SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

DEPARTMENT OF AEROSPACE ENGINEERING

19ASB204 – Aerospace Propulsion

Basic Thermodynamics Fundamental Equation

BASIC THERMODYNAMICS

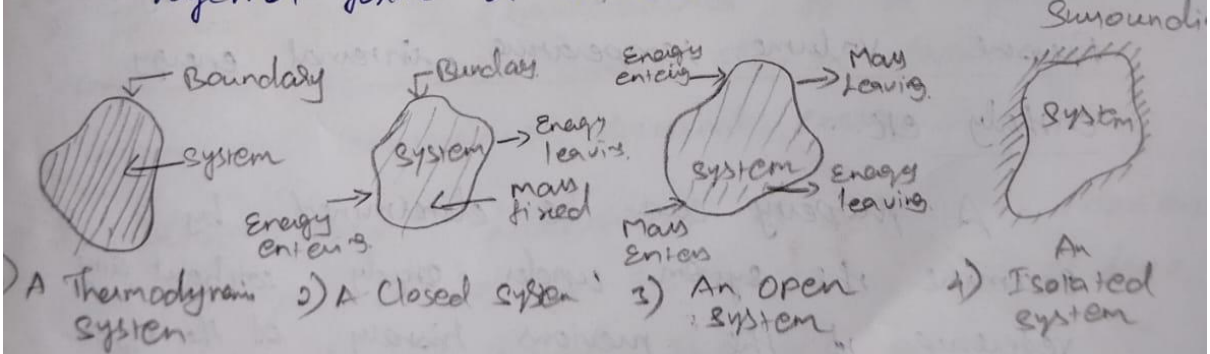
FUNDAMENTAL EQUATIONS

Thermodynamic system can be defined as a specified, in which change of energy, mass or both takes place.

(i) SURROUNDINGS - Space or matter outside of the thermodynamic system is called sur environment.

(ii) BOUNDARY - Between a thermodynamic system is called and its surroundings there exists a boundary.

(iii) UNIVERSE - A system and its surroundings together form a universe.



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Three kinds of Thermodynamic Systems

(a) closed system (b) Open system (c) Isolated syste

(a) A CLOSED SYSTEM - It is a system which the mass remains constant. No transfer of mass across the system boundary.

There may be transfer of energy b/w system and its surroundings.

Eg - Steam Engine. Piston - Cylinder.

(b) AN OPEN SYSTEM - The transfer of mass take place b/w the system and surroundings Also transfer of energy may takes place.

Eg - Air compressors, turbines, nozzles Engines etc.

(c) AN ISOLATED SYSTEM - No transfer of mass
* No. transfer of energy b/w system & surroundings
* No interaction b/w the system & surroundings.

Eg - Space

THERMODYNAMIC PROPERTIES

There are certain char of a system which describe its physical conditions. They are Pressure, volume, temperature, internal energy, enthalpy etc.

A property can be determined by examine the system under study without any

Properties are grouped into 2 categories

a) Intensive Prop

b) Extensive Prop

a) Intensive - Prop which are independent of the mass of the system. eg - Pr, Temp, Sp V, Sp Int Eng, Sp Entropy.

b) Extensive - Prop which are depend upon the mass of the system. The magnitude of an extensive property depends on mass of system.

Eg - Volume, Internal Energy, Enthalpy, Entropy

The ratio of an ext prop to the mass of a system called specific value of property.

eg - If total volume of system is V, mass m

Specific volume (or) Volume per Unit mass of the system $\Big\}$ $v = \frac{V}{m}$

Ny, specific internal energy $u = \frac{U}{m}$

* Caps - Extensive
* Small - Specific values of prop

* Internal Prop - Characteristics of a system within the equilibrium system. They are - mass, composition, temperature, internal energy etc.

* External Prop - Characteristics of either the motion or the position of the system in a field of force. They are - kinetic energy, Potential energy,

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STATE, PATH, PROCESS & CYCLE

(i) The properties of a system can be used as coordinates to describe the condition of the system. This condition is known as state of system.

(ii) Path - The succession of state passed through during a change of state forms the path of the change of state.

$$mC_v(T_1 - T_2) = \frac{mR(T_1 - T_2)}{\gamma - 1}$$

$$C_v(T_1 - T_2) = \frac{R(T_1 - T_2)}{\gamma - 1}$$

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