Section - 5

Q-1 Explain the principal and components of tidal power plants. Also, discuss the working of tidal power plants.

Ans(i) Principal :- To Utilize tidal energy, water must be trapped at high tide behind a dam and barrage and then made to drive turbine as it return to sea during low tides. The available energy is proportional to the square of the amplitude.

(ii) Component of tidal power plant :-

Main Components of a tidal power plants are :-

(a) Barrage
(b) Sluice gates
(c) Turbine
(d) Basin

(a) Barrage :- It is a dam of low head and requires the following features :-

(i) Less sloppy towards the ocean and basin side.
(ii) It should be able to withstand the shock load of tides and waves.
(iv) steel foundation frame and channels are embedded in the ducts with in the barrage for turbine and gates steel foundation.

(b) Sluice Gates:- These gates are opened by water pressure and no mechanical means is required.

(c) Turbine:- The Kaplan or bulb type turbine is used to operate with low head and the entire turbine generator unit is submerged in the water.

(d) Basin:- The basin can be single, pair or multiple type and have different designs.

(e) Working of tidal power plant:- The working is described according to the type of basin.

(a) Single basin System.
(b) Double basin System.

(a) Single basin System:-

(1) In a tidal power plant [based on single basin System], the power house is situated at the mouth of basin.

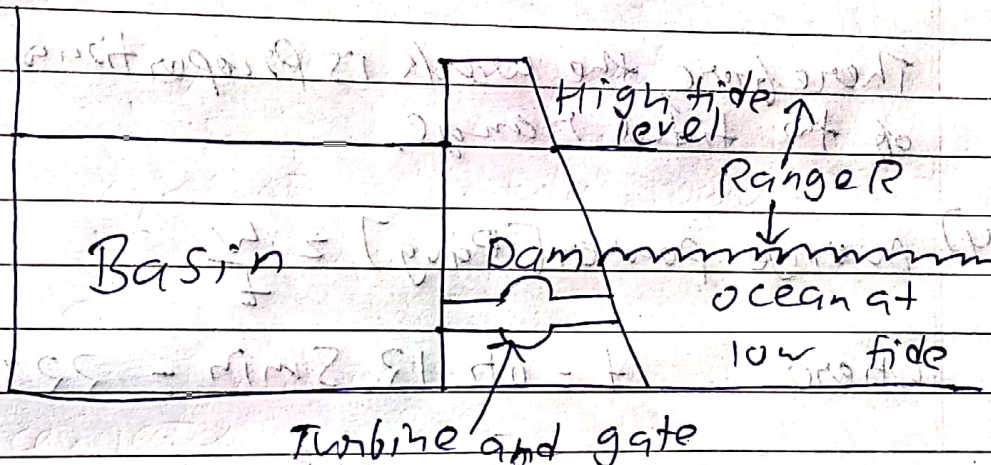
(2) The hydraulic turbine in the power house only operates during the discharge of water from of basin during ebb tide and during the high tide the basin is again filled.

(3) The direction of flow through the turbine the ebb and flood tides alternates and generation

of power is accomplished, both during the emptying and filling cycle of basin.

(4) Though the double cycle system has only short duration interruptions in turbine generator operation, but the continous power generation is still not possible.

(5) Further, the power generation coincides osionaly with the peak power demands the problem is overcome in double-basin system.



Energy and power in single basin system

(1) Let,

R = Tidal Range,
m = Mass flowing through turbine
W = work done
A = Surface area of basin
H = Intermediate head,
dH = Small head
g = Gravitational Constant
P = Density of water
dw = gH dm