Exam. Code: 0940
Sub. Code: 6711

2054

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. I which is compulsory and selecting two questions from each Part. Use of property, steam and gas tables is permitted.***

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Q-1)

1) Give various assumptions considered in an air-standard cycle analysis.
2) What is Van't Hoff equation?
3) Relate entropy to social aspects with real life examples.
4) How is intercooling beneficial for a gas turbine cycle
5) Differentiate between ram effect and ram pressure.

(5x2=10)

PART A

Q-2)

1) Differentiate mathematically between change in exergy and change in flow exergy during a process.
2) Explain construction, working and advantages of a Turbo jet engine.

(5,5)

Q-3)

1) Derive the general exergy balance relation for a closed system, starting with energy and entropy balances.
2) A Diesel cycle operates at 1 bar at the beginning of compression and volume is compressed to 1/16 of the initial volume. Heat is supplied until the volume is twice that of the clearance volume. Calculate mean effective pressure of the cycle.

(5,5)

Q-4)

1) Explain Clausius Inequality with mathematical expressions to obtain relations of entropy with type of processes.
2) Steam enters an adiabatic turbine steadily at 3MPa and 450^{0}C at 8kg/s and leaves at 0.2MPa and 150^{0}C. Steam is losing heat to the surrounding air at 100 kPa and 25^{0}C at 300kW, where changes in kinetic and potential energies are negligible. Determine second law efficiency.

(5,5)

P.T.O.

PART B

Q-5)

1) Derive the criterion expression for chemical equilibrium in terms of molar Gibbs function for a chemical reaction.
2) 0.25kg of an ideal gas at 300kPa, 80^0C and 0.07m^3 undergoes adiabatic process to a final condition of 300kPa and 0.1m^3. During this process 25kJ of work is done on the gas. Find the value of R, C_p and C_v for the gas.

(5,5)

Q-6)

1) Give any five conclusions regarding equilibrium constant for ideal gas mixtures.
2) Derive the expression of work transfer for an ideal gas in a reversible isothermal process.

(5,5)

Q-7)

Write short notes on any 2 of the following:-

1) Flow work and non-flow work
2) Corollary of Carnot's theorem
3) Examples of irreversibility due to lack of equilibrium

(5,5)

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