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CLASS:	**BE(C)**
SUBJECT:	**HYDRAULIC STRUCTURE**
SECTION:	**A**
ID:	**7708**
LECTURER:	**ENGR.ADEED**
ASSIGHNMENT	**01**

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Q 1.

a) Define reservoir also explain which type of reservoir will be more economical and why?

Ans. **RESERVOIR**

A reservoir is a man-made lake or large freshwater body of water. Many people think of a reservoir as a lake and might even use the words interchangeably. However, the key difference is that reservoirs are artificial and made by humans, while lakes are naturally occuring bodies of water. Reservoirs are great because they provide a supply of water for when naturally occuring bodies of water, like lakes or rivers, run dry.

TYPES OF RESERVOIR

There are three main types of reservoirs.

1) Valley-dammed reservoir.
2) Bank-side reservoir
3) Service reservoir

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EXPLANATION OF ONE TYPE OF RESERVIOR

In above three types service reservior is more economical then valley dammed reservoir and bank-side reservoir because the service reservoir is man made structure which does not take vast area as like the other two types of reservoirs because service reservoir water is directly used for house hold purposes etc means it is distributed to area. It can be made for a house for an emergency use of water it can aquire small space for the construction. Service reservoir does not need a diversion of water for a construction it can be made by concrete only. Due to service reservoir the town directly gets water for there use for different purposes. Large service reservior can also be managed to reduce the cost of pumping by refilling the reservoir at time of day when energy costs are low.

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Q1 (b) Which type of Embankment dam you will suggest in a hilly area and why?

Ans EXPLANATION

We Embankment dam come in two types the earth fill dam made of compacted earth, and the rock fill dam. Earth fill dam ~~dam~~ has 50% material used are soil. While rock filldam are 50% made from dumped and compacted rock fill So according to hilly areas we mostly prefers rock fill dam because the rocks which will used for the construction can be easily available there and less cost of transportation will come on bringing the rocks for filling. So the Rock fill dam in hilly areas will be more safe and economicall in case of earth fill dam. The rock fill dam include minimal settlement problems trough the use of compacted rockfill. It increased overall stability of the dam since the water pressure acts on the upstream face, and pore water pressure does not develop in the rockfill zone

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if it is well designed and constructed. Very rapid constructions are possible with rockfill because of its adaptability to bad weather and because the process of filling does not have to be interrupted for rolling or other separate compaction operation. In hilly areas the foundation of the dam is not possible so rock fill dam will greatly work.

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Q No. 2

a) List down different types of spillways also mention which type will be more efficient in a condition where freezing point of water is less than -10 degree centigrade in winters and why?

Ans **TYPES OF SPILLWAYS**

Different types of spillways are as follow

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

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SELECTION OF EFFICIENT SPILLWAY

In a condition where freezing point of water is less than -10 degree centigrade in winters the most efficient in winters the most spillway is chute Spillway disposed water from upstream to the downstream through a steepy sloped open channel so that the flow will be very fast. the flowing water pressure will be high and will be in supercritical condition. That will dissipate energy from the following water, energy dissipaters are also provided in this type of spillway thus the temperature of water will not allow water to freez and stop. So the water will move freely in this cold area.

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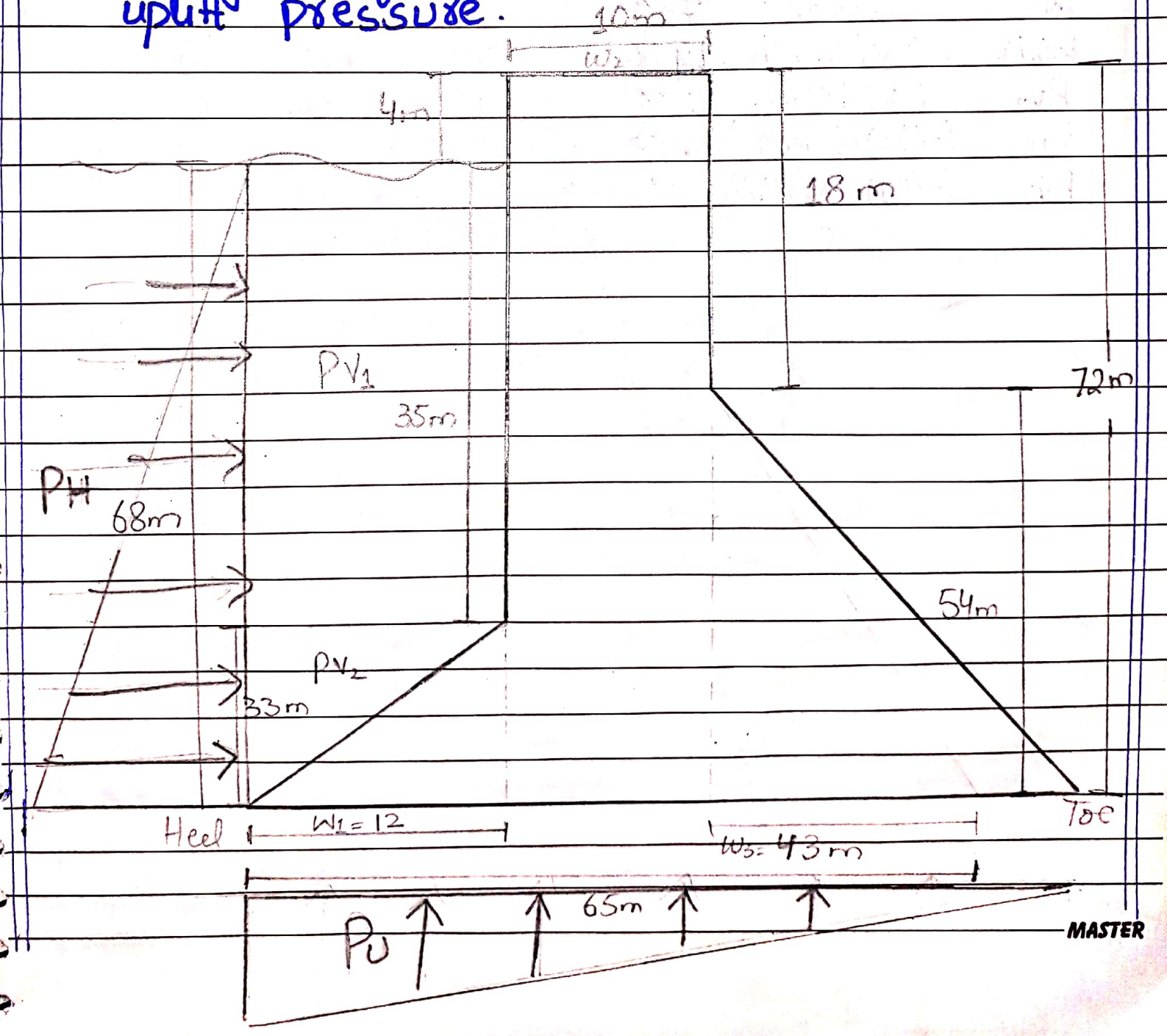
Q.No.3

a) Design the gravity dam by assuming the dam dimensions, find all the stability checks at least three of them must be in a safe condition and economical. In reservious full condition considering weight of dam, water pressure and uplift pressure.



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Assume Unit Weight for Concrete = γ_d = 24 KN/m³

Assume Unit Weight for Water = γ_w = 10 KN/m³

Forced And Moment Calculation

Forces	Forced formula	Fv(KN)	FH(KN)	Lever Arm(m)	Ms	Mo
W1	(1/2) x L x W x γ_d	4752		57.0	270864	
W2	L x W x γ_d	17280		48.0	829440	
W3	(1/2) x L x W x γ_d	27864		28.67	798768	
Pv1	(1/2) x L x W x γ_w	1980		61.0	120780	
Pv2	L x W x γ_w	4200		59.0	247800	
Pu	(-(1/2) x L x W x γ_w)	-22100		43.33		957666.67
Ph	(-(1/2) x L x W x γ_w)		-23120	22.67		524053.33
		Σ33976	+23120		2267652	1481720

For Factor of Safety Against Tension

Condition → $e < B/6$ $\Rightarrow \frac{B}{6} = \frac{65}{6} =$ **10.83 m**

Eccentricity of the Resultant force

$e = \frac{B}{2} - \bar{X}$ ∴ $\bar{X}$ = location of Resultant force from Toe

$$\bar{X} = \frac{\Sigma M_\gamma - \Sigma M_o}{\Sigma F_v}$$

$$\bar{X} = \frac{2267652 - 1481720}{33976}$$

$$\bar{X} = 23.13$$

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So

$$e = \frac{65}{2} - 23.13$$

$$\boxed{e = 9.37 \text{ m}}$$

For Safety against Tension

Condition $e < \frac{B}{6} \Rightarrow \boxed{9.37 < 10.83}$

So it is safe in Tension (OK)

For Factor of Safety Against Stress

Condition → $\gamma_{heel} > 0$

$$\gamma_{heel} = \left(\frac{\leq F_v}{B}\right)\left(1 \pm \frac{6e}{B}\right)$$

$$\gamma = \left\{\left(\frac{33976}{65}\right)\left(1 + \frac{6(9.37)}{65}\right)\right\}$$

$$\boxed{\gamma_{Toe} = 974.71432 \text{ KN/m}^3}$$

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

$$\gamma_{heel} = \left(\frac{33976}{65}\right)\left(1 - \frac{6(9.37)}{65}\right)$$

$$\gamma_{heel} = 70.70 \quad KN/m^3$$

As per condition γ_{heel} will be greater than Zero.

$\gamma_{heel} > 0$

$70.70 > 0$

So it is safe in Stress (OK)

For Factor of Safety Against Overturning

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

$$= \frac{\Sigma M_r}{\Sigma M_o} \Rightarrow \frac{2267652}{1481720}$$

$$= \boxed{1.53} < 2$$

So as per condition it is not safe in overturning (NOT OK)

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Now $\Sigma M_R > \Sigma M_O$

$\Sigma M_R = 2267652$

$\Sigma M_O = 1481720$

So $\Sigma M_R > \Sigma M_O$ the it is safe (ok)

For Factor Of Safety Against Sliding

Condition $\rightarrow \left(\frac{(\mu \Sigma F_V + BQ)}{\Sigma F_H}\right) > 1$

$Q = 1400$

$\mu = 0.7$ (0.65 to 0.75)

$= \left(\frac{(0.7 \times 33976) + (65 \times 1400)}{+23120}\right)$

$= \boxed{4.96 > 1}$ $\boxed{\text{Safe (ok)}}$

So it is conclude from condition that it is safe in Sliding (OK)

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