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TEACHER

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SUBJECT

HYDRAULIC STRUCTURS

SECTION:

B

QUESTION # 01 (A)

RESERVOIR:

⇒ A Reservoir is Most Commanly an Enlarged natural or Artifical lake pond or impoundment, created using a dam or locle to store water.

⇒ A Reservoir is a man-made lake or large freshwater body of water.

⇒ Reservoir are great because they provide a supply of water for when naturally occuring bodies of water, like lake or rivers, run dry.

→ Service Reservoir will be more Economical than other Type of reservoir. because of following Reasons.

(1) Service Reservoir are fully man made Reservoir., no heavy machinary is Reqired for its construction.

(2) Service Reservoir Store treated water, and construct close to

the point of distribution, so less cost and Energy will required for distribution.

(3) Service Reservoir also Ensuring Sufficient head of water in the water distribution Systems.

(4) Service Reservoir Can not Required any diversion for natural water which is very costly.

(5) Service Reservoir can also managed to reduce the cost of pumping, by Refilling the reservoir at day time when Energy cost are low.

Question # 02 (B)

There are two types of Embankment

(1) Rockfill Embankment.
(2) Earthfill Embankment.

Rockfill Embankment is type of Embankment which containt more then 50% Rockes, while Earthfill Embankment is type of Embankment which contain more than 50% Soil.

For construction of an Embankment in hilly Area, I will Suggest Rockfill Embankment because of following Reasons;

(1) Rockfill Embankment have more Strength than the Earthfill Embankment.
(2) Rockfill Embankment will be Easily Available at Site which will reduce our project cost.

(3) The Rockfill Embankment also provide strength and stability during heavy rainfall and flood.

(4) Rockfill Embankment also have property to with stand to cold condition, hot condition and humid climate.

QUESTION # 02.

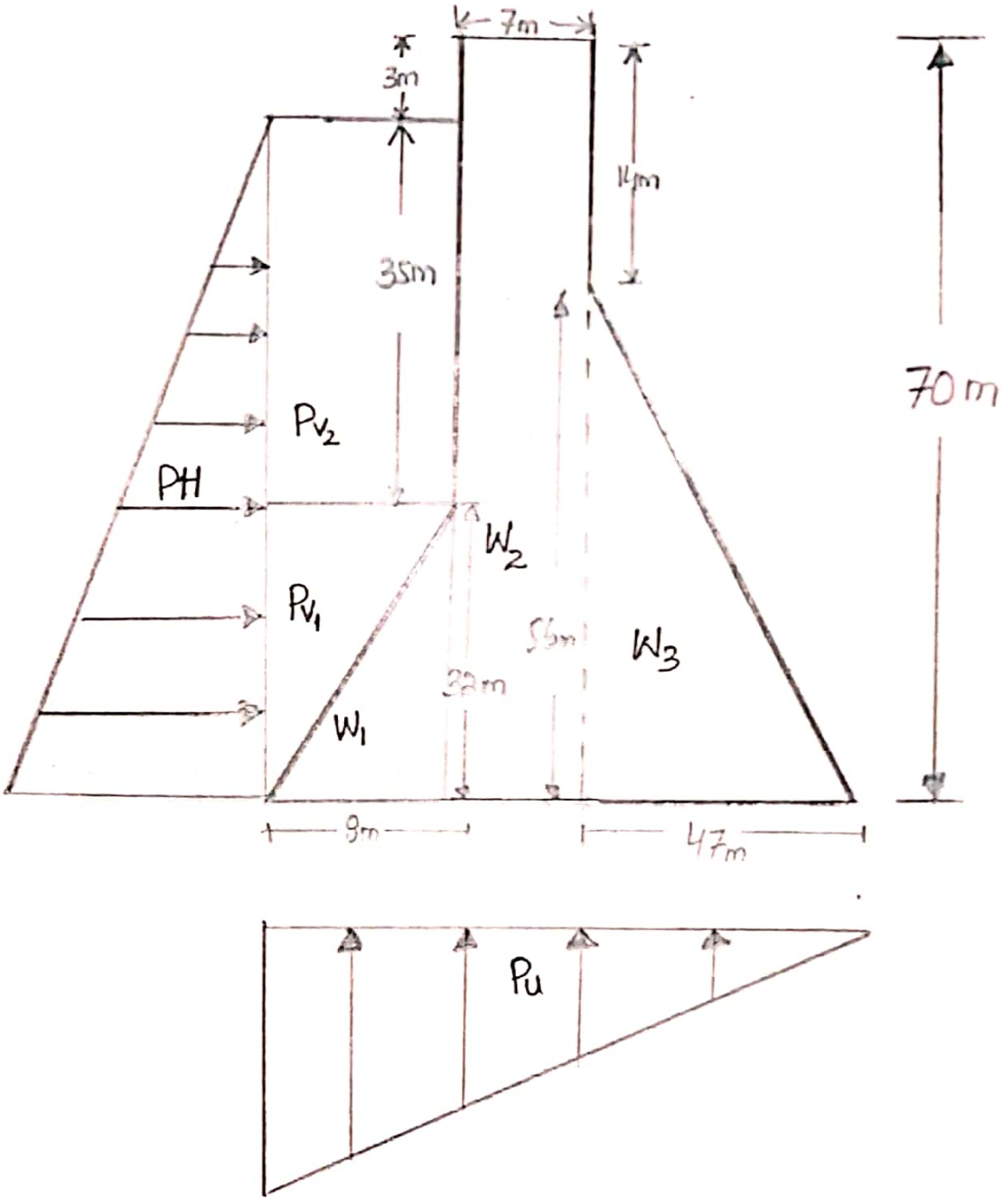
TYPES OF SPILLWAYS :

The types of spillways are give below :.

(1) Strength drop Spillway.
(2) ogee Spillway.
(3) Labyrinth Spillwey.
(4) Siphon Spillwey.
(5) Side channel Spillway.
(6) Shaft Spillway.
(7) cHute Spillway.

In Condition where freezing point of water is less than -10 degree centigrade. So the most Efficient Spillway will be chutee Spillway, because of Its design As In chutee spill the slp is very steep. So the ice will flow fastly and cannot stuck on its Surface. As the slop is steep so there will be Supper Critical Condition that will disipate Energy from falling water.

→ The Energy disipater is also provided in this type of spillway So the teppratue of water will go high and the watee will not freez at top of spillway. and spillway will be safe from the ice load.



ASSUMED:

- Unit Weight of Concrete $\gamma_c = 24 kN/m^3$
- Unit Weight of water $\gamma_w = 10 kN/m^3$
- $q = 14.00$

FORCES	FORCES CALCULATION	F.V (k.N)	F. H	LEVER ARM (FxLA)	RESISTING MOMENT M_r	OVER TURN MOMENT M_o
W_1	$\frac{1}{2}\times 8\times 32\times 24$	3072		$54+8/3$ $=56.67$	3072×56.67 $=174090.2$	
W_2	$7\times 70\times 24$	11760		$47+7/2$ $=50.5$	11760×50.5 $=593880$	
W_3	$\frac{1}{2}\times 47\times 56.24$	31584		$47*2/3$ $=31.33$	31584×31.33 $=98952.6$	
P_{V_1}	$\frac{1}{2}\times 8\times 32\times 10$	1280		$54+8\times 2/3$ $=59.33$	1280×59.3 $=75942.40$	
P_{V_2}	$35\times 8\times 10$	2800		$54+8/2$ $=58$	2800×58 162400	
P_U	$-\frac{1}{2}\times 62\times 67\times 10$	-20770		$62\times 2/3$ $=41.33$		20770×41.33 $=858424.1$
PH	$-\frac{67^2}{2}\times 10$		-22445	$\frac{67}{3}$ $=22.3$		22445×22.3 $=501196.85$
	Σ	29726	22445		1995839.36	1359620.95

ECCENTRICITY

As we know that,

$$e = \frac{B}{2} - \bar{x} \rightarrow (1)$$

first we will find $\bar{x}$

So,

$$\bar{x} = \frac{\sum M_y - \sum M_o}{\sum F_v}$$

Now, puting values.

$$\bar{x} = \frac{1995839.36 - 1359620.95}{29726}$$

$$\bar{x} = 21.4$$

Now put the values of $\bar{x}$ in eq (1)

Equation (1) =>

$$e = \frac{62}{2} - 21.4$$

$$e = 9.6m$$

Hence 9.6m is the Required value of.

Eccentricity of the Resultant forces.

FACTOR AGAINST TENSION:

CHECK:

$e < B/6$.

$e < 62/6$.

$e < 10.3$.

$9.6 < 10.3$ **OK!**

Hence our design is Correct.

FACTOR AGAINST STRESSES;

CHECK: $\gamma_{heel} > 0$

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

For γ_{toe};

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

$$\gamma_{toe} = \frac{29726}{62}\left(1 + \frac{6(9.6)}{2}\right)$$

$$\gamma_{toe} = 924.9\ kN/m^2$$

NOW FOR γ_{HEEL} ;

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

$$= \frac{29726}{62}\left(1 - \frac{6(9.6)}{62}\right)$$

$$\gamma_{heel} = 34.03$$

11. As from condition. $\gamma_{heel} > 0$.

So Our desing Against Stress is Correct.

FACTOR AGAINST OVERTURNING :

CHECK ;

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

$$\frac{1995839.36}{1359620.95} = 1.46$$

So our design Against Overturning. is Incorrect.

CHECK NO2:

$$\Sigma M_v > \Sigma M_o$$

$$1495839.36 > 1359620.95 \quad \text{OK!!}$$

FACTOR AGAINST SLIDING:

CHECK:

$$\mu \times \Sigma F_v + B \times q_v / \Sigma F_H > 1$$

$$\frac{0.75 \times 29726 + 62 \times 1400}{22415}$$

$$4.86.$$

Our value is greater than 1.

So Our design is Correct.