Assignment/Quiz 1

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SECTION : "A"

DEPARTMENT : CIVIL Engineering

SUBJECT : Hydraulic Structure

SUBMITTED TO : Engr.Adeed

Question No: 01 Answer:

Reservious:

A reservious is a man-made lake or large fresh-hwater body of water. Many people think of a reservious as a lake and might even use the words interchangebly. However, the key difference is that reservious are artifical & made by humains, while lakes are naturally occuring bodies of water. Reservious are great because they provide a supply of water for when naturally occuring bodies of water like lake or rivers run dry.

There are three types of reservious.

(i) Valley dammed reservious
(ii) Bank side reservious
(iii) Service reservious

In the above three types of reservious the bank-side reservious are the most economical because in this only water is diverted from a local river or lake to an existing reservious. It means that the bank-side reservious are build on already constructed reservious and that's why it become economical only and only water is diverted from a river for it.

Question No: 01 (b)

Which type of Embankment dam you will suggest in hilly area:

Commonly there are two types of embankment dam one is earth filled embankment dam and other is rocked filled embankment dam. I will suggest rock-filled embankment dam in hilly are because rock are easily available in hilly area and it will become economical for us. The rock-filled

is known from its name and there is use of rocks instead of soil etc. But one thing is the rock-filled embankment dam need a high strength foundation.

Question No: 02 Answers:

Following are the names of spillways:

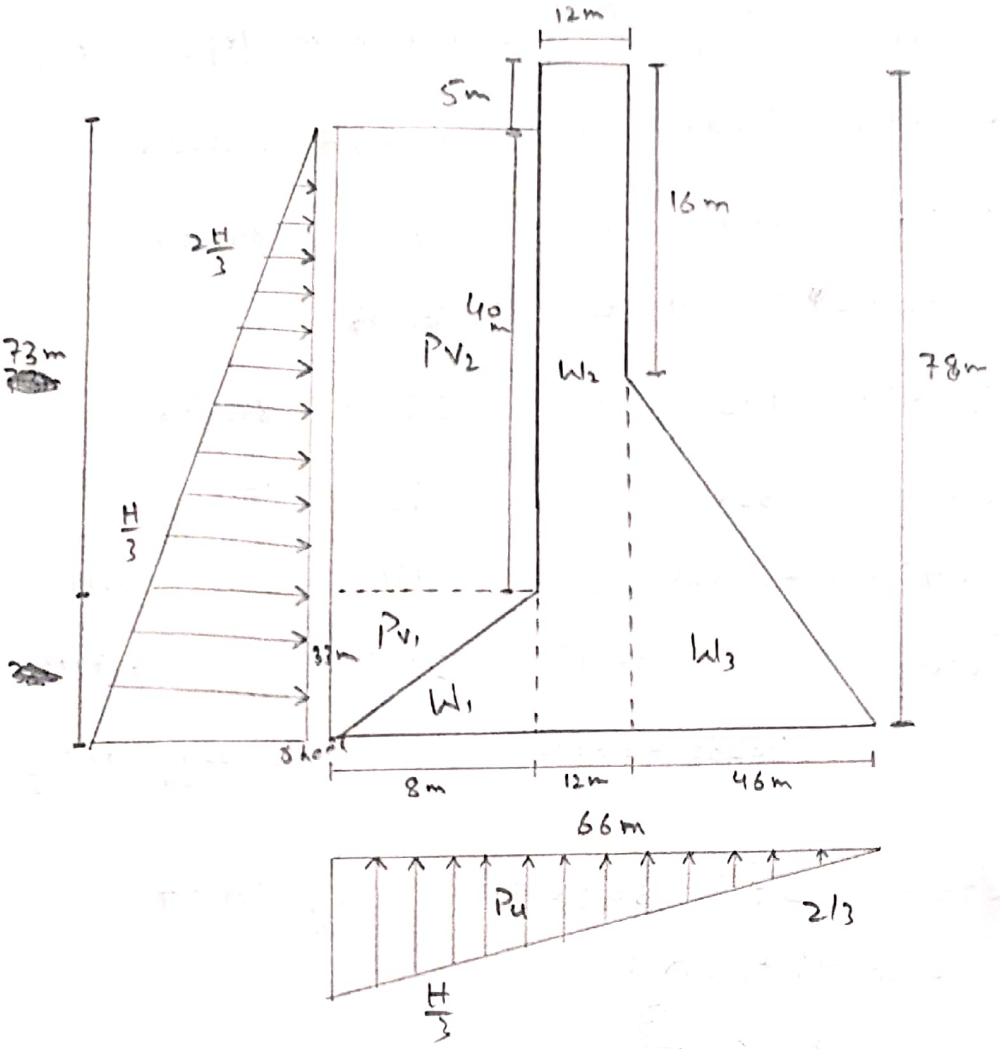
- Straight drop spillway
- Ogee spillway
- Shaft spillway
- Chute spillway
- Side channel spillway
- Siphon spillway
- ~~Lab~~ Labyrinth spillway.

In condition where freezing point in winter is less than -10°C, the most suitable is ~~chute~~ spillway is chute spillway. Because the chute spillaway is design in a very steep slop and the water from the upstream side

to the downstream side is very fast. The flowing water pressure will be high and will be in supercritical condition, that will dissipate energy from the falling water, energy dissipate are also provided in this spillway. Thus the temperature of water go high and it will not allow water to freeze and so the water will move freely in this cold area.

Question No: 03

Solution:



We assume all the data:

Assume unit weight of concrete

= 24 KN/m³

Assume unit weight of water

= 10 KN/m³

$\mu = 0.7$

$q = 1400$

Force & moment calculation

Force	Force calculation	F_V (kg)	F_H (kg)	Lever arm	M_R	M_O
W_1	$\frac{1}{2} \times 8 \times 33 \times 24$	3168	0	60.67	192202.56	
W_2	$12 \times 78 \times 24$	22464	0	40	898560	
W_3	$\frac{1}{2} \times 46 \times 62 \times 24$	34224	0	30.67	1049656.88	
PV_1	$\frac{1}{2} \times 8 \times 33 \times 10$	1320	0	63.33	83595.6	
PV_2	$8 \times 40 \times 10$	3200	0	62	198400	
P_U	$\frac{1}{2} \times 66 \times 73 \times 10$	-24090	0	44		1059960
P_h	$\frac{69^2}{2} \times 10$	0	-26645	24.3		647473.5
Σ		40286	-26645		2422408.24	1707433.5

★. For factor of safety against tension condition:

$$e < \frac{B}{6}$$

$$\frac{B}{6} = \frac{66}{6} = 11 \text{ m}$$

eccentricity of resultant force.

$$e = \left(\frac{B}{2}\right) - \bar{x}$$

$\bar{x}$ = Location of resultant force from toe.

$$\bar{x} = \frac{\Sigma M_R - \Sigma M_O}{\Sigma F_V}$$

$$= \frac{2422408.24 - 1707433.5}{40286}$$

$$\bar{x} = 22.75$$

Now $e = \frac{B}{2} - \bar{x}$

$$e = \frac{66}{2} - 22.75$$

$$e = 10.5 < \frac{B}{6}$$

Condition → safe in tension.

★ For factor of safety against stress : $\gamma_{heel} > 0$

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

$$\gamma_{Toe} = \left(\frac{40286}{66}\right)\left(1 + \frac{6 \times 15.25}{66}\right)$$

$$\gamma_{Toe} = 1456.62$$

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

$$\gamma_{heel} = -235.83 < 0$$

Condition → not safe.

★ For factor of safety against overturning : condition $\left(\frac{\Sigma M_\gamma}{\Sigma M_o}\right) > 2$

$$= \frac{2422408.24}{1707433.5} = 1.41$$

Condition → not safe.

★ The other condition ($\Sigma M_R > \Sigma M_O$)

$\Sigma M_R = 2422408.24$

$\Sigma M_O = 1707433.5$

Condition → Safe ok

★ Factor of safety against sliding.

condition : $\frac{\mu \Sigma F_V + B \times V}{\Sigma F_H} > 1$

$= \frac{0.7 \times 40286 + 66 \times 1400}{26645} > 1$

$= 4.53 > 1$

condition → safe in sliding.

Hence the three condition are atleast safe.