we get $\beta = \alpha$, $\alpha = r$ from ①, ③ & ④

Thus for a 50% reaction the moving & fixed blades must have the same shape. This condition gives the symmetrical velocity dia. this type of turbine is also known as Parson Reaction Turbine

when degree of reaction is $R = 0$ we have simple Impulse Turbine
" " " " " $R = 1$ " " Pure Reaction "

Q.13

Ans- (1) The air leakage in a condenser result in increasing the back pre. on the prime moves which means there is loss of heat drop & consequently thermal efficiency of the plant is lowered.

(2) The presence of Air in the condenser lowers the saturation temp. steam which means a lower saturation temp. as the saturation temp. of steam decreases, its latent heat increase so it will require greater amount of cooling tower.

(3) Because of poor thermal conductivity of air the rate of heat Transfer the vapour is reduced and the surface Area of the tubes has to be increased for a given condense duty.

Q.15

Ans Two stage Compressor with perfect Intercooling

9147 = low pre. cycle

7236 = high pre. cycle.

for this Arrangement

$$w = \frac{n}{n-1} P_1 v_1 \left[\left(\frac{P_4}{P_1} \right)^{\frac{n-1}{n}} - 1 \right] + \frac{n}{n-1} P_2 v_2 \left[\left(\frac{P_3}{P_2} \right)^{\frac{n-1}{n}} - 1 \right] \quad \text{---①}$$

delivery temp. is given by

$$T_3 = T_2 \left(\frac{P_3}{P_2} \right)^{\frac{n-1}{n}} = T_1 \left(\frac{P_1}{P_2} \right)^{\frac{n-1}{n}} \quad \text{Since } T_2 = T_1$$

Now since $T_2 = T_1$ then

$$P_2 v_2 = P_1 v_1$$

also $P_4 = P_2$

Integrating eqn ③ & ④ in eqn ①

$$w = \frac{n}{n-1} P_1 v_1 \left[\left(\frac{P_2}{P_1} \right)^{\frac{n-1}{n}} + \left(\frac{P_3}{P_2} \right)^{\frac{n-1}{n}} 2 \right]$$