Q1 Define reservior also explain which type of reservior will be more encoomical and why. ①

Ans: Reservior:

A reservoir is a mon-made lake or large fresh water body of water. Many people think of a reservior as a lake and might even use the words interchangeably. However, the key difference is that reserviors are artifical and made by human. while lakeare naturally occuring bodies of water. Resevoirs are great because they provide a supply of water for when naturally ocuring bodies of water like lakes or rivers, run dry.

Types of resevoirs:

Four Types of resevoirs

1. valley-dammed reservoir.
2. bank-side resevior.
3. servize reservoirs.
4. coastal resevoir.

A coastal reservoir will be more economical because As the lend based reservoir construction is fraught with sobstatial land submergence, coastal reservoir is preferred economically and technically since it does not use scarce land area. Many costal reservoirs were constructed in Asia and Europe.

Q2 Which type of Embankment dam you will suggest in a hilly area and why.

Ans Types of Embankment dam.

1. Earthfill embankment dam
2. rock fill embankment dam.

I suggest in hilly areas a rock fill embankment dam. The rock fill dam. A cross-section of an embankment dam shows a shape like a bank or hill. Most have a central section or core composed of an impermeable material to stop water from seeping through the dam. The core can be of clay is a good choice for site with wide valley. They can be built on hard rock or on hard rock or softer soil. For a rock-fill dam, rock fill is blasted using explosive to break the rock. Additionally the rock pieces may need to be crushed into smaller grade to get the right range of size for use in an embankment dam.

P3. List down the different types of spillways also mention which type of spillways will be more efficient in a condition where freezing point of water is less than than -15 degree centigrade in winter and why?

Ans.

Types of spillways

Different types of spillway are as follows.

1. Straigth Drop spillway.
2. Ogee spillway
3. shaft spillway
4. chute spillway
5. side channel spillway
6. Siphon Spillway
7. Labyrinth spillway.

(1) Straight Drop spillway:

A straught drop spillway consists of low height weir wall having its down stream face roughly or perfectly vertical when the water level in the reservoir rises above the normal pool level, the surplus water fall freely from the crest of the weir and hence it is known as straight drop spillway.

(2) Ogee-shaped spillway:

An Ogee shaped spillway is the most commonly used spillway. it is widely used with gravity dams, arch dams & buttress dam. Several Earth and rock fill dam are also provided with This type of spillways as a super structure.

An Ogee-shaped spillway has a control weir of ogee shaped. The upper part of the spillway surface matches closely to the profile of the lower nappe of a ventilated sheet of water falling freely from a sharp-crested weir.

(3) Shaft spillway.

A shaft spillway consist of a horizontial crest & vertical shaft, with its top surface at the crest level of the spillway and its lower end connected to a vertial shaft. The other end of the vertical shaft is connected to a horizontial conduit or tunnel, which extends through or around the dam and carries the water to the river downstream. A shaft spillway is used at the sites where the condition are not favorable for an overflow or a chute spill-way.

(4) Chute spillway.

it is the type of spillway in which surplus water from upstream is disposed to the downstream through a steeply sloped open channel. it is generally constructed at one end of the dam or separately away from the dam in a natural saddle in a bank of river. it is suitable for gravity dams, earthen dams, rockfill dams. it is preferred when the width of the river valley is very narrow. it is also called trough spillway or open channel spillway. The slope is design in such a way that the flow should be always in ~~cff~~ super critical condition.

(5) 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 its sides whereas crest of chute spillway is located b/w the side walls. In other words, the water ~~spillway~~ spilling from the crest is turned to 90 degree and flow parallel to the crest of side channel spillway unlike in chute spillway.

(6) Siphon Spillway.

Type of spillway in which 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.

(7) Labyrinth spillway:

It is type of spillway in which the weir wall is constructed in a zigzag manner in order to increse the effective length of the weir crest with respect to channel width. This increse is effective length raises the discharge capacity of the weir and hence higher water flow at small head can be conveyed to the down stream easily.

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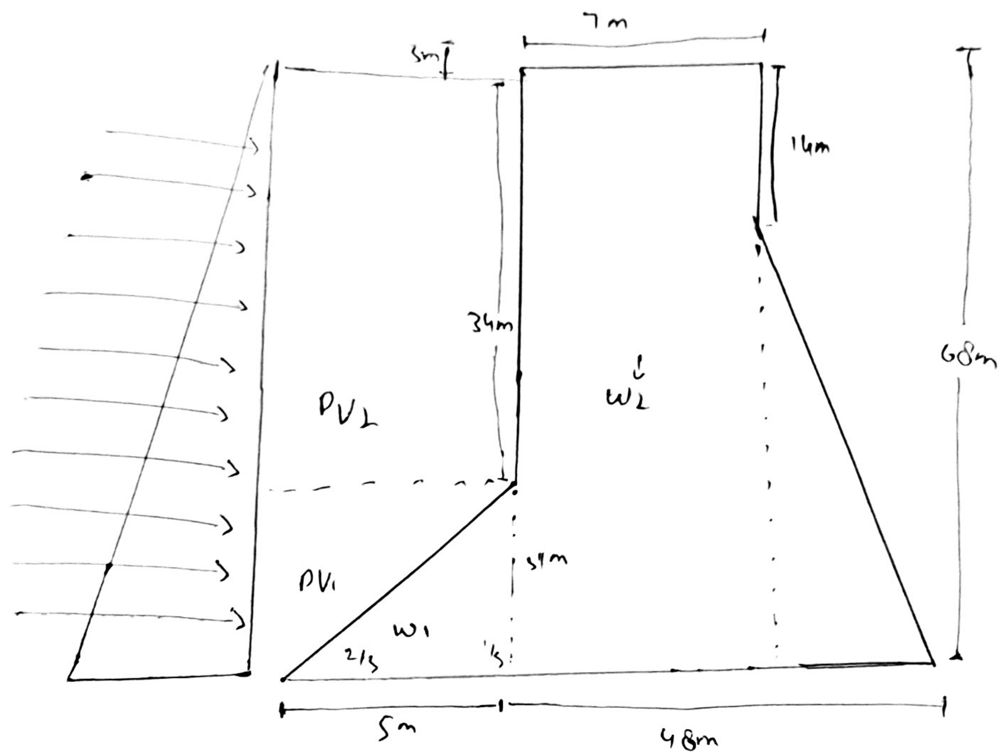
I preffed ogee spillway and chute spillway which is more efficent in a condition of where frezzing point of water is Loss than -15 degree in winter because these two spillway slope is more then the others.

Q3

Sol>



Assume : unit weight of concrete.

$\gamma d = 24 \, kN/m^3$

unit weight for water $\gamma w = 10 \, kN/m^3$

Moment calculation.

Force	Force calculation	FV	FH	Lever Arm (L.A)	Mr	M_{o} F
W_1	$\frac{1}{2} \times 5 \times 31 \times 24$	1800		$48 + 5 \times 1/3 = 49.67$	1800×49.67	
W_2	$7 \times 68 \times 24$	11424		$41 + 7/2 = 44.5$	508368	
W_3	$\frac{1}{2} \times 41 \times 54 \times 24$	26568		$41 \times \frac{2}{3} = 27.33$	726103.44	
PV_1	$\frac{1}{2} \times 5 \times 31 \times 10$	975		$48 + 5 \times \frac{2}{3} = 51.33$	3978071	
PV_2	$5 \times 34 \times 10$	1700		$48 + \frac{5}{2} = 50.5$	85850	
PU	$-\frac{1}{2} \times 53 \times 65 \times 10$	-17225		$53 \times \frac{2}{3} = 35.33$		608559.[illegible]
PH	$-\frac{65^2}{2} \times 10$		-21125	$\frac{65}{3} \times 21.67$		457778.71
		$\Sigma FV = 25102$	ΣFH 21125		$\Sigma Mr = 1452488.39$	$\Sigma Mo = 1066338$

Eccentricity of the resultant force

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

∴ = location of resultant force from toe

$\bar{X} = \frac{\Sigma Mr - \Sigma Mo}{\Sigma Fv}$

$\bar{x} = \frac{1452488.39 - 1066338}{25102}$

$\bar{x} = 15.3M$

$e = \frac{B}{2} - \bar{x} = \frac{53}{2} - 15.38$

$e = 11.12m$

Factor of safety Against Tension

condition $e < B/6$

$e < \frac{53}{6}$

$11.12 \nless 8.83$ Not ok fail in Tension.

Stress $r_{heel} > 0$

$r = \frac{\Sigma fv}{B}\left(1 \pm \frac{6e}{B}\right)$

$r_{toe} = \frac{\Sigma fv}{B}\left(1 + \frac{6e}{B}\right) = \frac{25102}{53}\left(1 + \frac{6 \times 11.12}{53}\right)$

$= 1069.81 kN/m^2$

$r_{heel} = \frac{\Sigma fv}{B}\left(1 - \frac{6e}{B}\right) = \frac{25102}{53}\left(1 - \frac{6 \times 11.12}{53}\right)$

$= -122.6 kN/m^2$

∴ $r_{heel} < 0$ Not safe

⇒ Factor of safety against Over turning.

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

$$= \frac{1452488.39}{1066338}$$

$= 1.36 < 2$ Not safe
Fail

$\Sigma M_r > \Sigma M_o$

$1452488.39 > 1066338$ ok safe

→ FOS against slibling

$$\frac{\mu \; \Sigma F_V + B \times q}{\Sigma F_H} > 1$$

$$= \frac{0.7 \times 25102 + 33 \times 1400}{21125}$$

$\left(\begin{array}{l} 0.65 + 00.75 \\ \mu = 0.7 \\ q = 1400 \end{array} \right)$

$= 4.34 > 1$ safe