Q.1 Explain the following Terms:

Ans Nozzle efficiency: It is defined as the ratio of the Actual enthalpy drop to the isentropic enthalpy drop b/w the same pre.

Nozzle efficiency = 'k' = $\frac{\text{Actual enthalpy drop}}{\text{Isentropic enthalpy drop}} = \frac{h_1 - h_f}{h_1 - h_2}$

When steam at entry to nozzle is dry saturated =

$= \frac{h_a - h_r}{h_a - h_s}$

Q.2 Explain the essential diff. in the fun. of moving blades in Impulse and reaction Turbine.

Ans

Impulse turbine	Reaction Turbine
1. The steam completly expands in the nozzle and its pre. remains constt. while passing through the blade passage.	1. The steam expands partialy i.e the fixed blades & further expansion take place in the moving blades
2. The relative velocity of steam remain const. while passing over moving blades	2. The relative velocity of steam increase as it expands while passing over the moving blades.
3. The shape of blade is of Profile type.	3. The shape of blades is of airfoil type.
4. The blade passage is of const. cross-sectional Area as there is No expansion.	4. The blade passage is of variable cross sectional area to allow expansion.
5. ~~The blades speed & steam speed~~ are large due to large pre. drop	5. The blade speeds & steams speed are small due to small Pre. drop
6. Less space is needed per unit Power	6. more space is needed per unit Power.
7. They are suitable for small Power	7. They are suitable for mediums & high Power.

Q.4 Define vaccume efficiency & condenser efficiency. Discuss the factor on which these are depends.

Ans vaccume efficiency :⇒ This is the ratio of the actual vaccume at perfect condensing plant. It means there should be no air present in the condenser & the pre. in it should be that due to exhaust steam alone at inlet to the condenser corresponding to the Saturation temp. of steam.

vaccume efficiency = $\frac{\text{Actual vaccume}}{\text{max. obtainable vaccume.}}$

Vaccume efficiency would be 100% if there is no air present in condenser.

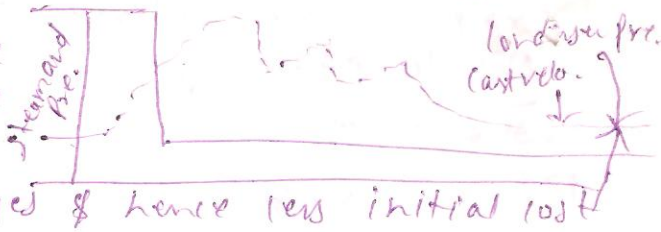
* (condenser efficiency ⇒ It states that it is the ratio of the diff. b/w the outlet & inlet temp. of the cooling water.

Condenser efficiency = $\frac{\text{Rise in temp. of cooling water}}{\text{Temp. corres. to vaccume} - \text{inlet temp. of cooling water in the condenser.}}$

Q.6

Ans Velocity compounding: There are a no. of moving blades separated by ring of fixed blades keyed in series on a common shaft. The steam from the boiler is passed through

nozzle where in expanding to condenser pre, it aquire very high velocity. This high velocity steam then passed through a no. of moving & fixed blade rings. Since there is no fall in pre. as the steam flows over the moving blades.

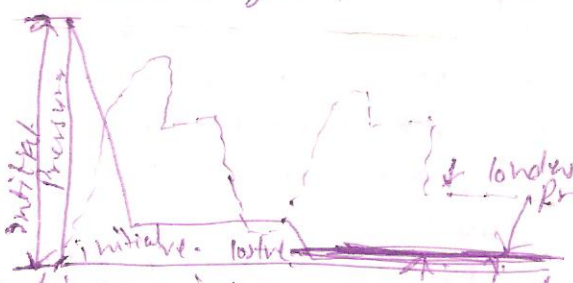


* Advantages:- Relatively few no. of stages & hence less initial cost
- requires less space.
- The system is reliable & easily to start.

* Disadvantages:- This friction loss is high due to high vel. so η is low.
- The η is also low due to the fact that the ratio of blade velocity to steam velocity is not optimum for all wheels.

* Pressure compounding:- In this case rings of fixed nozzle are interposed b/w the rings of moving blades which are keyed to the shaft in series. the steam from boiler is passed through the first ring of nozzle where it expands only partially. the velocity is absorbed. Each pre. drop as already discussed is known as a stage. This is most efficient type of Turbine because the ratio of blade velocity to steam velocity remains constt. but has the disadvantages of large no. of stages and hence it most expensive.

Pressure velocity Compounding:- It is combination of two methods. The Total drop in steam pre. is carried out in two stages & the vel. obtained in each stages is also compounding. Turbine method of compounding may be said to combine many of the advantages of both pre. and vel. staging. By allowing a bigger pre. drop in each stages, less no. of stages are necessary and hence a shorter turbine will be obtained for a given pre drop. This method of pre. velocity compounding is used in the more & the curtis turbine.



(Q.5)
The Principle advantages of Jet condenser are its simplicity of design & lower manufacturing cost, lower upkeep / small floor space required, requir less air is require, quantity of circulating water to effect. The steam condensation.

The principle advantage of Surface condenser are - The max^m. vaccume attained in a surface condenser is 73.5 cm of Hg, therefore it give the highest thermal eff. of the plant.
- Less air is carried out to the boiler & auxilary power required is less than that of jet condenser

* Limitations of Surface Condenser:-
- The surface condenser is quite bulky & require more space.
- It's capital, running & maintanance cost are considerably high.