20 Marks)

- 1 a Distinguish between Open and Closed system.
- b What is quasi-equilibrium process? What is its importance in engineering?
- c What is meant by PMM1?
- d Define internal energy and enthalpy.
- e What is thermal energy reservoir? Give some examples.
- f What do you understand by the entropy principle?
- g Define triple point and critical point for pure substance.
- h What is meant by superheated steam?
- i Mention the assumptions made on the air standard cycle analysis.
- j Write the relation for specific heats of a gas mixture.

PART B

(Answer all the Questions Each carry 10 Marks)

- 2 a Air at a Pressure of 50 bar and a volume of 0.2m^3 is expanded at constant pressure until the volume is doubled. It is then expanded according to $PV^{1.3} = \text{constant}$ until the volume is 0.8m^3 . Evaluate the work done in each process and total work done.
- b State and explain Zeroth law of thermodynamics.

OR

- 3 a Differentiate Intensive and Extensive properties with examples.
- b Explain the concept of macroscopic and microscopic viewpoints applied to the study of thermodynamics.
- 4 a On a hot summer day, a student turns his fan on when he leaves his room in morning. When he returns in the evening, will the room be warmer or cooler than the neighboring rooms? Why? Assume all doors and windows are kept closed.
- b 100KJ of heat is supplied to a system at a constant volume. The system rejects 90KJ of heat at constant pressure and 20KJ of work is done on it. The system is brought back to original state by adiabatic process? Estimate the adiabatic work and the values of internal energy at all end states if initial value is 110 KJ.

OR

- 5 a A room is heated by an iron that is left plugged in. Is this a heat or work interaction? Take the entire room, including the iron, as the system.
- b 680 kg of fish at 5°C are to be frozen and stored at -12°C . The specific heat of fish above freezing point is 3.182 and below freezing point is 1.717 KJ/Kg K. the freezing point is -2°C and the latent heat of fusion is 234.5 KJ/Kg. How much heat must be removed to cool the fish and what percentage of this is latent heat?
- 6 a Explain and write the efficiency expression for heat engine.
- b A reversible engine is supplied with heat from two constant temperature sources at 900K and 600K and rejects heat to a constant temperature sink at 300K . The engine develops work equivalent to 90KJ/s and rejects heat at the rate of 56KJ/s . Estimate (i) Heat supplied by each source and (ii) Thermal efficiency of the engine.

OR

- 7 a State and explain the second law of thermodynamics.
- b Explain clausis in equality statement.
- 8 a Explain the term: Degree of super heat, Degree of sub cooling.
- b Wet steam of 0.5 MPa and 95% dry occupies 500litres of volume. What is its internal energy? If this steam is heated in a closed rigid vessel till the pressure becomes 1Mpa , find the heat added. Plot the process on Mollier chart. What is dryness fraction and degree of superheat?

OR

- 9 a Derive the Maxwell relations .
- b Derive the expression for clausis clapryon equation.

- 10 a Derive an expression for efficiency of Otto cycle. Draw the P-V and T-S diagrams.
b In a Diesel cycle, air at 0.1 MPa and 300K is compressed adiabatically until the pressure rises to 5 MPa. If 700 KJ/Kg of energy in form of heat is supplied at constant pressure, determine compression ratio, cut off ration, thermal efficiency and mean effective pressure.
- (OR)
- 11 a Explain briefly Dalton's law and Avogadro's law.
b A vessel of 0.35 m³ capacity contains 0.4 kg of carbon monoxide and 1 kg of air at 20°C. Calculate partial pressure of each constituents.