

Name # Habibullah

ID # 7716

Subject # Hydraulic Structures

## "Hydraulic Structures"

Qno (1):

(a) :- Reservoir :

is a man made lake or large freshwater body of water. Reservoir are artificial and made by humans.

**Economical Type :**

**Coastal :-**

are fresh water storage reservoirs located on the sea coast near the river mouth, to store the flood water of a river.

"Coastal reservoir is preferred economically and technically since it does not use scarce land area."

Qno 4:

(b) :- Earth filled dam is good choice for sites with wide valleys.

A cross-section of an embankment dam shows like bank or hill. Must have central section or core composed of an impermeable material to stop water from seeping through the dam. The core can be of clay, concrete or asphalt concrete.

## Qno 2:

A spillways is a channel through which flood or surplus water escapes safely from a reservoir.

## Types:

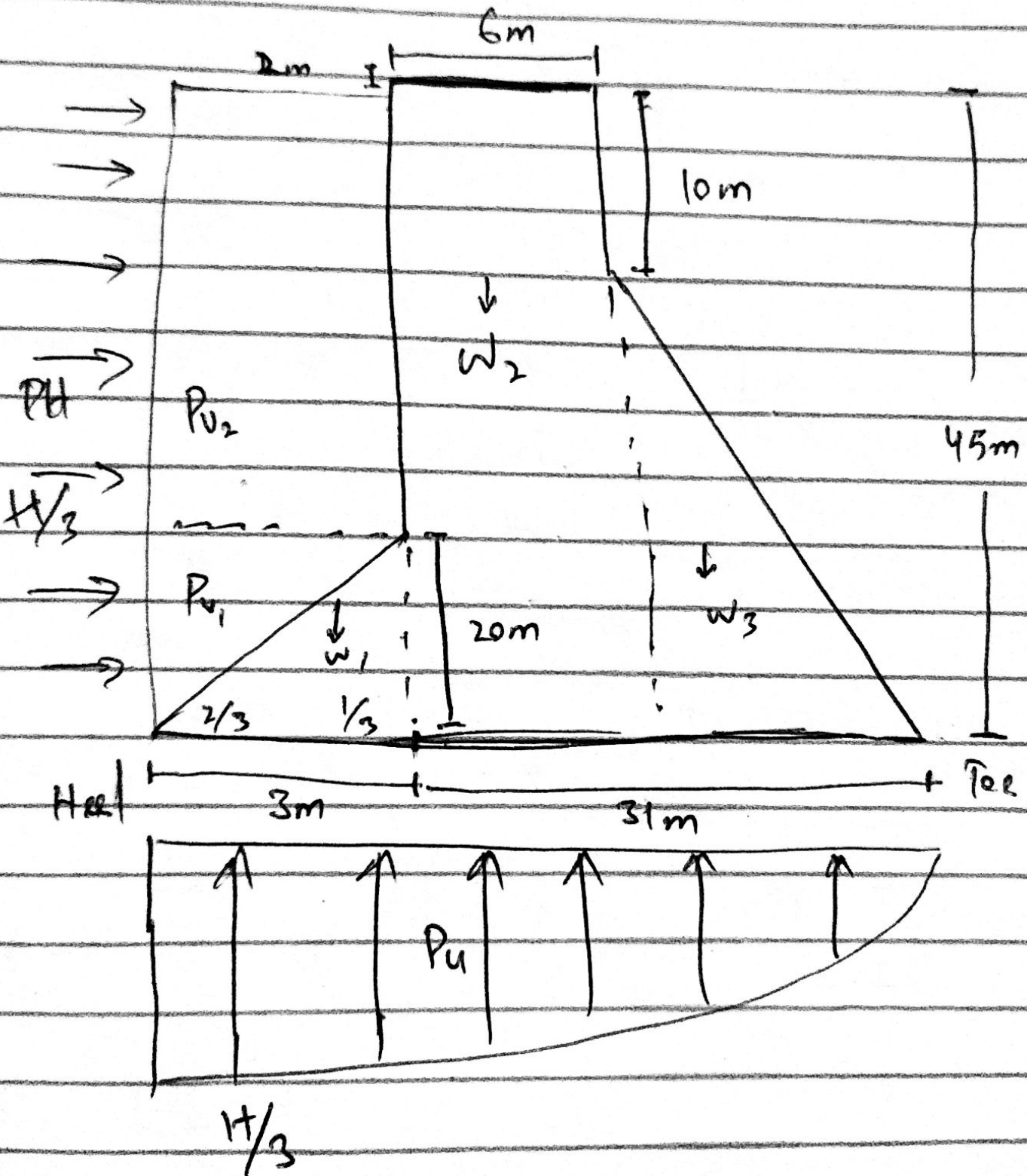
- ① Straight Drop spillway.
- ② Ogee spillway.
- ③ Shaft spillway.
- ④ Chute spillway.
- ⑤ Side channel spillway.
- ⑥ Siphon spillway.
- ⑦ Labyrinth spillway.

Shaft spillway will be more efficient in a condition where freezing point of water is  $-10$  degree.

A shaft spillway is used at the sites where the conditions are not favorable for a overflow.



Qno (03)



# Moment Calculations:

Forces	Forces Calculation	Fv (kN)	FH	Lever Arm	Mv	M <sub>0</sub>
W <sub>1</sub>	$\frac{1}{2} \times 3 \times 20 \times 24$	720		$31 + 3 \times \frac{1}{2} = 32$	23040	
W <sub>2</sub>	$6 \times 45 \times 24$	6480		$25 + 6 \times \frac{1}{2} = 28$	181440	
W <sub>3</sub>	$\frac{1}{2} \times 25 \times 35 \times 24$	10500		$31 \times \frac{2}{3} = 21$	220500	
Pv <sub>1</sub>	$\frac{1}{2} \times 3 \times 20 \times 10$	300		$31 + 3 \times \frac{2}{3} = 33$	9900	
Pv <sub>2</sub>	$3 \times 23 \times 10$	690		$31 + \frac{3}{2} = 32.5$	22425	
Pu	$\frac{1}{2} \times 34 \times 42 \times 10$	<del>7140</del>	-7140	$33 \times \frac{2}{3} = 22$		157080
PH	$\frac{43}{2} \times 10$		-9245	$\frac{43}{3} = 14.33$		132480.85
		$\Sigma Fv =$ 11550	$\Sigma FH =$ -9245		$\Sigma Mv =$ = 457300	$\Sigma M_0 =$ 289560.85

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

$$\bar{x} = \frac{\sum M_v - \sum M_o}{\sum F_v}$$

$$\bar{x} = \frac{457305 - 289560.85}{11550}$$

$$\bar{x} = 14.52$$

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

$$e = 2.48$$

Factor of Safety for tension

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

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

$$2.48 < 5.67$$

ok in tension

Stress  $\gamma_{toe} > 0$

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

$$\gamma_{toe} = \frac{EFv}{B} \left( 1 + \frac{6e}{B} \right)$$

$$\gamma_{toe} = \frac{11550}{34} \left( 1 + \frac{6 \times 248}{34} \right)$$

$$\gamma_{toe} = (339.71) (1 + 0.48)$$

$$\gamma_{toe} = (339.71) (1.48)$$

$$\gamma_{toe} = 502.778$$

$\gamma_{heel} > 0$

$$\gamma_{heel} = \frac{11550}{34} \left( 1 - \frac{6 \times 248}{34} \right)$$

$$\gamma_{heel} = (339.71) (1 - 0.44)$$

$$\gamma_{heel} = (339.71) (0.56)$$

$$\gamma_{heel} = 190.24 \quad \text{OK}$$



→ Factor of Safety against  
Overturning.

$$\frac{EM_v}{EM_o} \geq 2$$

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

1.58 < 2 (Not Safe)

F.O.S against Sliding

$$\frac{4 \sum F_v + B \times q}{\sum F_H} \geq 1$$

$$\frac{(0.7)(11950) + (34)(1400)}{9245} \geq 1$$

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

6.02 > 1 (OK)

(Safe against Sliding)