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HYDRAULIC STRUCTURE (1)

QUESTION # 1: - PART (1)

(a) Reservoir:

A reservoir is a man-made lake or large body of freshwater, but people consider reservoir as a lake but the difference b/w a lake and reservoir is lake is are natural and reservoir are artificial.

Types of Reservoir:

* Bank-side Reservoir
* Valley damed Reservoir
* Service Reservior

Economical Reservoir:

in the above three types. service reservoir is is economical because it's, entirely man-made. it's frame is easily constructed as well as no need of any water body diversion. less space is required for service reservoir.

QUESTION #1: PART (2)

TYPES OF EMBANKMENT DAM:

* Earth fill embankment.
* Rock fill embankment.

Embankment in hilly area:

they earth fill embaukment consists of 50% or more soil and the rock fill embankment consist of 50% or more rocks if we have to choose : embaukment in hilly area we have to built rock fill embankment because it in hilly area rocks are easily available it would have more strength and dye to the easily available material our project will be economical and save.

QUESTION # (2):

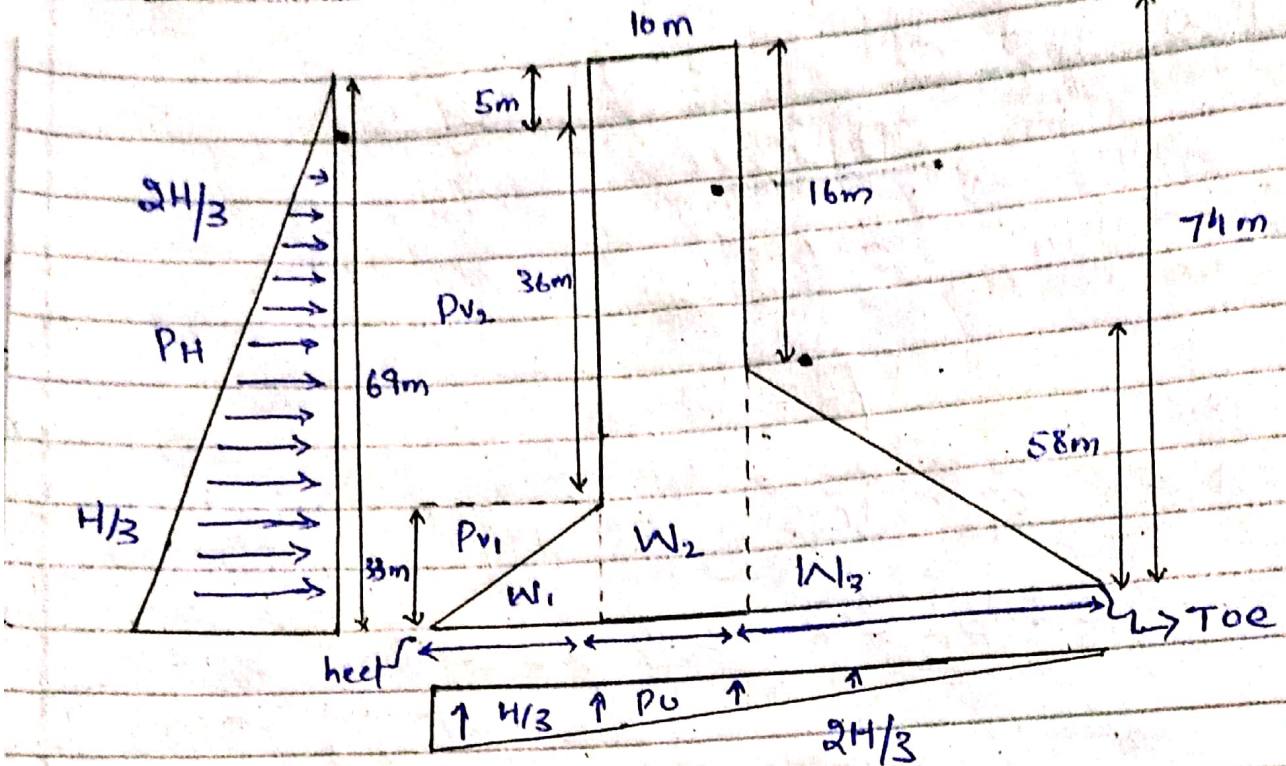
TYPES OF SPILLWAYS:

* Straight drop spill way
* Ogee spill way
* shaft spill way
* Chute spill way
* Side channel spillway
* Siphon spill way
* laby rinth spill way

In condition where freezing point will be -10°C in winter we would choose chute spillway because chute spillway water is disposed from upstream to down stream at a very high speed and the flow will be in supercritical condition that will disipate the energy from the fall water

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

QUESTION #3:



Forces	Forces Formula	Fv (KN)	FH (KN)	lever Form (m)	Mr FvxL.A	Mo
W_1	1/2xLxWxγd	2376	0	57.00	135432	0
W_2	LxWxγd	17760	0	50.00	888000	0
W_3	1/2xLxWxγd	31320	0	30.00	939600	0
P_{V1}	1/2xLxWxγw	990	0	59.00	58410	0
P_{V2}	LxWxγw	2160	0	58.00	58410	0
P_U	-1/2xLxWxγw	-21045	0	40.67	0	855830
P_H	-1/2xLxWxγd	0	-23805	23.00	0	547535
	Σ	33561	-23805		2146722	1403345

assume unit weight of concrete = 24 KN/m³

assume unit weight of water = 10 KN/m³

⇒ Now factor of safety against tension

Condition $e < B/6$

$B/6 = 10.16$

New eccentricity of resultant forces

$e = B/2 - \bar{x}$ ∴ $\bar{x}$ = location of resultant forces from toe.

$$\bar{x} = \frac{\Sigma Mr - \Sigma Mo}{\Sigma Fv}$$

$$= \frac{2146722 - 1403415.15}{83561}$$

$$\bar{x} = 22.15$$

So

$$e = \frac{61}{2} - 22.15$$

$$e = 8.35\ m$$

condition of tension (OK)

=> For Fos against Stress

condition; $\gamma_{heel} > 0$

As

$$\gamma = \frac{\Sigma F_v}{B}\left(1 \pm \frac{6e}{B}\right)$$

For toe:

$$\gamma_{toe} = \frac{\Sigma F_v}{B}\left(1 + \frac{6e}{B}\right)$$

$$\gamma_{toe} = \frac{33561}{61}\left(1 + \frac{6(8.35)}{61}\right)$$

$$\gamma_{toe} = 1002.049$$

Also

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

$$\gamma_{heel} = \frac{33561}{61}\left(1 - \frac{6(8.35)}{61}\right)$$

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

condition is safe in stress.

⇒ For Factor of safety against over toming

Condition $\frac{\Sigma M_r}{\Sigma M_o} > 2$

$\Rightarrow \frac{2146722}{1403415.15} = 1.53 < 2$ not ok

so condition

$(\Sigma M_r > \Sigma M_o)$

$2146722 > 1403415.15$. (OK)

⇒ For Factor of safety against sliding

Condition

$\frac{\mu F_v + B + qv}{\Sigma F_H} > 1$ ∴ $q = 1400$, $\mu = 0.7$

So

$\frac{0.7(33561) + 61 \times 1400}{23805} = 4.57$

So condition is safe in sliding.