MID TERM EXAM

Name: Aazaz Ahmad

ID NO: 7705

Section: B

Dept: BE (CE)

Submitted to: Engr Adeed Khan

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Subject: Hydraulic structure

Q.No(01)

(part)(A)

Define reserviour also explain which type of reserviour will be more echomical and why?

Ans:: A water supply scheme drawing water directly from a river or a stream may faiul to satisfy the consumeers demands during extremely low flows, while during high flow it may become difficult to carry out its operation due to devastating floods, a barrier in the form of dam is, therefore constructed across the river, so as to form a pool of water on the upstream side of the dam is known as reservoirs.

As there are three types of reservoirs,

Valley- dammed reservoir
Bank- side reservoir
Service reservoir

Service reservoir is the most economical reservoir because it is entirely man made. As we are familiar with the large water towers in the countryside so the cost for these type of reservoir is very much low then the valley-dammed and back side reservoirs.

b) Which type of Embankment dam you will suggest in a hilly area and why?

Ans

As we know that there are two types of embankment dams. Earth fill embankment and Rock fill embankment. Earth fill embankment are those which contains more than 50.1. Compacted Soil. And rock fill are those which contains more than 50.1. of rocks. So in hilly areas we will Soggest rock fill embankment. Because in hilly area rock is easily available and also rock fill embankment has more Strength and will be durable & safe as compared to the earth fill embankment.

Q.NO(02)

(a)

List down different types of Spillways also mention which type of Spillway will be more efficient in a condition where freezing point of water is less then -10 degree centigrate in winters and why?

Sol:

Different types of Spillway

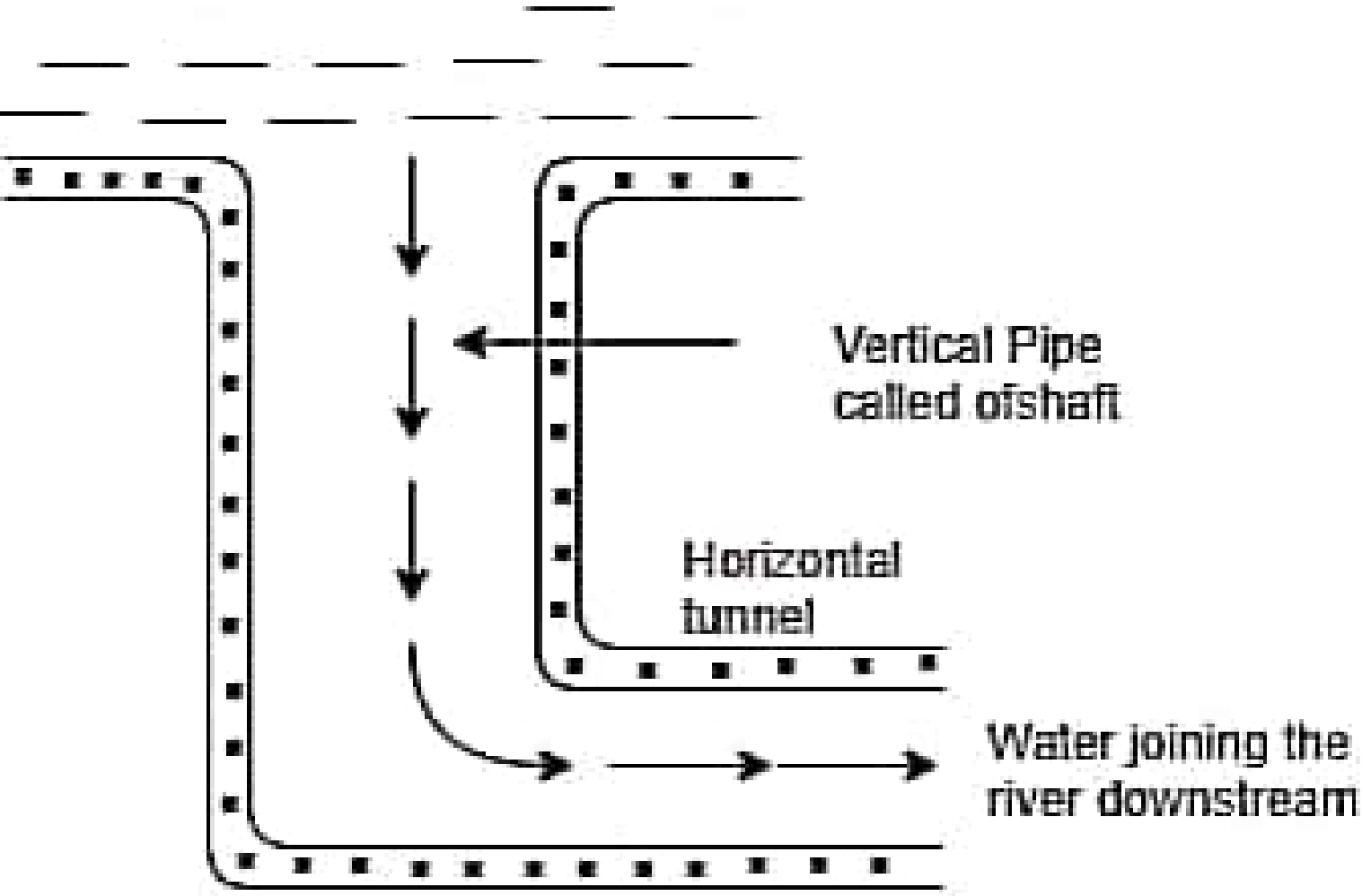
1. Straight drop Spillway
2. Ogee Spillway
3. Shaft Spillway
4. Chute Spillway
5. Side Channel Spillway
6. Siphon Spillway
7. Labyrinth Spillway

The Spillway which is best in winter zone where temperature is less than -10°C we use Shaft Spillway:

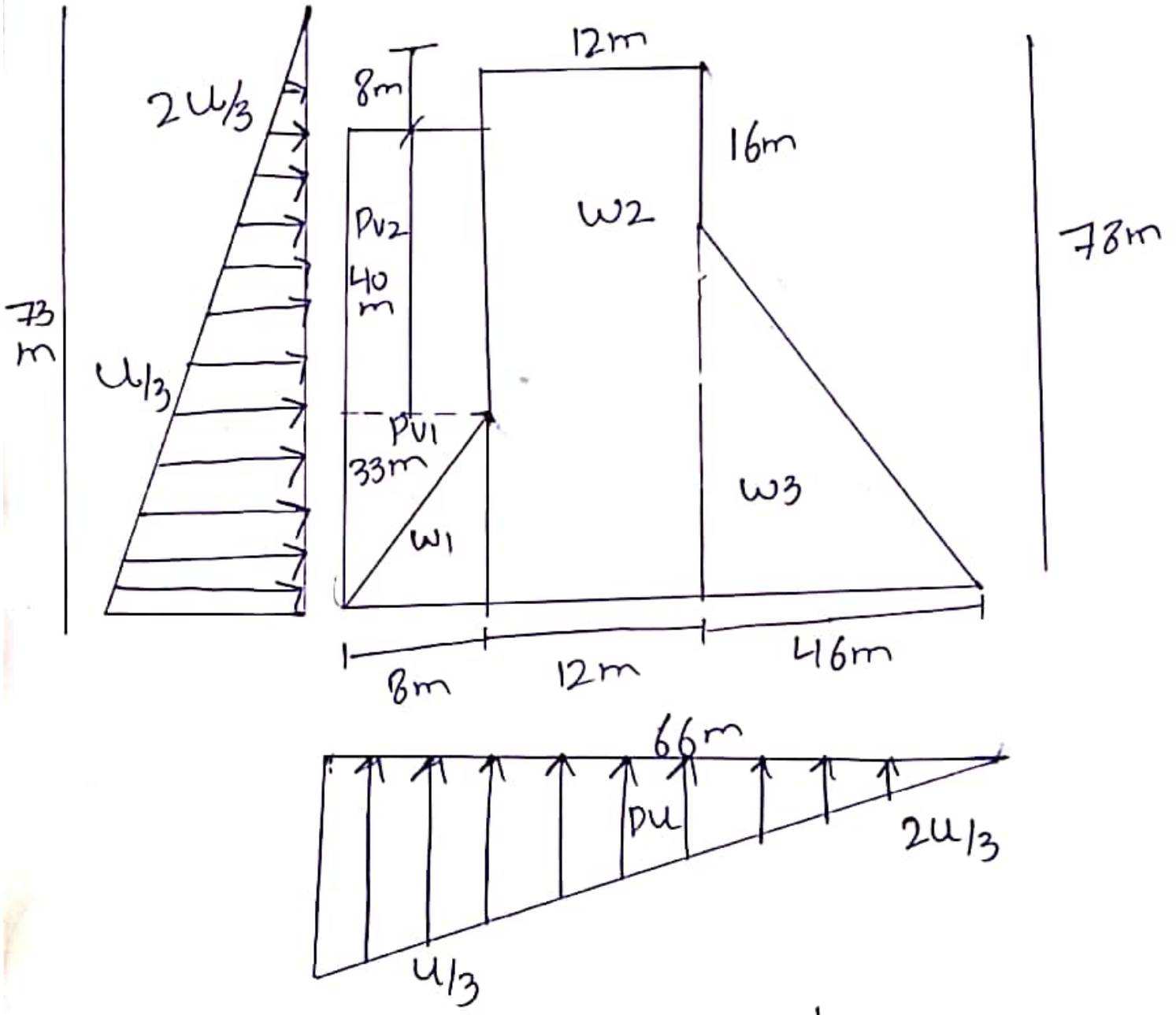
because,

- The water flow through whole perimeter of spillway in vertical action. So no conjension of frost take place and there will be no stoppage of water

This is circular in shape and vertical flow occurs normally



SHAFT SPILLWAY



Assume all the data

Assume unit weight of concrete
= 24 KN/m3

Assume Unit weight of water
= 100 KN/m3

u = 0.7

Q = 1400

Force & Moment Calculation (7)

Force	Force calculation	FV	FH	Lever Arm	MR	MO
W_1	$\frac{1}{2}\times 8\times 33\times 24$	3168	0	60.67	19220256	
W_2	$12\times 78\times 24$	22464	0	40	898560	
W_3	$\frac{1}{2}\times 46\times 62\times 24$	34224	0	30.67	1049650.08	
P_{V1}	$\frac{1}{2}\times 8\times 33\times 10$	1320	0	63.33	83595.6	
P_{V2}	$8\times 40\times 10$	3200	0	62	198400	
P_u	$-\frac{1}{2}\times 66\times 73\times 10$	-24090	0	44		1059960
P_h	$\frac{69^2}{2}\times 10$	0	-24090	24.3		647473.5
Σ		40286	-26645		2422408 / 24	1707433.5

⇒ For factor of safety against tension condition

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

$$\frac{B}{6} = \frac{66}{66} = 11m$$

⇒ eccentricity of resultant force:

$$e = \left(\frac{B}{2}\right) - \tilde{x}$$

$\tilde{x}$ = Location of resultant

Force from toe

$$\tilde{x} = \frac{\Sigma Mr - \Sigma Mo}{\Sigma FV}$$

$$\tilde{x} = \frac{2422208.24 - 1707433.5}{40.286}$$

$$\tilde{x} = 22.75$$

Now;

$$e = \frac{B}{2} - \text{•}x^{\sim}$$

$$e = \frac{66}{2} - 22.75$$

$$e = 10.5 < \frac{B}{6}$$

Condition Safe in tension

=> For factor of safety against Stress

$\gamma_{heel} > 0$

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

$$\gamma_{Toe} = \left(\frac{40286}{66}\right)\left(1 + \frac{6 \times 15.25}{66}\right)$$

$$\gamma_{Toe} = 1456.62$$

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

$$\sigma_{heel} = -235.84 < 0$$

Condition → not safe

⇒ For factor of safety against overturning

Condition $\left(\frac{\Sigma Mr}{\Sigma Mo}\right) \geq 2$

$$= \frac{2422408.24}{1767433.5} = 1.41 < 2$$

Condition not safe

The other Condition ($\Sigma Mr > \Sigma Mo$)

$\Sigma Mr = 2422408.24$

$\Sigma Mo = 1707433.5$

Condition Safe ok

$\Rightarrow$ Factor of safety against sliding

Condition $\Rightarrow \frac{u \Sigma Fr + B+q}{\Sigma FH} > 1$

$= \frac{0.7 \times 40286 + 66 \times 1400}{26645}$

$= 4.537 > 1$

Condition Safe in sliding

Hence the three condition are at least safe.