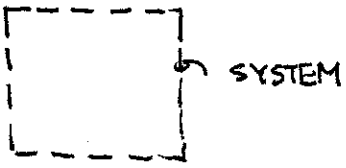
DR. THOM'S CRASH COURSE IN *

FOR A GENERAL SYSTEM



Cons. of Mass:

$$\frac{dm_{sys}}{dt} = \sum_{IN} \dot{m} - \sum_{OUT} \dot{m}$$

CLOSED SYSTEM

STEADY-STATE OPEN SYS.

Cons. of Energy:

$$\frac{dE_{sys}}{dt} = \dot{Q}_{IN} + \dot{W}_{IN} + \sum_{IN} \dot{m}\left(h + \frac{V^2}{2} + gz\right) - \sum_{OUT} \dot{m}\left(h + \frac{V^2}{2} + gz\right)$$

* NO KE & PE

CLOSED SYSTEM

STEADY-STATE, OPEN SYS

FINITE TIME

NO KE, PE

* THE COURSE FORMERLY KNOWN AS THERMO I.

PROPERTY STUFF

1. INCOMPRESSIBLE SUBSTANCE w/ CONST. C

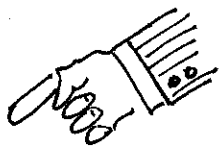
$$\rho = \frac{1}{v} = \text{CONST}$$

$$u_2 - u_1 =$$

$$h_2 - h_1 = u_2 - u_1 + v(P_2 - P_1) =$$

$$=$$

$$s_2 - s_1 =$$



2. IDEAL GAS w/ CONST c_v, c_p

- $PV = NR_u T$

$$R \equiv \frac{R_u}{\quad}$$

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$$u_2 - u_1 =$$

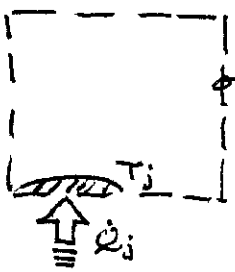
$$h_2 - h_1 =$$

$$s_2 - s_1 =$$

$$=$$

ENTROPY ACCT'ING & 2ND LAW STUFF

FOR A GENERAL SYSTEM:



$$\frac{dS_{sys}}{dt} = \sum \frac{\dot{Q}_j}{T_j} + \sum_{in} \dot{m}s - \sum_{out} \dot{m}s + \dot{S}_{GEN}$$

INTERNALLY REVERSIBLE ⇨

CLOSED SYSTEM ⇩

OPEN, STEADY-STATE ⇩

FINITE TIME ⇩

THE 2ND LAW SAYS...

$\dot{S}_{gen}$

OTHER USEFUL STUFF

- Boundary work for a <u>closed system</u>:

$$W_{1\to 2} =$$

- Mass flow rate across a surface

$$\dot{m} =$$

- "$T\,ds$" Equations

$T\,ds =$ $\qquad$ $T\,ds =$