MID TERM PAPER.

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Q2) A): Reservoir:.

Reservoir is most commonly, an enlarged natural or artificial lake, pond or impoundment created using a dam or lock to store water. Reservoirs are great because they provide a supply of water for when naturally occuring bodies of water, like lakes or rivers, run dry.

Economical Reservoir.

Service Reservoir is one of the economical Reservoir of all the other Reservior.

Because they are man made reservoir. They do not require any special requirement for construction.

They are very economical from other Reservoirs. They can made at any sort of place where there is water tower at higher level than the surrounding area.

In some areas, people dig cistems, or service Reservoirs that are underground.

Q1):. B):. Which type of Embankment dam will you suggest in a hilly area and why?

Ans:. Almost each dam that has been constructed all over the world is unique. This is so because a particular type is chosen because of the considerations of many factors, as discussed from past.

1):. Earthfill Embakement:.

An Earthfill dam is constructed primarily of selected engineering soils compacted uniformly and intensively in relatively thin layers and at controlled moisture content. An Embankement may be categorized as an earthfill dam if compacted soil account for over 50% of the placed volume of material.

Advantages:.

1). Can be constructed on any type of foundation.

2). Can be Constructed Rapidly.

3). Skilled labour not required.

4). Can be constructed with material available nearby.

5). Cheaper than other type Dams.

6). Height can be raised without any difficulty.

Q No: 2):. Types of Spillways:.

Following are the types of spillway.

1). Straight Drop Spillway.

2). Ogee Spillway.

3). Shaft Spillway.

4). Chute Spillway.

5). Side Channel Spillway.

6). Siphon Spillway.

7). Labyrinth Spillway.

Ogee Spillway:.

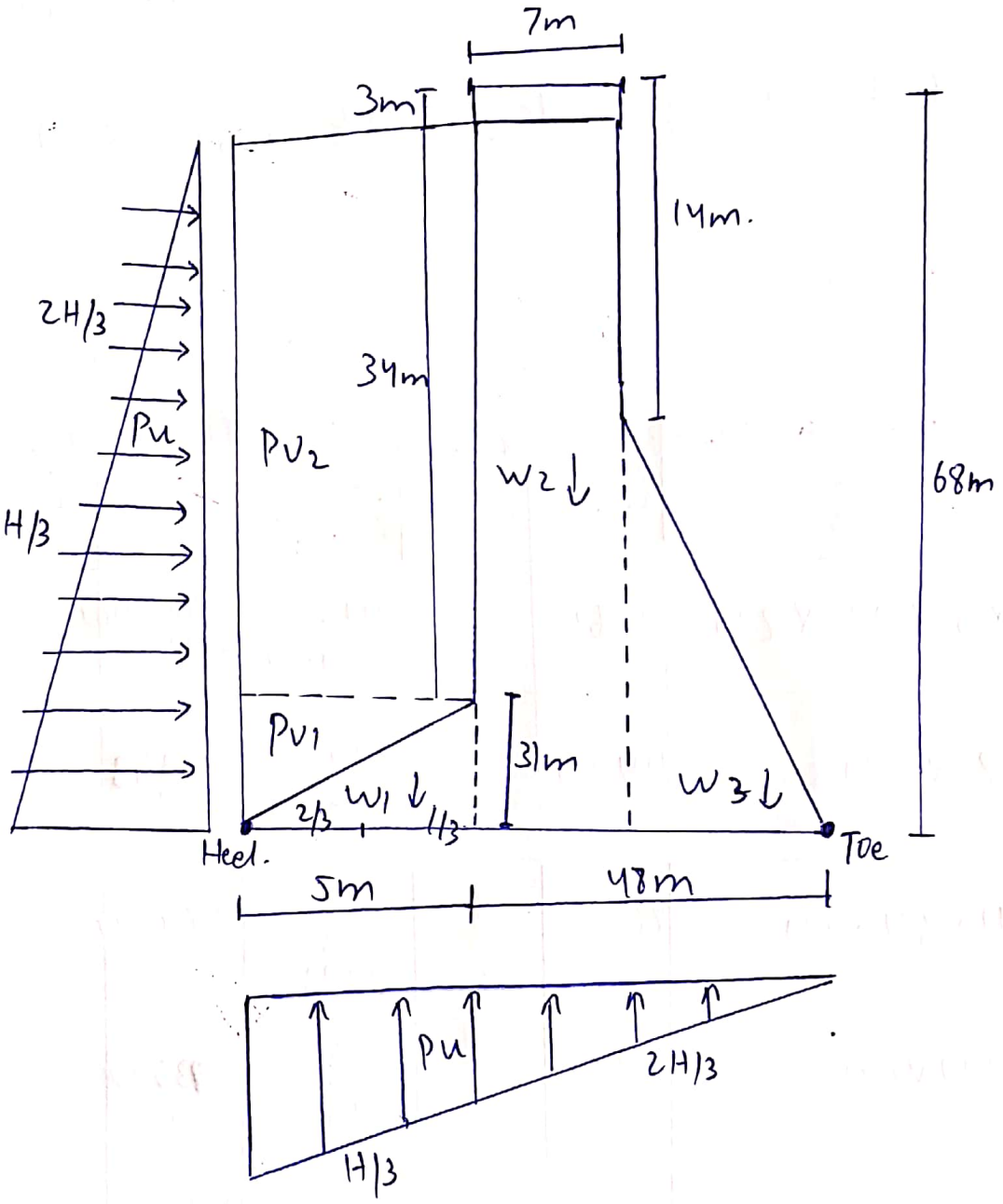
Ogee Spillway, as the name says, represent the shape of the downstream face of the weir. It is improved form of straight drop spillway. Ogee Spillway are most commonly used in case of gravity

dams, arch dams, buttress dams. etc. For Gravity dam, it is generally located within the dam body.

Advantages...

* Very stable. The likelihood of serious structural damage is less than for other types of structures.
* The Rectangular weir is less likely to be clogged by debris than the openings of other structures of comparative discharge capacities.
* They are likely easy to construct. The concrete block type can be built with farm labor.

Q No:3/.. Design of Gravity Dam:..



Solution:.

Assume unit wt for Concrete = 24 KN/m³. (γ_c).

Assume Unit wt of water = 10 KN/m³ (γ_w).

Moment Calculations:.

Forces.	Forces Calculations.	FV (KN)	FH	Lever Arm (L.A)	M_o	M_o F
W_1	1/2 X 5 X 31 X 24	1860		48+5X1/3 =49.67	1860 X 49.67 =923386.2	
W_2	7 X 68 X 24	11424		$\frac{41+2}{2}$ =44.5	508136.8	
W_3	1/2 X 41 X 54 X 24	26568		41 X $\frac{2}{3}$ =27.33	726103.44	
P_{V1}	$\frac{1}{2}$ X 5 X 31 X 10	775		$\frac{48+5}{2}$ =51.53	39978075	
P_{V2}	5 X 34 X 10	1700		$\frac{48+5}{2}$ =50.5	85850	
P_H	$\frac{-1}{2}$ X 53 X 65 X 10	-17225		53 X $\frac{2}{3}$ =35.33		608553.25
P_H	$\frac{-65^2}{2}$ X 10		-21125	$\frac{65}{3}$ = 21.67		457778.75

ΣFV = 25102 ΣFH = 21125

ΣM_o = 1452488.39

ΣM_o = 1066332

Eccentricity of the Resultant Force.

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

$\therefore \bar{X}$ = location of resultant force from Toe.

$$X = \frac{\Sigma M_R - \Sigma M_O}{\Sigma F_V}$$

$$\bar{X} = \frac{2643043.39 - 1066332}{25102}$$

$$\boxed{\bar{X} = 15.38m}$$

$$e = \frac{B}{2} - X$$

$$e = \frac{53}{2} - 15.38$$

$$\boxed{e = 11.12m}$$

Factor of Safety against Tension.

Condition $e < B/6$

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

$\boxed{11.12 \not< 8.83.}$ Not Ok! (Fail in Tension)

Stress $\sigma_{heel} > 0$.

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

$$\sigma_{toe} = \frac{\Sigma Fv}{B}\left(1 + \frac{6e}{B}\right)$$

$$\sigma_{toe} = \frac{2510.2}{5.3}\left(1 + \frac{6 \times 11.12}{5.3}\right)$$

$$\boxed{\sigma_{toe} = 1069.8\ KN/m^2}$$

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

$$\sigma_{heel} = \frac{2510.2}{5.3}\left(1 - \frac{6 \times 1612}{5.3}\right)$$

$$\boxed{\sigma_{heel} = -122.6\ KN/m^2}$$

$\therefore \sigma_{heel} < 0$ (Not Safe)

→ Factor of Safety Against Overturning.

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

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

$$= 1.36 < 2 \quad (\text{Not Safe Fail}).$$

$$\Sigma M_R > \Sigma M_O.$$

$$1452488.39 > 1066338$$

Ok!

Safe.

→ Factor of Safety Against Sliding.

0.65 to 0.75

$\mu = 0.7$

$q = 1400$

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

$$= \frac{0.7 \times 25102 + 53 \times 1400}{21125.}$$

$$= 4.34 > 1$$

OK!

Safe.
