(2g-gravity acceleration (m/s
z- elevation from reference(m)
(u-internal energy(J/kg
w-work done(J/kg)
(h=enthalpy(J/kg
referred to inlet and outlet respectively2 and 1 and subscripts
note that for heat entering the system , its sign is positive in the equations above and negative as the heat lost to the surrounding. For work the positive sign is used as the work . done by the system while a negative sign is used as the work is done on the system

150 kg/sec ,it enters with a velocity of 4.5 B) A fluid flows through a gas turbine at a rate of m/sec, specific 120 kJ/kg. At the exit the velocity is 3000 m/sec and a specific enthalpy of kJ/kg as it passes 25kJ/kg, and the fluid has a heat loss to the surrounding of 2300 enthalpy is through the turbine. Neglect potential energy; determine the power developed by the turbine in .MW
Ans

The steady state flow energy equation is

$$h_1 + \frac{V_1^2}{2} + gz_1 = w + h_2 + \frac{V_2^2}{2} + gz_2 + q$$

)then0 Neglect potential energy (i.e $\Delta z =$

$$1000 \times 3000 + 25000 - \frac{150^2}{2} + 1000 \times 2300 = w + \frac{120^2}{2}$$

$$w = 679050 \; J/kg$$

But

$$Power = \dot{m} w$$

MW3.055725 Watts=3055725 =679050x4.5=

The principle of thermodynamics engine .6

The thermodynamics engine is a device in which energy is supplied in form of heat and some of this energy is transformed into work. It would be ideal , if all energy supplied was transformed into work and no such transformation process exists then the percentage of heat received which can be transformed to useful work is defined the thermal efficiency of the system

$$\eta = \frac{work\ done}{Heat\ received}$$ m

.in best situation40% Usually in practice it no exceeds

The heat engine .7

It is an engine in which heat transfer occurs . If heat is introduced into the system and as a result of cyclic process, some work appears from that system, together with some heat rejection from the system, and then this is heat engine

All thermodynamics engine are mostly referred to as heat engine

2Chapter

Gases and single phase system

characteristic equation of a perfect gas 2.1

a. Boyls law : During a change of state if mass and temperature of a gas remains constant then

— where V is volume, P is pressure $V \propto \frac{1}{p}$

— Then $V = \frac{c}{p} \Rightarrow PV = c$ where c is constant

b. charles law :during a change of state , If mass and pressure of a gas remains constant then $V \propto T$ where V is volume , T is temperature in K

— V=CT $\Rightarrow \frac{V}{T} = const$ (2)

c. characterstic equation of a perfect gas

x- Boyls law1 from

x- from 2

then