Hydraulic Structures

Submitted To

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Section

B

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Q1 (a)

Ans: **Reservior :-**

A reservoir is a man-made Lake or Large freshwater body of water.

Many people think of a reservoir as a Lake and might even use words interchangeably. Howevers, the key difference is that reservoir are artifical and Lakes are naturally.

Main three types of Reservior

-> Valley dammed reservior

-> Bank side reservior

-> Service reservior

=> **More economical Reservior:.**

Service reservior is more economical because service Reservior

Store fully Potable water close to the point of distribution.

⇒ Service Reservior are Man-made.

⇒ Service Reservior perform several function including ensuring sufficient head of water in the water distribution system.

⇒ Service Reservior providing water capacity even out peak demand from consumers, enabling the treatment plant to run of optimum effieiency.

⇒ Large Service reservior can also be managed to reduce the cost of pumping by refilling the reservior at time of day when energy costs are low.

Q1 :. (b)

Ans):

I will suggest a rockfill embankment in hilly area because rocks that are used in embankment are easily and widely available in hilly areas as compared to clay and sand which is not available in hilly areas. As there are more rains in hilly areas and Rockfill dam doesnot allow water to pass through embankment as compareed to earthfill embankment in which water may penetrate. Rockfill embankment are also known as gravity structure which are easy to build and rigid structures or gravity structures are self supported by their weights.

Q NO 2:

Ans:

Types of Spillways:

Different types of spillways are as follows:

1: Straight Drop spillway
2: Ogee spillway
3: Shaft spillway
4: Chute spillaway
5: Side channel spillway
6: Siphon spillway
7: Labyrinth spillway

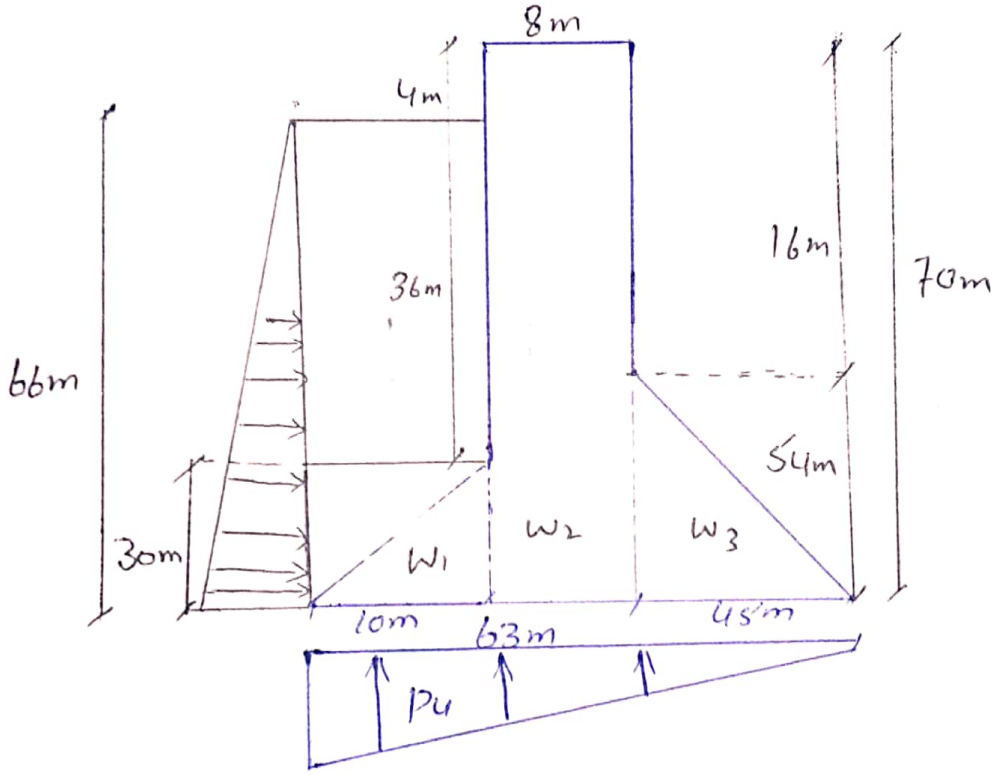
In regions where the temperature in winters falls up to -10c°, for such areas I will suggest chute spillway beause the slope of chute spillway is

very steep and the water flows and doesnot freeze due to steep slope and the kinetic energy increases the temperature of water.

The water flows from chute spillway with high pressure and will be in supercritical condition Hence the energy of water is dissipated through dissipators provided in chute spillway. once the energy is dissipated than the water doenot freezes and structure of dam is in safe condition.

Q NO: 3

Solution:



=> Assume unit wt of for Concrete = 24 kN/m³

=> Assume unit wt for water = 10 kN/m³

=> Now force & Moment calculation.

Force	Force Formula	Fv (kN)	FH (kN)	Lever Arm	MY	Mo
W1	$\frac{1}{2} \times L \times W \times \gamma_d$	3600	0	56.33	202800	0
W2	$L \times W \times \gamma_d$	13440	0	49.00	658560	0
W3	$\frac{1}{2} \times L \times W \times \gamma_d$	29160	0	30.00	874800	0
P_{V_1}	$\frac{1}{2} \times L \times W \times \gamma_w$	1500	0	59.67	89500	0
P_{V_2}	$L \times W \times \gamma_w$	3600	0	58.00	208800	0
P_V	$(-(\frac{1}{2}) \times L \times W \times \gamma_w)$	-20790	0	42.00	0	873180
P_n	$(-(\frac{1}{2}) \times L \times W \times \gamma_w)$	0	-21790	22.00	0	479160
	Σ	30510	-21790	Σ	2034460	1352340

⇒ For Factor of safty Against Tension

condition → $e < B/6$ → $B/6 = 10.50m$

ecentricity of the Resultant force

$\Rightarrow e = B/2 - \bar{x}$ —— (1)

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

$$\Rightarrow \bar{x} = \frac{\Sigma M_r - \Sigma M_o}{\Sigma F_v}$$

$$\bar{x} = \frac{2034460 - 1352340}{30510}$$

$$\bar{x} = 22.36$$

Putting value we get

$$So \quad e = \frac{63}{2} - 22.36$$

$$\boxed{e = 9.14\ m}$$

Condition → safe in tension → ok.

⇒ For Factor of safety Against stress.

→ Condition → $Y_{Heel} > 0$

Now

$$\gamma = (\Sigma F_v/B)(1 \pm 6e/B) \rightarrow (A)$$

Now from Eq (A) we get.

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

$$\gamma_{Toe} = 905.97128 \text{ kN/m}^3$$

and

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

$$= \left(\frac{3051.0}{63}\right)\left(1 - \frac{6 \times 9.14}{63}\right)$$

$$\boxed{\gamma_{Heel} = 62.72 \text{ kN/m}^3}$$

Condition safe in stress $\longrightarrow$ ok

$\Rightarrow$ For Factor of safty Against overturning.

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

$$\Rightarrow \frac{2034460}{1352340} = 1.50 \not> 2$$

Condition $\rightarrow$ No safe in overturning $\rightarrow$ Not ok

⇒ condition $\Sigma M_r > \Sigma M_o$

$\Sigma M_r = 2034460$

$\Sigma M_o = 1352340$

Condition safe ⟶ ok

⇒ For Factor of safty Against sliding.

Condition → $\frac{(\mu \Sigma F_v + Bq)}{\Sigma F_H} > 1$

$\therefore q = 1400$

$\mu = 0.7$

Putting value we get

$= \frac{0.7 \times 30510 + 63 \times 1400}{21780}$

$= 5.03 > 1$

Condition safe in Sliding.

End