Exam.Code:0940
Sub. Code: 6711

2023
B.E. (Mechanical Engineering)
Fourth Semester
MEC-401: Engineering Thermodynamics

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part. Use of Steam and Gas tables is permitted.

x-x-x

Q-1)

1) Draw PV diagrams for Stirling and Ericsson cycles.
2) Relate entropy to social aspects with real life examples
3) What is Van't Hoff equation?
4) What is second law efficiency for a mixing chamber?
5) What is the significance of clearance volume in cylinders?

(5x2=10)

PART A

Q-2)

1) Explain with expressions the decrease of exergy principle.
2) A piston cylinder device contains 0.05kg of steam at 1MPa and 300°C. Steam now expands to a final state of 200 kPa and 150°C, doing work. Heat losses from the system to the surroundings are 2kJ during this process. Assuming surroundings to be at P_0= 100kPa and T_0=25°C, determine exergy destroyed and second law efficiency.

(3,7)

Q-3)

1) A heat engine receives heat from a source at 1200K at a rate of 500kJ/s and rejects waste heat to a medium at 300K. Power output of the heat engine is 180kW. Determine reversible power and irreversibility rate for this process.
2) Explain construction, working and advantages of a Turbo prop engine.

(5,5)

Q-4)

1) A gas turbine operates on a pressure ratio of 6. Inlet air temperature to the compressor is 300K and air entering the turbine is at 577°C, if

Contd.....P/2

volume rate entering the compressor is 240m^3/sec then calculate Net Power Output of the cycle in MW and find its Efficiency, Inlet Pressure is 1 bar.

2) Derive and compare air standard efficiencies of Otto and Diesel cycles with PV and TS diagrams

(5,5)

PART B

Q-5)

1) Derive the expression between equilibrium constant for ideal gas mixtures with standard state Gibbs function change.
2) Give any five conclusions regarding equilibrium constant for ideal gas mixtures.

Q-6) **(5,5)**

1) How is phase equilibrium specified in a multicomponent system?
2) Differentiae between Dalton's and Amagat's laws for predicting P-V-T behavior of a gas mixture.

Q-7) **(5,5)**

Write short notes on any 2 of the following:-

1) Relate mole, pressure and volume fractions in ideal gas mixtures.
2) Flow work and non-flow work
3) Clausius inequality

(5,5)

x-x-x