∴ Student "MUDASIR"

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Section "B"

HYDRAULIC Structure

Inst: Engr. Adeed

MID / ASSIGNMENT

BE(C)

Q1:- RESERVOIR

(A)

A natural or artificial place where water is collected and stored for use, like irrigating, supplying a community etc.

→ A water supply scheme drawing water directly from a river or a stream may fail to satisfy the consumers demands during extreamly low flows, which during high flow it may become difficult to carry out its operation due to devasting flood, a barrier in the form of dam.

Which Resorvoir Will be ecnomical :-

" Service Reservoir " are the most economical because of the following reasons.

(i) less construction cost.
(ii) less time taken
(iii) Intirelly man made.
(iv) no heavy machinery required
(v) Sufficient energy head

** ———— **

(B) "Which type of Embankment DAM Will You Suggest In hilly Area"

⇒ In Hilly area I Suggest rock fill embankment.

because of the following reasons.

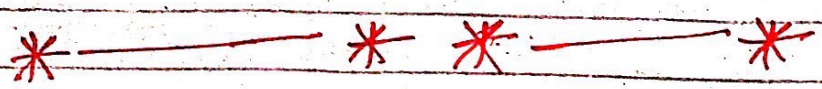
(1) The rock which are Used as 50% material in a rock fill embankment is an easily available in hilly area as Compared to earth fill embankment Silt and clay which are not available in hilly areas.

(2) The Strength of Rock fill embankment is more as Compared to earth fill embankment.

(3) Rock fill embankment failure occure at 15% while in earth fill embankment it occur on 25%.

(4) because the material are Same in hilly areas as rockfill embankment because from there we Collect rocks and make a dam from it.

(5) Its economical them the earth fill dam.



Q2 "TYPES OF SPILLWAYS"

(i) Straight Drop Spillway :- It is consist of low height weir wall having its down stream face roughly or perfectly vertical.

(ii) Ogee-Shaped Spillway :- It is the most commonly used spillway, It is widely used with gravity, arch dams & butter dam. An Ogee shaped spillway has a control weir of ogee-shaped, which is like the elongated English letter "S".

(iii) Shaft Spillway :- A shaft spillway consist of Horizontal crest & vertical shaft, with its top surface at the crest level of the spillway and its lower end connected to a vertical shaft.

(iv) CHute Spillway :- In this surplus water from upstream is disposed to the down stream through a steeply sloped open channel.

(v) Side Channel Spillway :- It is similar to CHute spillway but the only difference

is the Crest of Side Channel Spillway is located on one of it's Side Whereas Crest of Chute Spillway is located between the Side wall.

(vi) Siphon Spillway :- In this Surplus water is disposed to downstream through an Inverted U shaped Conduit. It is generally arranged inside the body or over the Crest of the dam.

(vii) Labyrinth Spillway :- A Labyrinth Spillway is a type of Spillway in which the weir/wall is constructed in a Zigzag manner in order to Increase the effective length of the weir Crest with respect to the Channel width

→ Which type of Spillway will be more efficient in a condition where freezing point of water is less than -10°C in winter and why ?

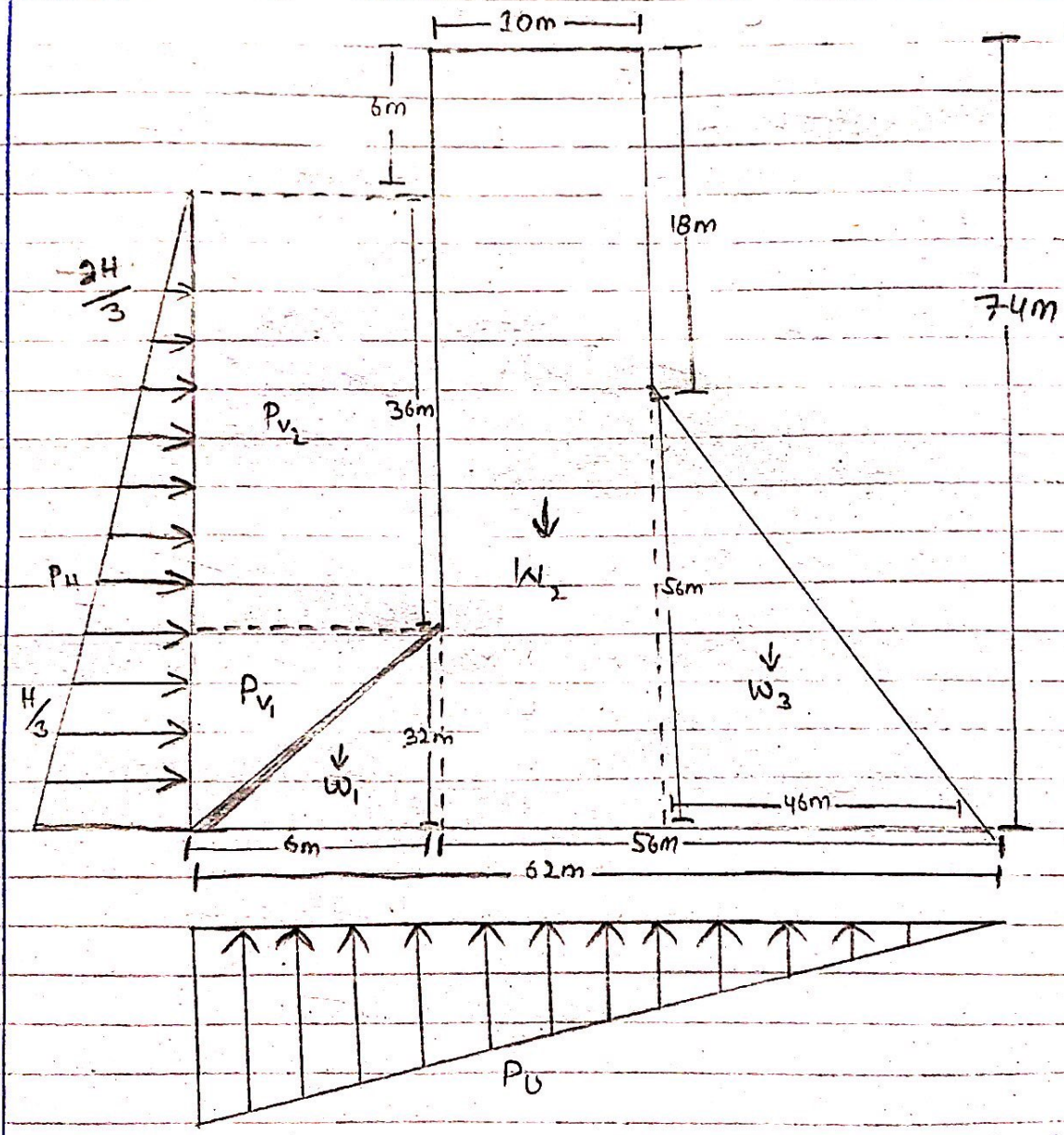
→ "STRAIGHT DROP SPILLWAY"

→ A straight drop spill way consists of low height weir wall having its downstream face roughly or perfectly vertical. When the water level in the reservoir rises above the normal pool level.

→ The surplus water falls freely from the crest of the weir hence it is known as straight drop spillway or free over fall spillways.

→ This type of spillway is quietly suitable for regions where the temperature remains down and water quickly changes to the ice due the its greater width the spillway will not be close due to ice and don't make damages to spillway as well as provide free flow the water cum ice, all other types of spill ways are not for the condition mentioned due to its small and narrow width.

Q3 GRAVITY DAM



$\gamma_d = 24\ KN/m^3$

$\gamma_w = 10\ KN/m^3$

Force	Force calculation	F_V (kN)	F_H (kN)	lever arm	M_R	M_o
W_1	$\frac{1}{2}$ X5X32 X24	384		56+6 X 1/3 =58	22272	
W_2	10X74X 24	11280		46+10/2 =51	654240	
W_3	$\frac{1}{2}$ X 56X 46X24	30912		2/3 X46 =30.66	947761.9	
P_{V_1}	$\frac{1}{2}$ X6X31 X10	930		56+6X 2/3 =60	55800	
P_{V_2}	6X 36 X10	2160		48+6/2 =51	110160	
P_U	$-\frac{1}{2}$ X62X68 X10	-21080		68 X 2/3 =45.33		955556.4
P_H	$-10X\frac{(68)^2}{2}$		-23120	$\frac{H}{3}=\frac{68}{3}$ = 22.66		523899.2
		ΣF_V= 24586	ΣF_H = 23120		ΣM_R= 1790233.9	ΣM_o= 1479455.6

Step # 01

Eccentricity of the resultant

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

$$\bar{x} = \frac{\Sigma M_R - \Sigma M_o}{\Sigma F_v} \Rightarrow \frac{1790233.9 - 1479455.6}{24586}$$

$$\boxed{\bar{x} = 9.55 \text{ m.}}$$

FOS against Tension

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

$$\frac{B}{6} \Rightarrow \frac{62}{6} = 10.33$$

So $9.55 < 10.33$ Ok

Step # 2

σ_{Toe} σ_{heel}

$$\sigma = \left(\frac{\Sigma F_v}{B}\right)\left(1 + \frac{6e}{B}\right) \qquad \sigma = \left(\frac{\Sigma F_v}{B}\right)\left(1 - \frac{6e}{B}\right)$$

$\sigma_{Toe} = 881.6$ -88.51

$\therefore \sigma < 0$

Not Ok

Step #3

FOS against Turning

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

$$1790233.9 / 1479455.6 = 2.21$$

$\therefore$ $2.21 > 2$ **Ok**

Step #4

$$\Sigma M_R > \Sigma M_o$$

$1790233.9 > 1479455.6$

Ok

Step #5 FOS against Sliding

$q = 1400$

$\mu = 0.7$

$$= \frac{\mu \Sigma F_V + B \cdot q}{\Sigma F_H}$$

$$= \frac{0.7 \times 24586 + 62 \times 1400}{23120} = 4.49 > 1$$

Ok
