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Department: Civil Engineering

Subject : Hydraulic Structure

Assignment # 01

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Q01 (a) Define reservoir and which type of reservoir will be more economical and why?

Reservoir :- A Reservoir is a man-made lake or large fresh water body of water. Many people think of a reservoir as a lake and might even use the words interchangeably. The key difference is that reservoir are artificial and made by human. while lakes are naturally occuring bodies of water, like lakes or rivers, run dry. "OR"

A reservoir is a basin constructed valley of a stream to store the water during the excess stream flow. It acts as a source of water supply when natural flow in the stream is insufficient to meet the water demands.

- Which type of reservoir will be more economical & why.

Bank-side reservoirs :- are reservoirs that are made by diverting water from local rivers or streams to an existing reservoir. Although this can be applied to many different geographical areas, unlike the valley-dammed reservoir, which requires a valley.

The Bank-side reservoirs are more economical to the other reservoir Because of that type only divert the some amount of water to the reservoir by constructed a small rectangular shape in the

exciting river or lake, which is more economical otherwise the construction of dam is more expensive and more time are required and also the maintanance cost.

In the other types of reservoir such as (valley - dammand and service reservoir) are required to construct a dam which is non economical

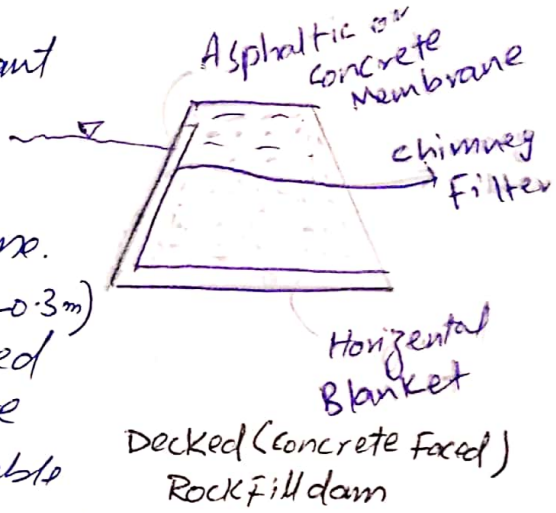
and the ~~side~~ Bank - side reservoir are economical which is functional with out construction of dam it required the constructing a rectangular or circular masonry structure at suitable places.

"The water from the river or lake is pumped into the reservoir and stored there for supplying to the consumers of Town/city. The water may be supplied to the consumers by pumping system or gravity system."

Q.01 Part b

which type of embankment dam you will suggest in a hilly area and why?

- The decked rockfill embankment is illustrated in and depicts an asphaltic or concrete impermeable upstrem membrane. Than asphaltic membranes (0.15-0.3m) thick are now widely employed where soil suitable for core construction is either not available or uneconomic. An asphaltic membrane can accept a degree of deformation with out rupture.



we provided decked rock Fill embankment which

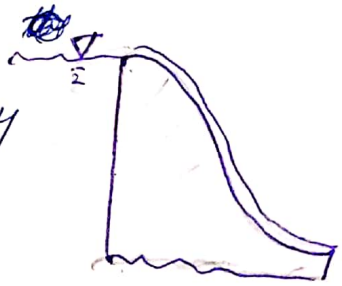
- the thin cover of asphalt or concrete are provide on the surface which resist to the rainfall and the water store in. @ many of d embankment dam are fail by rainfall which flow all the dam material.
- These are suitable for river valleys of any type: Streep gorges or wide valleys
- Can adapt to a board range of foundation conditions ranging from good rock to even permeable soil type of foundation
- uses naturally available materials
- Relatively less costly.

Q02

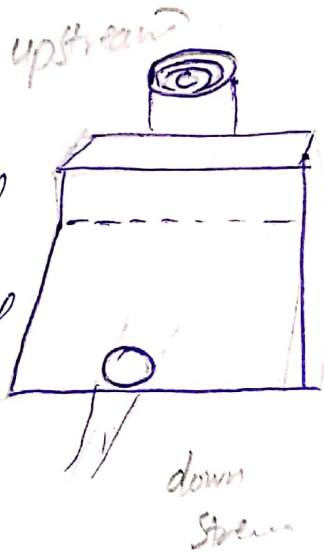
Part a :- List down different types of spillways also mention which type of spillway will be more efficient ....

1) Straight Drop Spillway :- A straight drop spillway consist of low height weir wall having its downstream face roughly or perfectly vertical. when the water level in the reservoir rise above the normal pool level, the surplus water falls freely from the crest of the weir.

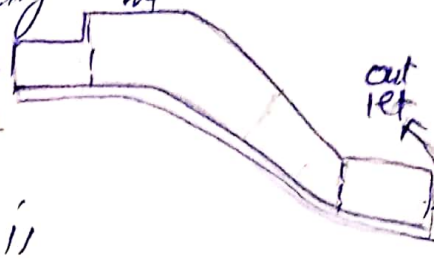
2) Ogee-shaped Spillway :- The ogee spillway is a modified form of drop spill way. Here the down downstrem profile of the spill way is made to coincide with the shape of the lower nappe of the free falling water jet from a sharp crested weir.



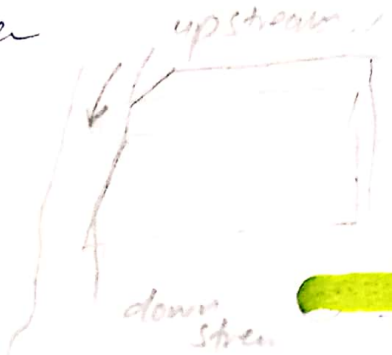
3) Shaft spillway :- A shaft spill way consist of a horizental crest & vertical shaft, with its top surface at the crest level of the spillway and its lower end connected to a vertical shaft. The other end of the vertical shaft is connected to horizental conduit or tunnel which extends through or around the dam & carries the water to the river downstream. A shaft spillway is used at the sites where the condition are not favorable for an overflow or a chute spillway



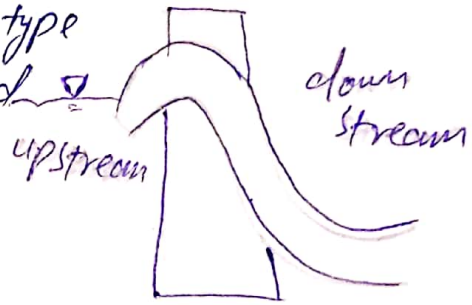
4) Chute spillway :- This spillway is simply a rectangular open channel provided on the dam to discharge the surplus water from the reservoir to the same river on the downstream side.



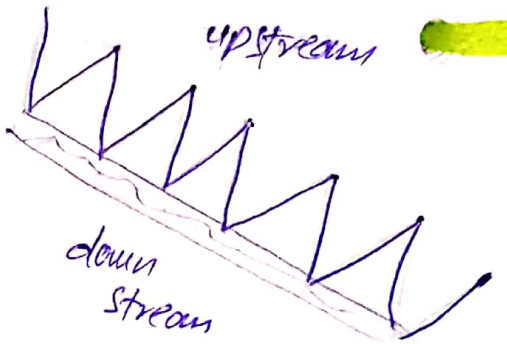
5) Side channel spillway :- Side channel spillway is similar to chute spillway but the only defference is the crest of side channel spillway is located on one of its sides whereas crest of chute spillway is located b/w the side wall, in other words, the water spilling from the crest is turned to 90 degree and flows parallel to the crest of side channel spillway unlike in chute spillway



6) Siphon spillway :- A siphon spillway is a type of spillway in which surplus water is disposed to downstream through an inverted U shaped conduit. It is generally arranged inside the body or over the crest of the dam



7) Labyrinth spillway :- A labyrinth spillway is a type of spillway in which the weir wall is constructed in a zigzag manner in order to increase the effective length of the weir crest with respect to the channel width. This increase in effective length raises the discharge capacity of the weir & hence higher water flow at small head can be conveyed to the downstream easily.



Shafte Spillway is more efficient in a condition where Freezing point of water is less than $-10^{\circ}C$ in water. In areas where the surface of the reservoir may Freez, this type of spillway is normally Fitted with ice-breaking arrangement to prevent the spill way from becoming ice-bound

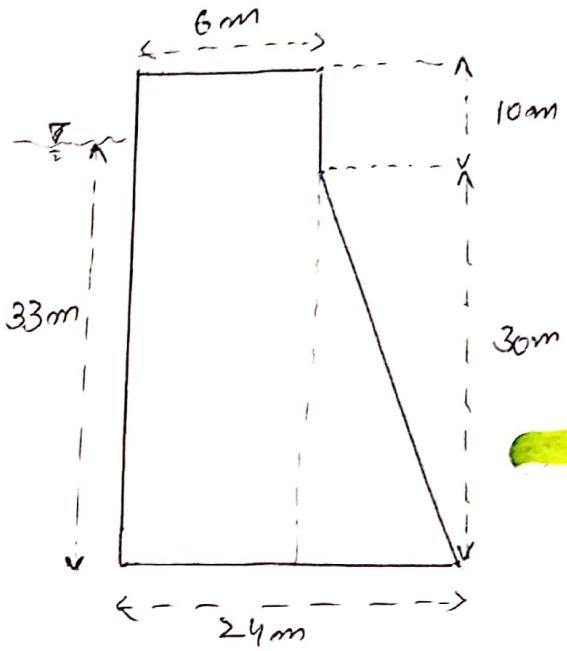
This spill way are more efficient because the other spillway outlets are on the crest level when the surface of reservoir are ~~Fres~~ Freez than water discharge in other spillway difficult which impose extra load to the dam

~~In shafte spillway the Freezing surface of reservoir~~

In shafte spilway are on out of the Dam body mean midle of the reservoir which water enter into it ~~and~~ easily.

Q03 Part A

Design the gravity dam by assuming the dam dimension . . . . . .



Assume the data

Length = 50m
$\gamma_m = 2.5 KN/m^3$
$\gamma_w = 1 KN/m^3$
$h_v = 1.5m$
$\gamma_s = 9 KN/m^3$

Solution

Hydrostatic water pressure

$P_H = 0.5 \gamma h^2$
$P_H = 0.5 \times 1 \times (33)^2$
$P_H = 544.5$

$P_y = \gamma A$ vertical are not so it will be zero
$P_y = 0$

self weight $W = \gamma_m \times V_{dam}$
$W = 2.5 \times 25500$
$W = 63750 KN$

vol of rectangle
$= 6 \times 40 \times 50$
$= 12000 m^3$
vol of Triangle
$= \frac{1}{2} bh \times l$
$= \frac{1}{2} \times 18 \times 30 \times 50$
$= 13500 m^3$
V = Rect + Triangle
$= 13500 + 12000$
$V = 25500 m^3$

uplift $= \frac{1}{2} \gamma_w h B$
$= \frac{1}{2} \times 1 \times (33) \times (24)$
uplift = 396 KN/m

silt load $P_s = \frac{\gamma_s h^2}{2} \times \frac{1-\sin\theta}{1+\sin\theta}$ $\therefore \theta = 18^\circ$ Assume $h = 2m$

$$P_s = \frac{9 \times (2)^2}{2} \times \frac{1-\sin(18)}{1+\sin(18)}$$

$$\boxed{P_s = 9.35\ KN/m}$$

wave $I_{wave} = 2.4\ \gamma_w h^2_{wave}$

$= 2.4 \times 1 \times (1.5)^2$

$$\boxed{I_{wave} = 5.4\ KN/m}$$

$\therefore \alpha = 0.2$

$P_{earth\ quake\ concrete} = \alpha W$

$= 0.2 \times 63750$

$$\boxed{P_{e.quak} = 12750\ KN}$$

$P_{earth\ quake\ on\ water} = \frac{2}{3} C_e \times h^2$

$= \frac{2}{3}(0.63) \times 0.2 \times (33)^2$

$$= 90.56\ KN$$

$P_{ice} = 0.07\ v\ d\ (\sqrt{A f_i})$ Assume the vale of v, d, A

$P_{ice} = 0.07 \times 0.5 \times 3 \times (\sqrt{19 \times 0.3})$

$$\boxed{P_{ice} = 0.172\ KN}$$