HYDRAULIC ENGINEERING

NAME : JUNAID AHMAD

ID : 6872

SECTION : B

SEMESTER : 8th

SUBMITTED TO : Engr; ADEED

Ans:01 "RESERVOIR"

A French word;
Reservoir means a "Tank".
A Reservoir is, most commonly, an elarged natural or artificial lake, pond or impoundment created using a dam or lock to store water.

"OR".

A natural or artificial place where water is collected and stored for use, espicially water for supplying a community, irrigating land, power e.t.c.

"ii" **Service Reservoir** will be more economical as compared to other type of reservoir. It is also known as "Distribution reservoir". These are the storage reservoirs, which store Treated water.

"Reasons"

"i" Service reservoirs store fully treated potable water close to the point of distribution, so need less cost and energy for distribution of water.

"ii" Service reservoir perform several functions;

- ensuring sufficient head of water in the water distribution system.
- providing water capacity to even out peak demand from consumers.

"iii" Large service reservoirs can also be managed to reduce the cost of pumping, by refilling the reservoir at times of day when energy costs are low.

"b" "Rockfill Embankment dam"

Rockfill embankment dams are best and economical in hilly areas.

- Because Rockfill dams are appropriate for construction at locations where suitable rock can be quarried at or near the dam site, and where the foundations will not be subjects to material settlement due to loading or to erosion from any seepage through or under the dam.
- One of the most important aspects of a rockfill dam is that it can be very cheap and economical since materials can be sourced from near the dam's location.
- This Type of dam can also be suitable in areas that don't present the best conditions for deep foundations.

- The section of compacted granular soil helps to slow the flow of water while the impervious zone provides strength and stability during heavy rainfall and flood.
- Another key benefit is that it
- can withstand to cold conditions, hot and humid climates, as well.

~8~

"Ans;02"

Spillways;

Types;

* Different types of spillways are as follow;

"i" Straight drop Spillway.
"ii" Ogee Spillway.
"iii" Shaft Spillway.
"iv" Chute Spillway.
"v" Side channel Spillway.
"vi" Siphon Spillway
"vii" Labyrinth Spillway.

Ans:02 Part No (b)

"Type of spillway for the cold regions"

Siphon Spillway;

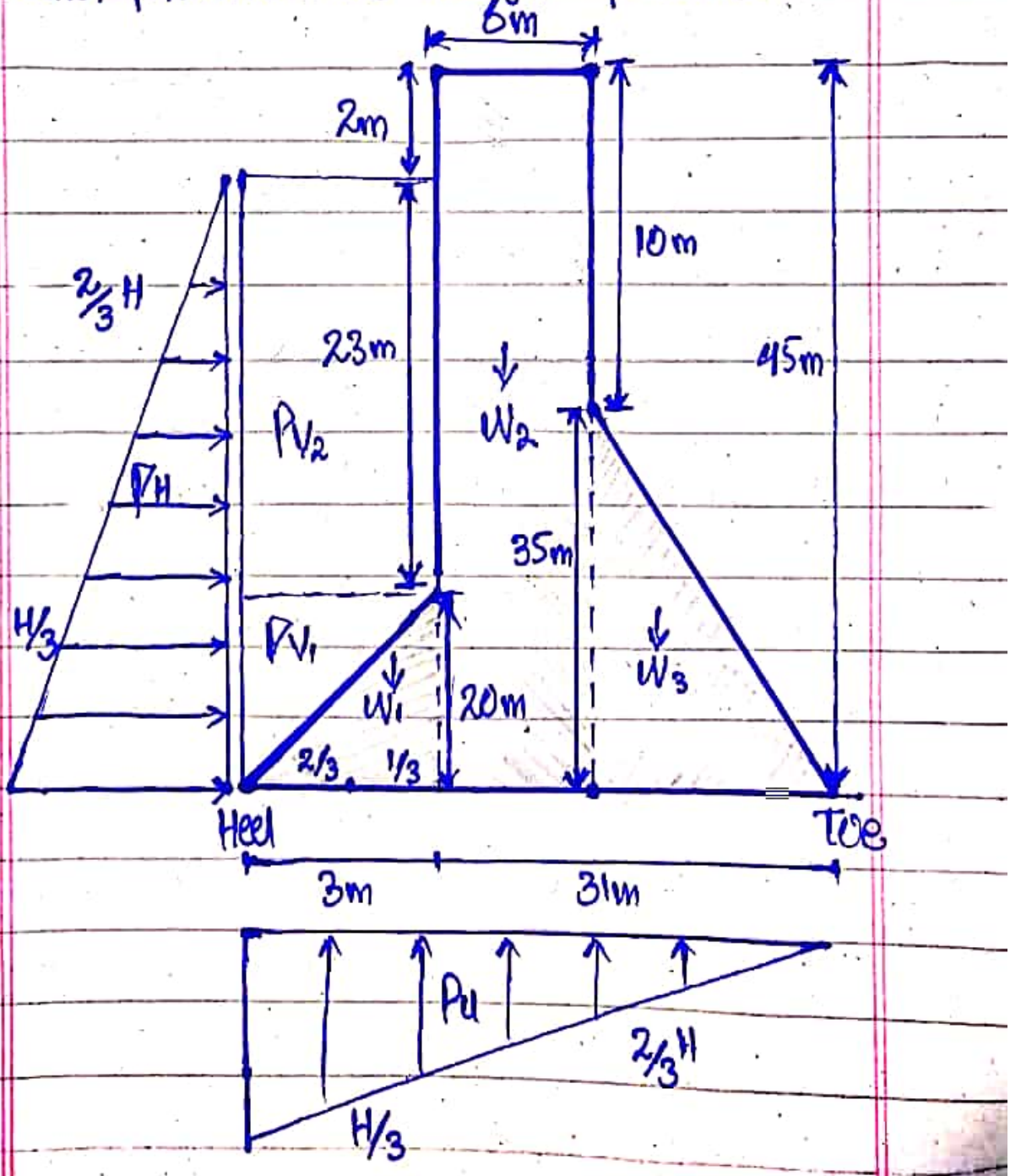
Siphon Spillway will be more effective in a condition where freezing point of water is less than 10-C° in winters.

Reason;

As we know that the water start freezing below 10 c° and in cold condition the water will be converted into ice on top surface if this ice enter into spill-way may damaging it. So for this reason Siphon spillway are such designed. Here the inlet end of the conduit placed well below the normal reservoir water level to prevent ice and drift from entering the conduit.

★ Graph Dam;

Ans;03 For the Graph-Dam as shown in figure, we will check the stability. In reservoir full condition considering weight of dam, water pressure, and weight pressure.



Moment Calculation

Assume; $\gamma_d = 24 kN/m^3$ (conc)
$\gamma_w = 10 kN/m^3$ (water)

Forces	Force calculation	FV (kN)	FH	Lever arm (L.A)	M_A	M_O
W_1	$\frac{1}{2} \times 3 \times 20 \times 24$	720		$31 + 3 \times \frac{1}{3} = 32$	23040	
W_2	$6 \times 45 \times 24$	6480		$25 + \frac{6}{2} = 28$	181440	
W_3	$\frac{1}{2} \times 25 \times 35 \times 24$	10500		$31 + \frac{2}{3} = 21$	220500	
P_{V_1}	$\frac{1}{2} \times 3 \times 20 \times 10$	300		$31 + 3 \times \frac{2}{3} = 33$	9900	
P_{V_2}	$3 \times 23 \times 10$	690		$31 + \frac{3}{2} = 32.5$	22425	
P_{H_2}	$-\frac{1}{2} \times 34 \times 42 \times 10$	-7140		$33 \times \frac{2}{3} = 22$		157080
P_H	$-\frac{43^2}{2} \times 10$		-9245	$43 \times \frac{1}{3} = 14.33$		132480.85
		$\Sigma F_V = 11550$	$\Sigma F_H = -9245$		$\Sigma M_A = 457305$	$\Sigma M_O = 289580.85$

Essentiality;

Given as;

$$e = \frac{B}{2} - \bar{x} \longrightarrow (A)$$

$$\bar{X} = \frac{\Sigma M_R - \Sigma M_O}{\Sigma F_V} = \frac{457305 - 289560.85}{11550}$$

$$\boxed{\bar{X} = 14.52}$$

By putting values "A"

$$e = \frac{34}{2} - 14.52 = 17 - 14.52$$

$$\boxed{e = 2.48}$$

"1" Factor of Safety for Tension.

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

$$2.48 < \frac{34}{6}$$

$$\boxed{2.48 < 5.67}$$ OK

"2" **Stress ;**

$$Y_{heel} \geq 0$$

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

$$Y_{Toe} = \frac{\Sigma F_V}{B}\left(1 + \frac{6e}{B}\right)$$

$$// = \frac{11550}{34}\left(1 + \frac{6(2.48)}{34}\right)$$

$$// = (339.71)(1 + 0.48)$$

$$// = (339.71)(1.48)$$

$$\boxed{Y_{Toe} = 502.778}$$

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

$$= \frac{11550}{34}\left(1 - \frac{6(2.48)}{34}\right)$$

$$= 339.71\,(1 - 0.44)$$

$$\boxed{Y_{heel} = 190.24} > 0 \quad \underline{OK}$$

"3" FACTOR OF SAFETY AGAINST "OVERTURNING".

Given as;

$$\frac{\Sigma M_r}{\Sigma M_o} > 2 \qquad (\Sigma M_r > \Sigma M_o)$$

$$\frac{457305}{289560.85} > 2$$

$1.58 > 2$

Not-Safe

$457305 > 289560.85$

Safe

"4" FOS AGAINST SLIDING;

$$\frac{\mu \Sigma F_v + B_q}{\Sigma F_H} > 1$$

Given
$\mu = 0.7$
$q = 1400$
0.65-0.75

$$\frac{(0.7)(11550) + (34)(1400)}{9245} > 1$$

$$\frac{8085 + 47600}{9245} > 1$$

$6.02 > 1$ OK

"Thus our Design is Safe."