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Subject	Hydraulic Structure
Semester	8th
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Section	C
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-(Q = No = 01)-

Reservior: -(a)-

A reservoir is a man-macle lake or large freshwater body of water. Many People think of a reservoir as a Lake and might even use the word Interchangeable However, the key difference is that reservoir are artifical and lakes are naturally.

Main three types of reservior:

* Valley - dammed reservions
* Bank - Side reservions
* Service reservions

⇒ Servic Reservior :-

The most economic type of reservior is Service reservior.

* Service reservior requires less time to Construct Comparatively.
* Service reservior Save us labour Cost and other material Such as machinery rent and other thing which help to

to Construct a reservoir.

* It will Cause less material other than valley-dammed reservior and Bank Side reservoir.

which will also help in reduce our Cost in the Construction of reservior.

* It also requires less area to Construct which will further reduce our Cost.

Q = No = 1

(b)

There are basically two types of embankment

* Earth - fill embankment
* Rock - fill embankment

The embankment which we suggested in hilly area is "Rock - fill embankment" because it is one which contains about 50% or more rock-fill materials of the total volume of materials. thus can be easily provided in hilly areas and are economical.

Similarly it is constructed on hard rock type foundation which can be easily provided in hilly areas as well as rock form best foundation material which are free form faults, seams of soft shale or clay etc.

Additionally shoulders of rock fill also provide structural stability.

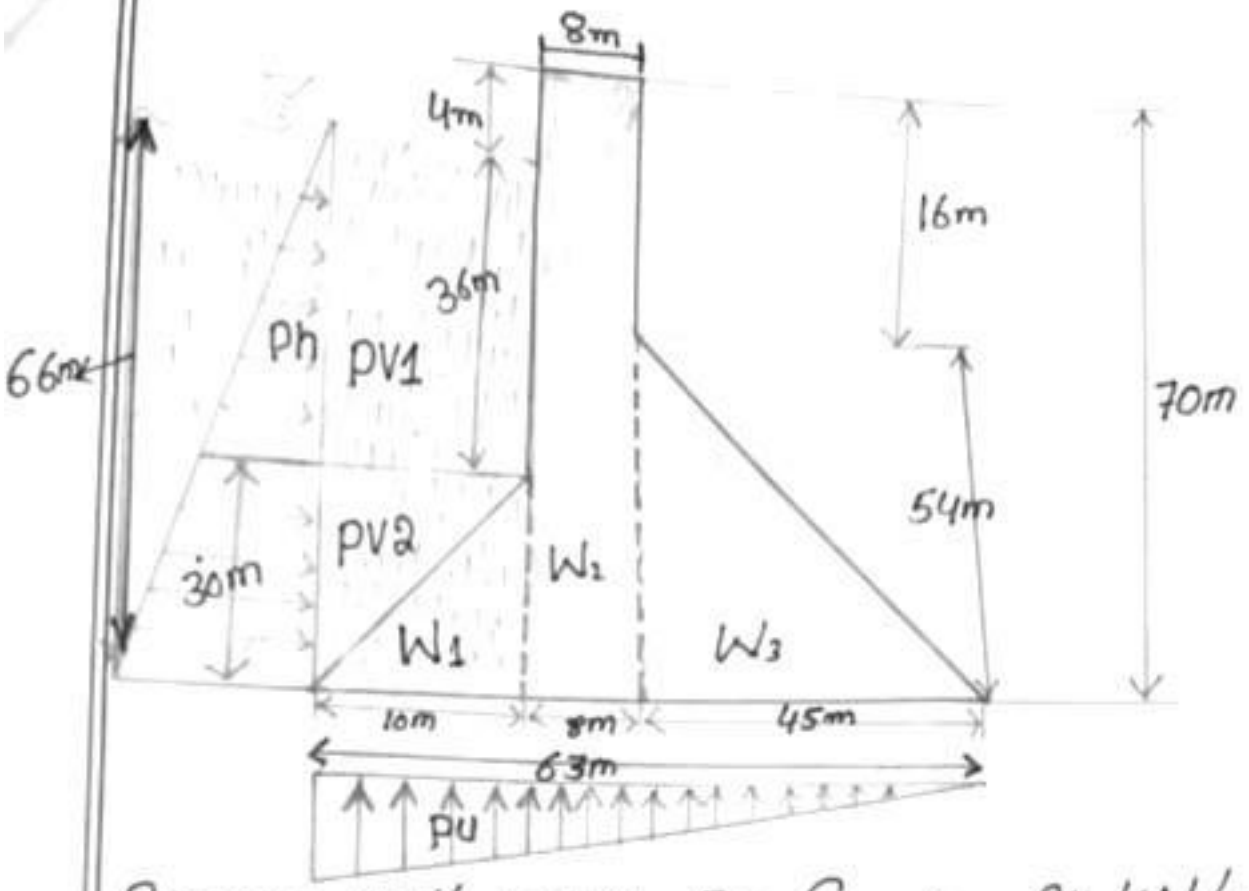
Q=NO=02 (4)

Answer: There are Several different types of Spillway Which are given below

1. Straight drop Spillway
2. Ogee Spill-Way
3. Shaft Spillway
4. Chute Spillway
5. Side channel spillway
6. Siphon Spillway
7. Labyrinth Spillway

Explaination: Chute Spillway is one of the most efficient Spillway. It is used in the area where temperature is less than -10degree. Because Cute Spillway disposed water from upstream to down stream through steepy sloped open Channel. So that the flow will be very fast. The flowing water premure will be high and will be in Supercritical Condition that will dissipate energy are also provide in this type of Spillway. Thus the temp of water go high and will not allow water to freez and stop So the water will moves freely in this Cold Area.

Q = NO = 03



Assume unit weight For Concrete = 24 kN/m³
Assume unit weight For Water = 10 kN/m³

FORCED AND MOMENT CALCULATIONS

Forces	Forced Formulas	Fv (kN)	FH (kN)	Level Arm (m)	Mr	Mo
W1	(1/2) × L × W × Yd	3600	0	56.33	202800	0
W2	L × W × Yd	13440	0	49.00	658560	0
W3	(1/2) × L × W × Yd	29160	0	30.00	874800	0
PV1	(1/2) × L × W × Yw	1500	0	59.67	89500	0
PV2	L × W × Yw	3600	0	58.00	208800	0
Pu	(-(1/2) × L × W × Yw)	-20790	0	42.00	0	873780
Ph	(-(1/2) × L × W × Yw)	0	-21780	22.00	0	479160
	Σ	30510	-21780	Σ	2034460	1352340

⇒ For Factor of Safety Against Tension

Condition → $e < B/6$

$B/6 = 10.50m$ $\boxed{B = 63m}$

Eccentricity of the Resultant Force

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

$\bar{x}$ = Location of Resultant Force from Toe

$\bar{x} = (\Sigma M_Y - \Sigma M_O)/\Sigma F_V = \dfrac{(2034460 - 1352340)}{30510}$

$\boxed{\bar{x} = 22.36} \Rightarrow e = \left(\frac{(10.50 \times 6)}{2} - 22.36\right)$

So $\boxed{e = 9.14m}$

Condition → Safe in Tension (ok)

⇒ For Factor of Safety Against Stress

Condition → $\gamma_{heel} > 0$

$\gamma = (\Sigma F_V/B)(1 \pm (6e/B))$

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

$\gamma_{Toe} = (30510/63)(1 + (6 \times 9.14)/63))$

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

$\gamma_{heel} = (\Sigma F_V/B)(1 - (6e/B))$

$\gamma_{heel} = \left(\frac{30510}{63}\right)\left(1 - \left(\frac{6 \times 9.14}{63}\right)\right)$

$\boxed{\gamma_{heel} = 62.60\ kN/m^3}$

Condition Safe in Stress

For Factor of Safety Against overturning

Condition → $\left(\frac{\Sigma M_r}{\Sigma M_o}\right) > 2$

$$\frac{\Sigma M_r}{\Sigma M_o} = \frac{2034460}{1352340} = 1.50$$

Condition → Not Safe in overturning (Not ok)

⇒ $(\Sigma M_r > \Sigma M_o)$

$\Sigma M_r = 2034460$

$\Sigma M_o = 1352340$

⇒ For Factor of Safety Against Sliding

Condition → $((u\Sigma F_v + Bq/\Sigma F_H) > 1$

$q = 1400$

$u = 0.7$ $\quad (0.65 - 0.75)$

$$((0.7 \times 30510) + \frac{63 \times 1400}{+21780})) = 5.03$$

Condition Safe in sliding (ok)

End