**ST.ALOYSIUS INSTITUTE OF TECHNOLOGY, JABALPUR**

THERMODYNAMICS B.E.-3rd SEM.

Two marks question

Q.1. Define thermodynamics and its significance.

Q.2. Explain thermodynamics equilibrium.

Q.3. Explain intensive and extensive property of a system.

Q.4. Define terms-state, process, quasi-static process.

Q.5.Explain zeroth law of thermodynamics.

Q.6. Explain different types of thermodynamics system.

Q.7.Define the specific heat at constant volume Cv & at constant pressure Cp.

Q.8.Define enthalpy & its thermodynamics expression.

Q.9. Define internal energy & its thermodynamics expression.

Q.10.What is an isothermal & adiabatic process.

Q.11. Explain reversible &irreversible process with example.

Q.12. What do you mean by PMM-I &PMM-II.

Q.13.Explain available and unavailable energy.

Q.14.Define term “Entropy” .

Q.15 State Carnot Theorem.

Q.16.State the limitation of 1st law of thermodynamics.

LONG ANSWER QUESTION

Q1.Explain the adiabatic process? Derive an expression for the work done during the adiabatic expansion of an ideal gas.

Q2. Explain refrigerator and heat pump and prove that

$$[COP]_{hp} = [COP]_{ref} + 1$$

Q3. What is Carnot cycle? Derive efficiency of Carnot cycle with P-V &T-S diagram.

Q4.Apply steady flow energy equation for a unit mass flow for –

(a) Turbine (b) Nozzle (c) Compressor

Q5.What is the difference between heat engine & heat pump .Draw their block diagram.

Q6. 0.1m3 of air at a pressure of 1.5 bar is expanded isothermally to 0.5m3. Calculate the final pressure of the gas and heat supplied during the process.

Q7. Air in a closed stationary system expands in a reversible adiabatic from 0.5 Mpa, $15^0$C to 0.2 Mpa. Find the final temperature and per Kg of air, the change in enthalpy. Also find heat transfer and the work Transfer. Let assume m=1kg, Cp = 1 KJ/KgK and $\gamma = 1.4$ Draw the p-v diagram.

Q8. A nozzle is a device for the increasing the velocity of a steadily flowing stream. At the inlet to a certain nozzle, the enthalpy of the fluid passing is 3000 KJ/KgK and the velocity is 60m/sec. At the discharge end the enthalpy is 2762KJ/KgK. The nozzle is horizontal and there is negligible heat loss from it. Find

(i) Velocity at the exit.

(ii) Mass flow rate, if inlet area is $0.1m^2$ and sp. volume at inlet is $0.187m^3$/kg.

(iii) Exit area of nozzle, if the sp. volume at exit is $0.498m^3$/kg.

Q9. The efficiency of a Carnot cycle rejecting heat to a cooling pond at $28^0$C is 30%. If the cooling pond receives 1050KJ/min. What is the power developed by the cycle ? Find the temperature of the source.

Q10. A heat engine operating between two reservoirs at 1000K and 300K is used to drive a heat pump which extracts heat from the reservoir at 300K at a rate twice that at which the engine rejects heat to it. If the efficiency of the heat engine is 40% of max possible and the COP of heat pump is 50% of the max possible, what is the rate of heat rejection from the heat pump if the rate of heat supply to the engine is 50KJ/sec?

Properties of STEAM-

Short answer type question-

Q.1 Explain sensible heat of water.
Q.2 Define dryness fraction of steam
Q.3 What do you mean by “latent heat”.
Q.4 Define wet, dry and superheated steam.
Q.5 What is a pure substance?
Q.6 What information do you get from a Mollier Chart?

Long answer type question-

Q.1 Describe the process of formation of steam and give its graphical representation.
Q.2 Explain PVT surface and its significance.
Q.3 Explain HS, TS, PV, TS diagrams.
Q.4 Explain the working of throttling calorimeter with neat sketch.
Q.5 Calculate the internal energy of 0.3 $m_3$ of steam at 4 bar and 0.95 dryness. If this steam is superheated at constant pressure through 30°C, determine the heat added and change in internal energy.