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Section : A

Quiz : Hydraulic Structure

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Q No 1 (Part a)

Ans:- A reservior is a man-made lake or large freshwater body of water.
Many People think of a reservior as a lake and might even use the words Interchangeable, However the key difference is that reservior are artificial and lakes are naturally.

Mainly three types of reserviors.

→ Valley demand reserivior.
→ Bank-side reserivior.
→ Service reservior.

In above three types, Service reservior is most economical because it is entirely man made. His frame Construction is easy to as well as no need of any natural water body diversion
It also required small space.

Q No 1 (Part b)

Ans:- There are two types of embankments dam. Earth fill embankments and rock fill embankments. earth fill embankment are the one which Consist of 50% or more Soil while rock fill embankments are the one which Consist of 50% or more of rock. If we have to build on embankment In a hilly area, we should built rock fill embankments because rocks fill embankment have more Strength then earth fill embankments and In hilly areas rocks will be easily available. which will make our Project economical and Save.

Q No.2

Ans:- Types of Spillways.

→ Straight drop spillway

→ Ogee Spill way

→ Shaft Spill way

→ Chute Spill way

→ Side Channel Spillway

→ Siphon Spill way

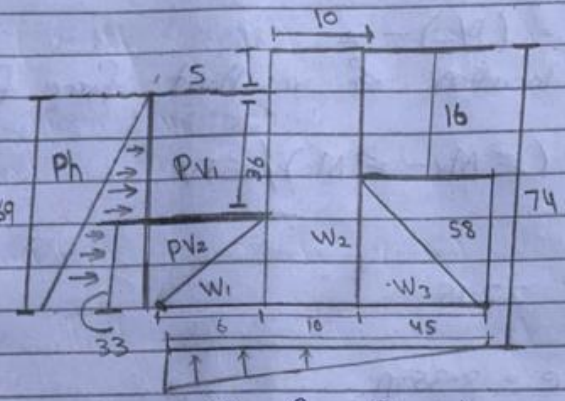
→ labyrinth Spill way

In Condition where freezing Point will be -10c° In winter we would choose chute Spillway because chute Spillway water is disposed from upstream to downstream at a very high speed and the flow will be In Super critical Condition that will disipate the energy from the fall water.

the temp of water will rise which will not allow the water to freeze.

Q No. 3

Ans :-



Assume unit weight for Concrete = 24 KN/m³
Assume unit weight for Water = 10 KN/m³

Forced and moment Calculation

Forces	Force formula	Fy	Fx	lever Arm (m)	Mr	Mo
W_1	$(1/2)\times L\times W\times \gamma_d$	2376	0	57.00	135432	0
W_2	$L\times W\times \gamma_d$	17760	0	50.00	888000.0	0
W_3	$(1/2)\times L\times W\times \gamma_d$	31320	0	30.00	939600.0	0
P_{V1}	$(1/2)\times L\times W\times \gamma_w$	990	0	59.00	58410	0
P_{V2}	$L\times W\times \gamma_w$	2160	0	58.00	58410	0
P_H	$(-(1/2)\times L\times W\times \gamma_w)$	-21045	0	40.67	0	855830
Ph	$(-(1/2)\times L\times W\times \gamma_w)$	0	-23805	23.00	0	547535
		Σ	33561	-23805	Σ	2146722.0	1403345

→ For factor of Safety against tension Condition.

$e < B/6$

$B/6 = 10.17\ m$

eccentricity of the resultant force

$e = (B/2) - \bar{x}$

$\bar{x}$ = location of resultant force from Toe

$\bar{x} = (\Sigma M_r - \Sigma M_o)/\Sigma F_v$

$\bar{x} = 22.15$

So $e = 8.35m$

Condition → Safe In Tension (OK)

→ For factor of Safety against stress

Condition → $\gamma_{heel} > 0$

$\gamma_{Toe} = (\Sigma F_v/B)(1 \pm (6e/B))$

$\gamma_{Toe} = 1002.0484 \ KN/m^3$

$\gamma_{heel} = (\Sigma F_v/B)(1-(6e/B))$

$\gamma_{heel} = 98.31 \ KN/m^3$

→ Condition → Safe In stress (OK)

⇒ For factor of Safety against overturning

Condition → $(\Sigma M_r/\Sigma M_o) > 2$

$= (\Sigma M_r/\Sigma M_o) = 1.53$

Condition → Not Safe In overturning (Not ok)

$(\Sigma M_r / \Sigma M_o)$

$\Sigma M_r = 21467220$

$\Sigma M_o = 1403345$

Condition → Safe (ok)

→ For factor of Safety against Sliding

Condition → $(\omega \Sigma F_V + B_q V) / \Sigma F_H > 1$

$q_V = 1400$

$\omega = 0.7$ (0.65 to 0.75)

$(C_w \Sigma F_V + B_q V) / \Sigma F_H = 4.57$

Condition → Safe In Sliding (ok)