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Semester:- 12<sup>th</sup>

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Subject:- Hydraulic Structures  
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# Q No 1:-

## a):- Reservoir:-

A reservoir is man-made lake or large fresh water 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 lakes are naturally.

## Mainly Three Types of Reservoir:-

- \* Vally damed Reservoir
- \* Bank-Side Reservoir.
- \* Service Reservoir.

In above three types service Reservoir is most economical because it is entirely man made. Hydraulic structure frame construction is easily to construct as well as no need of any natural water body diversion. & also required small space.

(2)

Q1:-

b:-

There are three types of embankments dam Earth fill embankments and Rock fill embankments.

Earth fill embankments are the one which consists of 50% of more soil while Rock fill embankments are the one which consists of 50% of more rock. If we have to build an embankment in a hilly area, we should build rock fill embankments because rock fill embankments have more strength than earth fill embankments, and in hilly area rocks will be easily available which will take our project economical & save.

(3)

Q NO 2:-

Different types of spillways are as follow:-

- 1) Straight Drop spillways.
- 2) ogee spillway
- 3) shaft spillway
- 4) chute spillway
- 5) side channel spillway
- 6) siphon spillway
- 7) Labyrinth spillway.

In a condition where freezing point of water is less than  $-10$  degree centigrade in winters the most efficient spillway is chute spillway, Because

(4)

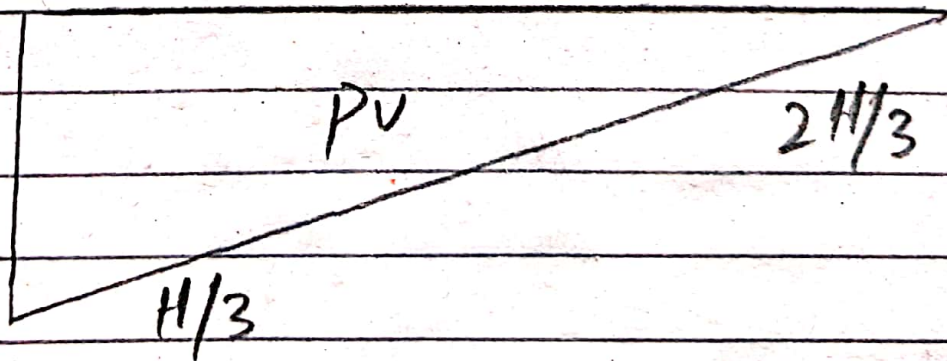
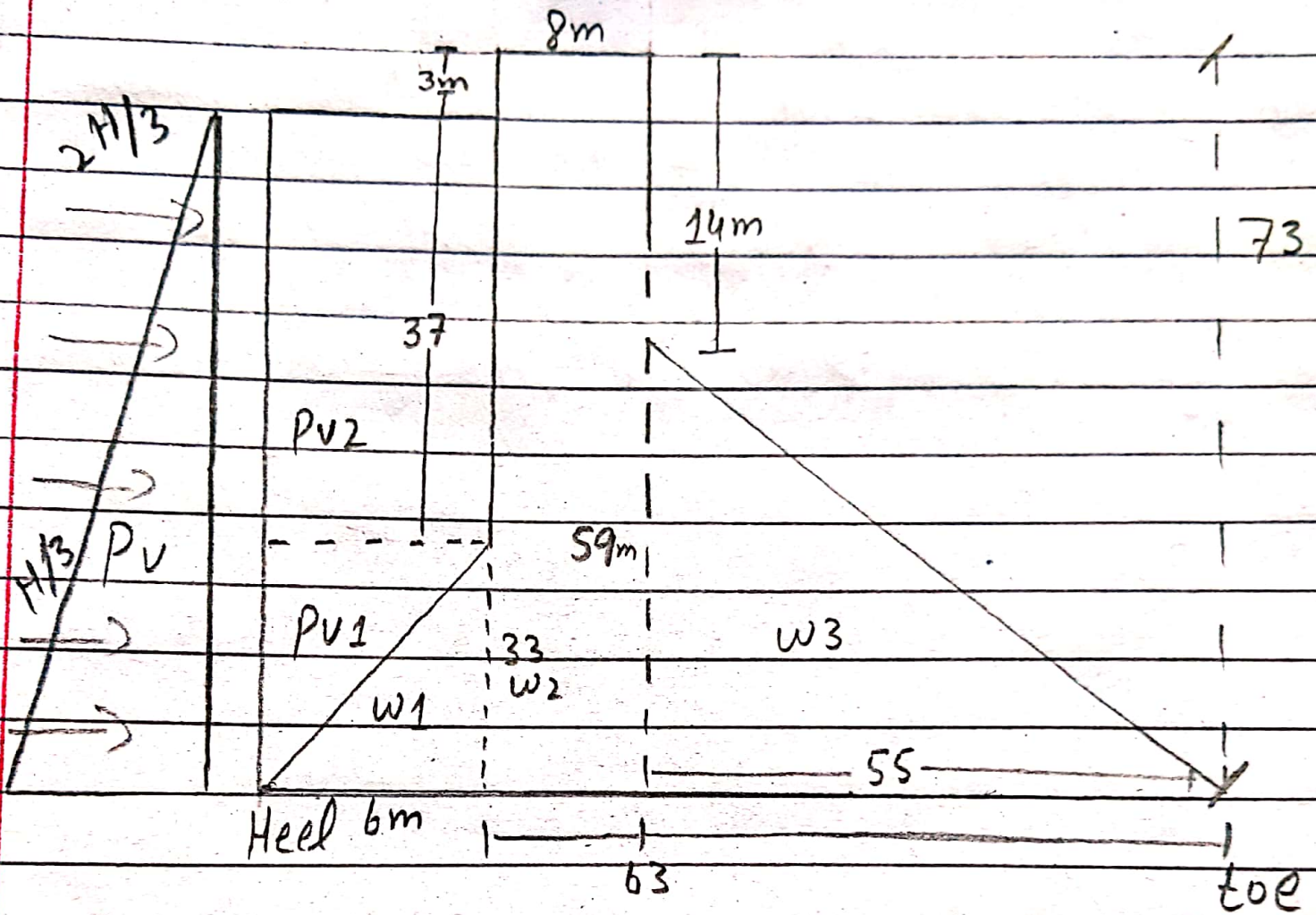
chute spillway disposed water from upstream to the downstream through a steeply sloped open channel so that the flow will be very fast.

The flowing water pressure will be high and will be in super-critical condition.

That will dissipate energy from the falling water. energy dissipators are also provided

in this type of spillway thus the temperature of water will go high and it will not allow water to freeze and stop.

(5)



6.

Forces	Force calculations	F <sub>V</sub>	F <sub>H</sub>	L.A	M <sub>X</sub>	M <sub>O</sub>
W <sub>1</sub>	$\frac{1}{2} \times 6 \times 33 \times 24$	2376		$63 + \frac{6}{3} = 65$	154440	
W <sub>2</sub>	$.8 \times 73 \times 24$	14016		$55 + \frac{8}{2} = 59$	826944	
W <sub>3</sub>	$\frac{1}{2} \times 55 \times 59 \times 24$	38940		$55 \times \frac{2}{3} = 36.6$	1427929.3	
P <sub>V1</sub>	$\frac{1}{2} \times 6 \times 33 \times 10$	990		$63 + \frac{2 \times 6}{3} = 67$	66330	
P <sub>V2</sub>	$6 \times 37 \times 10$	2220		$63 + \frac{6}{2} = 66$	146520	
P <sub>U</sub>	$-\frac{1}{2} \times 69 \times 70 \times 10$	-24150		$69 \times \frac{2}{3} = 46$		1110900
P <sub>H</sub>	$-70 \times \frac{1}{2} \times 10$		-24500	$70 \times \frac{1}{3} = 23.3$		570850

$\Sigma F_V = 3492$      $\Sigma F_H = 24500$      $\Sigma M_O = 2622163.8$      $1681950.0$

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

$$\bar{x} = 27.34 \text{ m}$$

$$e = 69/2 - 27.34$$

$e = 7.16 \text{ m}$

(7)

Condition:-

$$e < B/6$$

$$e < 69/6$$

$$7.16 < 11.5 \quad \text{OK safe.}$$

$$\gamma = \frac{EFV}{B} \left( 1 + \frac{6e}{B} \right)$$

$$\gamma_{\text{heel}} > 0$$

$$\gamma_{\text{toe}} = \frac{EFV}{B} \left( 1 + \frac{6e}{B} \right) \Rightarrow \frac{34392}{69} \left( 1 + \frac{6(7.16)}{69} \right)$$

$$\gamma_{\text{toe}} = 808.76 \text{ KN/m}^2$$

$$\gamma_{\text{heel}} = \frac{EFV}{B} \left( 1 - \frac{6e}{B} \right) \Rightarrow \frac{34392}{69} \left( 1 - \frac{6(7.16)}{69} \right)$$

$$\gamma_{\text{heel}} = 188.10 \text{ KN/m}^2$$

$$\gamma_{\text{heel}} \geq 0 \quad \text{OK safe.}$$

$$\frac{EM_x}{EM_0} > 2$$

$$EM_0$$

$$= \frac{2622163.8}{1681750.0}$$

$$= 1.56 < 2 \quad \text{Not safe.}$$

$$EM_x > EM_0 \\ 2622163.8 > 1681750.0 \quad \text{safe.}$$

(8)

$$\frac{UEFU + B \times q}{EFH} > 1$$

$$\frac{0.75 \times 34392 + 69 \times 1400}{24500}$$

$$4.99 > 1 \quad \text{OK safe.}$$