NAME FAWAD AHMAD

ID 14231

SUBJECT Thermodynamics

Q1 (a)

ANS:- Degree Fahrenheit

$$F = \frac{9}{5}C + 32$$

$$F = \left(\frac{9}{\not 5} \times \overset{28}{\not 140}\right) + 32$$

$$F = (9 \times 28) + 32$$

$$F = 252 + 32 = 284°F$$

Rankine

$$R = F + 459.67$$

$$R = 284 + 459.67$$

$$R = 743.67$$

Kelvin

$K = C + 273.15$

$K = 140 + 273.15\,K$

Q1(b)

Ans: Using the equation of state of ideal gas

$$PV = nRT$$

$$P(V) = \frac{nRT}{V}$$

$$W = \int_{V_1}^{V_2} P(V)\,dV$$

$$= \int_{V_1}^{V_2} \frac{nRT}{V}\,dV$$

$$= nRT\left[\log(V)\right]_{V_1}^{V_2}$$

$$= nRT \log\left(\frac{V_2}{V_1}\right)$$

More ever from the eq of state of ideal gas of isothermal process

$$P_1V_1 = P_2V_2$$

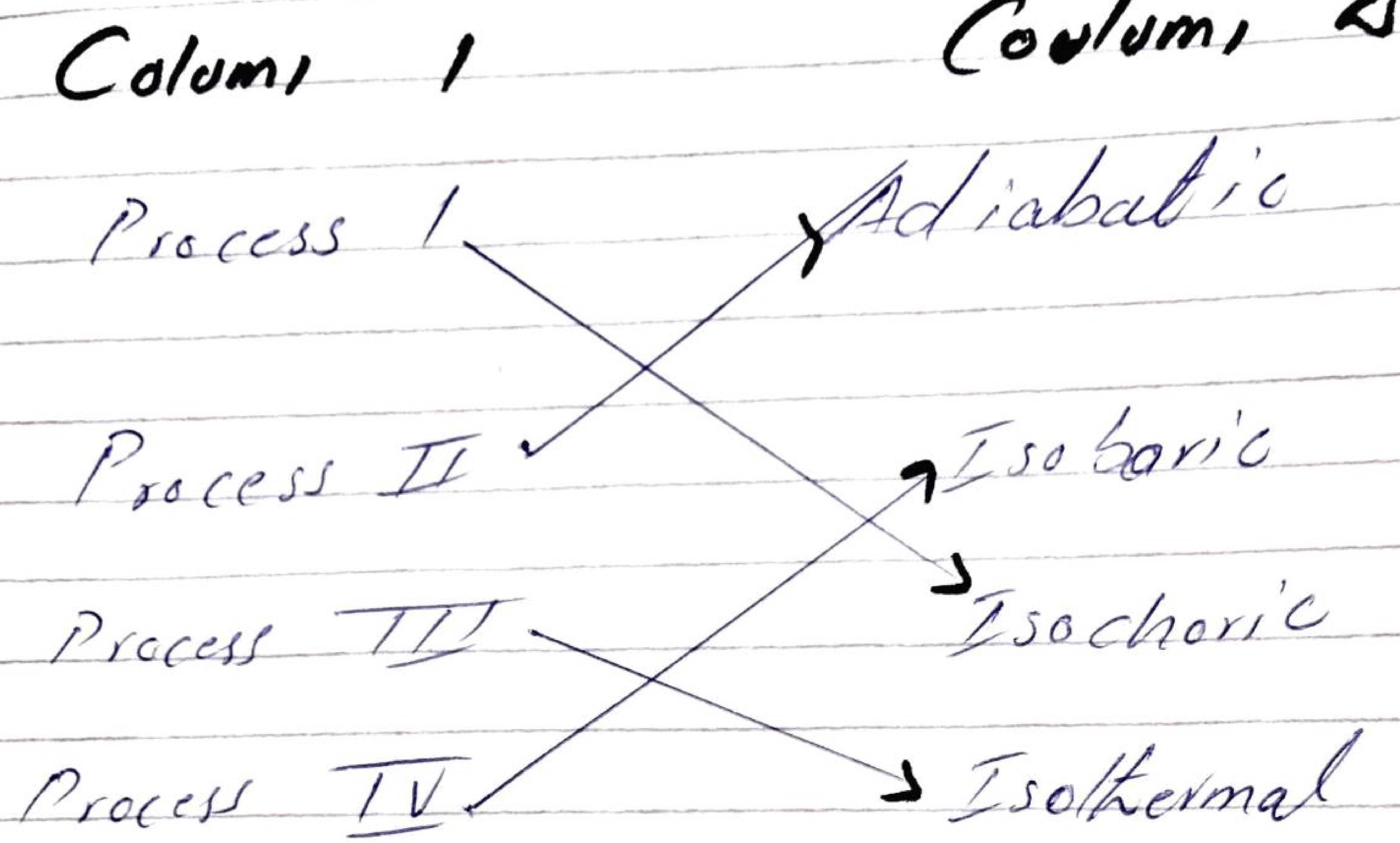
or

$$\frac{P_1}{P_2} = \frac{V_2}{V_1}$$

and thus

$$W = nRT \log\left(\frac{P_1}{P_2}\right)$$

Q2



Q3 i.

Ans:- Heat and work are two different ways of transferring energy from one system to another. The the distinction between Heat and work is important in the field of thermodynamics. Heat is the transfer of thermal energy between systems, while work is the transfer of mechanical

This distinetion between the microscopic motion and macroscopic motion is crucial to how thermodynamic process work. Heat can be transformed into work and vice verse, but they aren't the same thing. The first law of thermodynamics states that heat and work both contribute to the total internal energy of a system, but the second law of thermodynamics limit the amount of heat that can be turned into work.

Q3 ii.

Ans:- A system can be anything. It is most convenient if it has well defined boundaries.

* ΔQ is positive if heat flows into the system negative if it flows out of the system.

* ΔW is positive if heat flows into the system negative if it flows out of the system

* ΔW is positive if the system does work on its surrounding and it is negative if work is done on the system.

* ~~The internal energy~~ U :

It is a physical property of the system.

Q4

Ans:- A throating process is defined as a process in which there is no change in enthalphy from state one to state two $h1=h2$ no work is done $W=0$ and the proccess is adiabatic $Q=0$ To better understand the theory of the ideal throtting process let's compare what we can observe with the above theoretical assumptions. An example of a throating process is an ideal gas flowing through a valve in mid position.

From experience we can observe that: $P_{in} > P_{out}$, $vel_{in} < vel_{out}$

(where P= pressure and vel=velocity)

These observation confirm the theory that $h_{in} = h_{out}$. Remember $h = u + Pv$ (v= specific volume) so if pressure decrease then specific volume must increase if enthalpy is to remain constant (assuming u is constant). Because mass flow is constant the change in specific volume is observed as a increase in gas velocity and this is verified by our observation.

The theory also states W=0 observation again confirm this to be true as clearly no work has been done by the throatting process. Finally, the theory states that an ideal throating process is adiabatic. This cannot clearly be proven by observation since a "real" throtting process is not ideal and will have some heat transfer.