

Exam. Code: 0940
Sub. Code: 33855

2056
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 property, steam and gas tables is permitted.

x-x-x

Q-1)

- 1) Draw a generalized jet propulsion system with all critical components.
- 2) Draw PV TS diagram for a Stirling Cycle.
- 3) What are air breathing engines?
- 4) State the general exergy balance relation in words and in mathematical form
- 5) Differentiate between ram effect and ram pressure.

(5x2=10)

PART A

Q-2)

- 1) Explain construction, working and advantages of a Turbo prop engine.
- 2) Differentiate between exergy transfer by heat with exergy transfer by mass.

(5,5)

Q-3)

- 1) Explain Clausius Inequality with mathematical expressions to obtain relations of entropy with type of processes.
- 2) If the exergy destruction in a process is zero, what can you conclude about the nature of the process? Is this achievable in practice?

(5,5)

Q-4)

- 1) Air expands through a turbine from 500kPa, 520°C to 100kPa, 300°C. During expansion 10kJ/kg of heat is lost to the surroundings which is at 98kPa, 20°C. Neglecting, K.E. and P.E. changes, determine maximum work per kg.

Contd.....P/2

(2)

- 2) Calculate decrease in exergy when 25kg of water at 95°C mixed with 35kg of water at 35°C , the pressure being taken as constant and temperature of the surroundings being 15°C .

(5,5)

PART B

Q-5)

- 1) What are the conclusions of Henry's Law?
- 2) Consider a gas mixture that consists of 3kg O_2 , 5 kg of N_2 and 12kg of CH_4 . Determine (a) mass fraction of each component (b) mole fraction of each component.

(5,5)

Q-6)

- 1) Show that at chemical equilibrium, the total Gibbs function of the mixture is at a minimum. What mathematical condition expresses this?
- 2) Differentiate between Dalton's and Amagat's laws for predicting P-V-T behavior of a gas mixture.

(5,5)

Q-7)

Write short notes on any 2 of the following:-

- 1) Equilibrium constant for ideal gas mixtures
- 2) Phase Equilibrium for multicomponent systems
- 3) Examples of irreversibility due to lack of equilibrium

(5,5)

x-x-x