Name	Sohail Ahmad
Sec	A
ID	7699
Subject	Hydraulic Structure
Exam	Mid Term
Teacher	Engr Adeed Khan
Department	Bs (civil)

Q.No = 1

Part (A) **Reservior:**

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 words interchangeably. Howevers, the key difference is that reservior are artifical and lakes are naturally.

Main three types of Reservior

* Valley dammed reservior
* Bank-side reservior
* Service reservoirs.

⇒ **More economical Reservior**

Service reservior is more because service Reservior store fully Potable water close to the Point of distribution.

* Service Reservior are man-made.
* Service Reservior Perform several function including ensuring sufficient head of water in the water distribution System.
* Service Reservior Providing water capacity even out Peak demand from cansumers, enabling the treatment Plant to run of optimum efficiency.
* large service reservior can also be managed to reduce the cost of Pumping by refilling the reservior at time of day when energy costs are low.

Q No = 1

Part (B)
Ans

I will suggest a rockfill embankment in hilly area because rocks that are used in embankment are easily and widely available in hilly areas as compared to clay and sand which is not available in hilly areas. As there are more rains in hilly areas and rockfill dam doesnot allow water to pass through embankment as camparced to earthfill embankment in which water may ~~Penetrate~~ Penetrate. rockfill embankment are also known as gravity structure which are easy to build and rigid structures or gravity structures are self supported by their weight.

Q No 2

Ans

Types of Spillways:-

Types of spillways are as follow;

* Straight drop spillway.
* Ogee spillway.
* Shaft spillway.
* Chute spillway.
* Side channel spillway.
* Siphan spillway.
* Labyrinth spillway.

in region where the temperature in winters falls upto $-10^{\circ}C$, for such area I will suggest chute spillway because the slope of chute spillway is ~~very~~ very steep and the water flows and doesn't freeze due to steep slope and the kinetic energy increases the temperature of water.

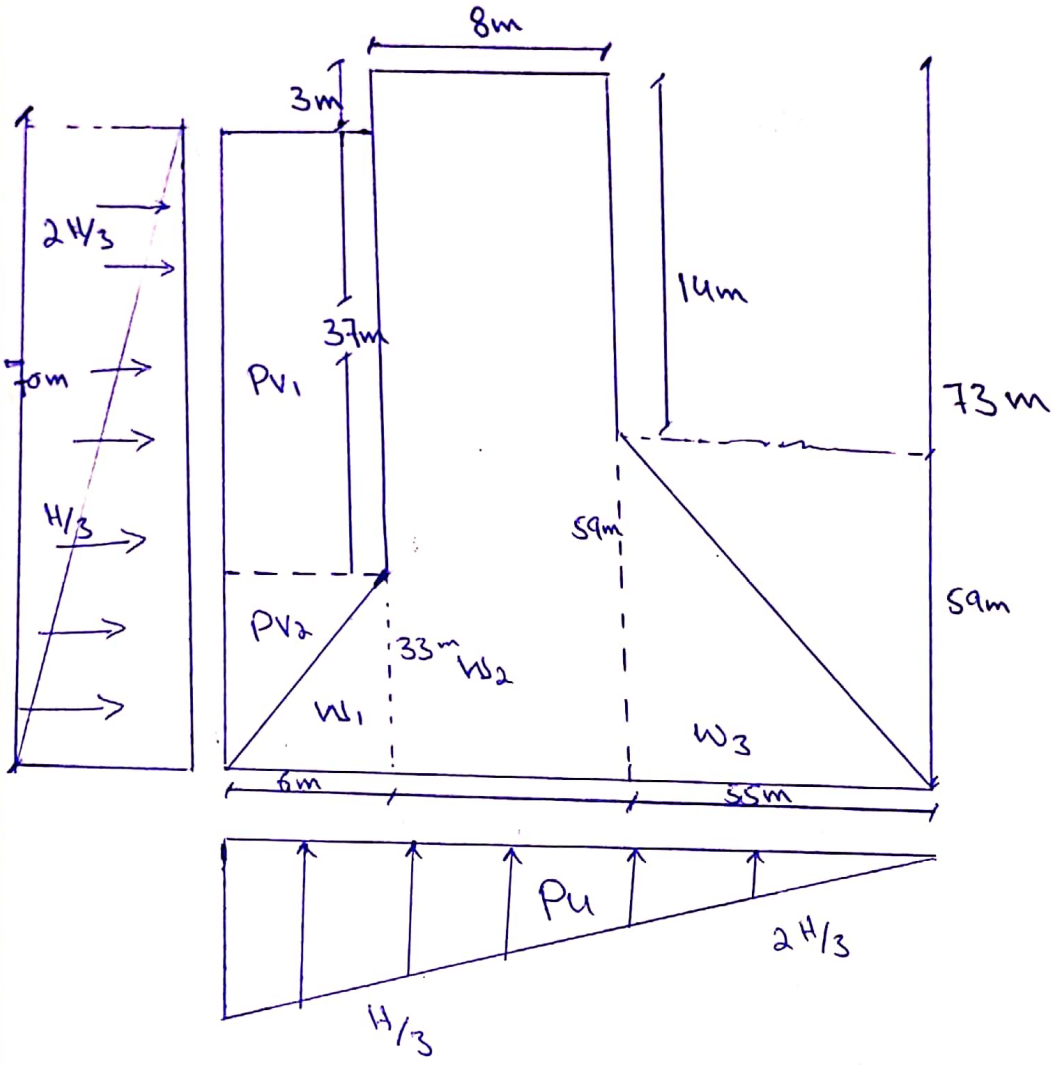
the water flows from chute spillway with high pressure and will be in

Supercritical condition. Hence the energy of water is despated through energy dissipators Provided in chute spillway. Once the energy is dissipated than the water doesn't freezes and structure of dam is in safe conditions.

X — X — X — X —

Q. No = 03

Problem:.



Unit wt of Concrete Section = $\gamma_d = 24 kN/m^3$

Unit wt of water $\gamma_w = 10 kN/m^3$

$\mu = 0.65 - 0.75$

$Q = 1400$

Moment Calculation:-

Forces	Forces calculation	Fv (kN)	FH	lever Arm (L.A)	Mv	Mo F
W_1	$1/2 \times 6 \times 33 \times 24$	2376		$63 + 6/3 = 65$	154440	
W_2	$8 \times 73 \times 24$	14016		$55 + 8/2 = 59$	826944	
W_3	$1/3 \times 55 \times 59 \times 24$	38940		$55 \times 2/3 = 36.67$	1427929.3 ~~66330~~	
Pv_1	$1/2 \times 6 \times 33 \times 10$	990		$63 + \frac{2 \times 6}{3} = 67$	66330	
Pv_2	$6 \times 37 \times 10$	2220		$63 + 6/2 = 66$	146520	
P_4	$-1/2 \times 69 \times 70 \times 10$	-24150		$69 \times 2/3 = 46$		1110900
PH	$\frac{-70^2}{2} \times 10$		-24500	$70 \times 1/3 = 23.3$		570850

$\Sigma Fv = 34392$, ~~$\Sigma FH = 24500$~~,

$\Sigma FH = 24500$

$\Sigma M_Y = 2622163.8$

$\Sigma M_o = 1681750.0$

Eccentricity of the resultant force

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

$\bar{x}$ = location of resultant force from toe.

$$\bar{x} = \frac{\Sigma M_Y - \Sigma M_O}{\Sigma F_V}$$

$$\bar{x} = \frac{2622163.8 - 1681750.0}{34392}$$

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

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

$$= \frac{69}{2} - 27.34$$

$$\boxed{e = 7.16 m}$$

factor of safety Against tension

Condition $e < B/6$

$e < 69/6$

$\boxed{7.16 < 11.5 \quad ok \ safe}$

Stress $Y_{heel} > 0$

$$Y = \frac{\Sigma F_V}{B}\left(1 \pm \frac{6e}{B}\right)$$

$$Y_{toe} = \frac{\Sigma F_V}{B}\left(1 + \frac{6e}{B}\right)$$

$$= \frac{34392}{69}\left(1 + \frac{6(7.16)}{69}\right)$$

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

(4)

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

$$= \frac{34392}{69}\left(1 - \frac{6(7.16)}{69}\right)$$

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

$\gamma_{heel} > 0$ ok safe

Factor of safety against Overturing

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

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

$= 1.56 \not> 2$ Not Safe

$\Sigma M_r > \Sigma M_o$

$2622163.8 > 1681750.0$ ok safe

FOS against sliding

$$\frac{\mu \Sigma F_V + B \times q}{\Sigma F_H} > 1$$

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

$4.99 > 1$ ok safe

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