Name : M. Ikhlas Khan (1)

ID : 7768

Subject : Hydraulic structure

Section : B

Teacher name : Engr - Adeed Khan

Q1 a) Define reserviour also explain which type of reservioir will be more ennomical and why ?

Ans A water supply scheme drawing water directly from a river or a stream may fail to satisfy the consumersed demands during extremely low flows while during high flows it may become difficult to carry out it operation due to devastating

floods, a barrier in the form of dam is, therefore constructed across the river, so as to the form a pool of water on the upstream side of the dam is known as a reseriours.

As there are three type of reseroirs.

* Valley - dammed reseriou
* Bank - side reseriour
* Service reseriour

Service reseriour is the most enomical reseriour because it is entirely man made. As we are familiar with the large water towers in the country side so the cost for these type of reseriour is very much low than the valley - dammed and bank side reseriour. Also construction is easy and takes very much less time as comfaced to the other two types.

(b) Which type of Embankment dam (3)
You will Suggest in a Hilly area
and why?

Ans As we know that there are two type of embankment dams, earth fill embankment and Rock fill embankment earth fill are those which contains more than 50% of combacted soils and rock fill containe more to 50% of rocks - so in Hilly area we will suggest Rock fill embankment because in Hilly areas rock is easily avaiable and also rock fill embankment has more strength and will be dauable & safe as compaced to the earth fill embamkement.

Q2 List down different (4) types of spillways also mention which types of spillway will be more ~~diff~~ efficent in a condition where freezing of water is less than -10 degree centigrade in winters and why?

Ans Types of spillways are as follow.

1. Straight drop spillway
2. ogee spillway
3. shaft spillway
4. chute spillway
5. side spillway
6. Siphon spillway
7. Cabyrinth spillway.

The type of spillway that I will suggest for regions where temperature in winters fall upto -10°c is chute spillway because of the following reasons;

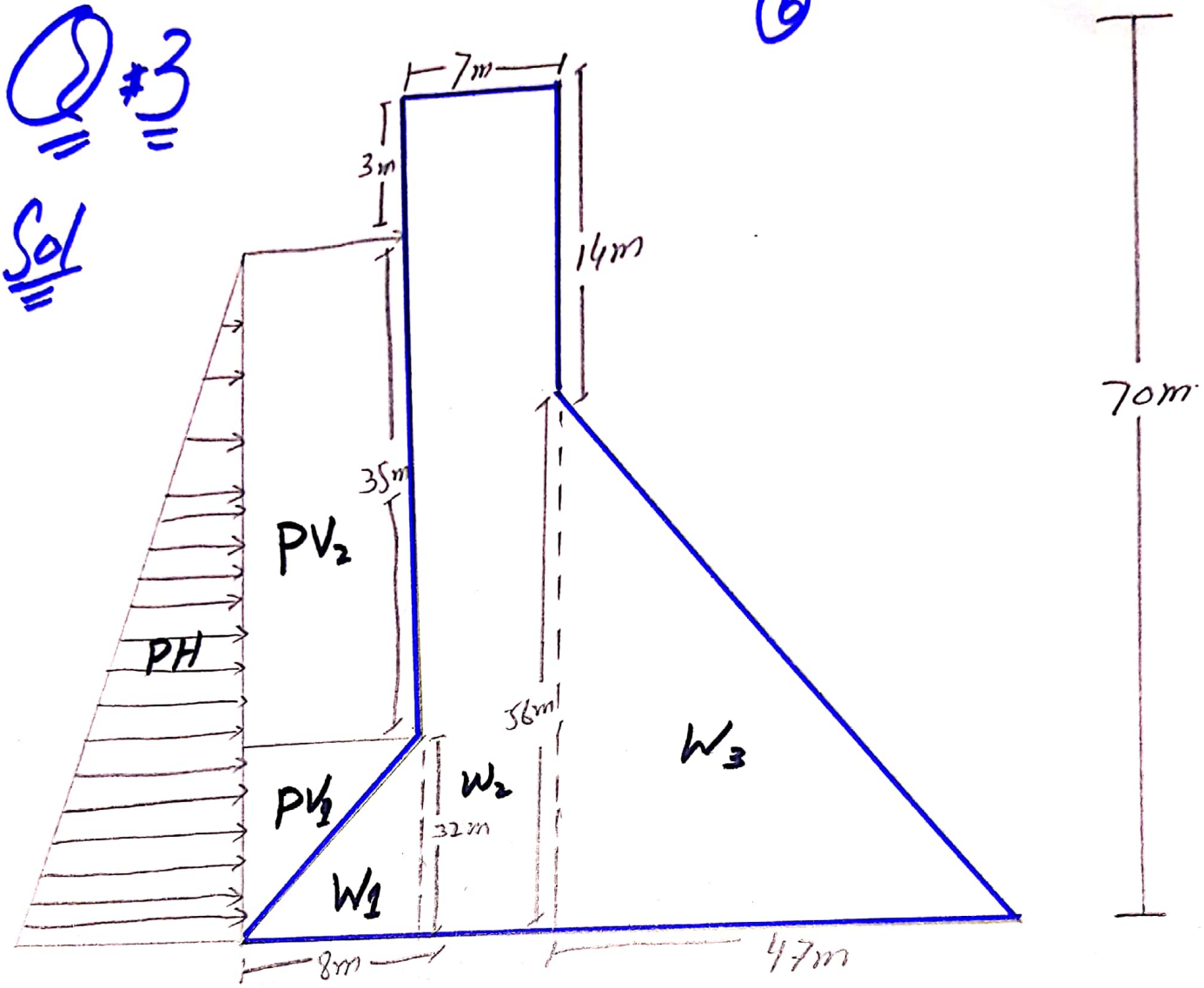
The slope of the chute spillway (5)
is very steep and the water flows and doesnot freezers due to steep slope and the Kinetic energy increase the temperature of water.

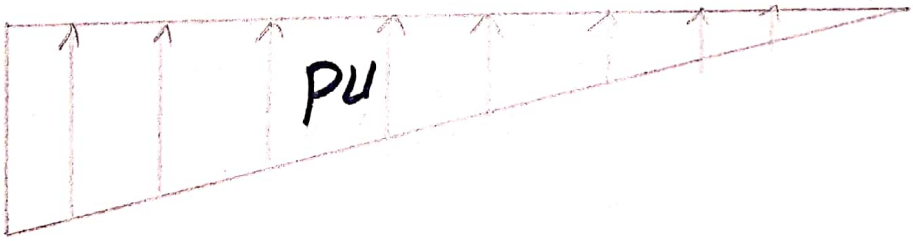
2. The water flows from chute spillway with high pressure and will be in super-critial condition. Hence the energy of water is dissipated through disipator provided in chute spillway. once the energy is dissipated than the water does not freezes and dam structure will not be in danger.

(6)

Q#3

Sol




## Assumptions

* Unit weight of concrete, $\gamma_d = 24\ KN/m^3$
* Unit weight of water, $\gamma_w = 10KN/m^3$
* $q_v = 1400$

| Force | Force Calculation | FV (KN) | FH | ① Lever Arm | Resisting moment Mr | overturning moment Mo |
|---|---|---|---|---|---|---|
| $W_1$ | $\frac{1}{2} \times 8 \times 32 \times 24$ | 3072 | | $54 + \frac{8}{3}$ $= 56.67$ | $3072 \times 56.6$ $= 174090.2$ | |
| $W_2$ | $7 \times 70 \times 24$ | 11760 | | $47 + \frac{7}{3}$ $= 50.33$ | $11760 \times 50.5$ $= 593880$ | |
| $W_3$ | $\frac{1}{2} \times 47 \times 56 \times 24$ | 31584 | | $47 \times \frac{2}{3}$ $= 31.33$ | 989526.7 | |
| $PV_1$ | $\frac{1}{2} \times 8 \times 32 \times 10$ | 1280 | | $54 + 8 \times \frac{2}{3}$ $= 59.33$ | 75942.4 | |
| $PV_2$ | $35 \times 8 \times 10$ | 2800 | | $54 + \frac{8}{2}$ $= 58$ | 162400 | |
| PU | $\frac{1}{2} \times 62 \times 67 \times 10$ | -20770 | | $62 \times \frac{2}{3}$ $= 41.33$ | | $20770 \times 41.3$ $= 858424.1$ |
| PH | $-\frac{67^2}{2} \times 10$ | | -22445 | $\frac{67}{3} = 22.3$ | | $= 501196.85$ |
| | $\sum$ | 29726 | 22445 | | 1995839.36 | 1359620.95 |

# Eccentricity of the Resultant Force,

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

$$\bar{x} = \frac{\Sigma M_r - \Sigma M_o}{\Sigma F_v}$$

$$\bar{x} = \frac{1995839.36 - 1359820.95}{29726}$$

$$\bar{x} = 21.4$$

So

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

$$e = 62/2 - 21.4$$

$$e = 9.6\,m$$

$$\gamma_{toe} = \frac{29726}{62}\left(1 + \frac{6(9.6)}{2}\right)$$

$$\gamma_{toe} = 924.9\ KN/m^2$$

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

$$= \frac{29726}{62}\left(1 - \frac{6(9.6)}{62}\right)$$

$$\gamma_{steel} = 34.03$$

So

$Y_{steel} > 0$ ok

* Dam structure is safe in bearing the streess.

# Factor of safety Against overturning

## Condition.

$$\frac{\Sigma M_r}{\Sigma M_o} > 2$$

$$= \frac{1995839.36}{1359620.95}$$

$$= 1.46 \not> 2$$

So the condition is not safe and there are chances for dam to overturn.

## Condition 2

$$\Sigma M_r > \Sigma M_o$$

$$1995839.36 > 1359620.95$$

OK! safe

# Factor of Safety Against Sliding.

Condition

$$\mu \times \Sigma F_v \times B \times q / \Sigma F_H > 1$$

$$\frac{0.75 \times 29726 + 62 \times 1400}{22445}$$

$$4.86$$

So $4.86 > 1$ hence dam Structure will resist sliding.