Hydraulic structure

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1

Ans part (a):

Reservoir:

A Reservoir is an artifical lake whose water is stored. Most Reservoir are formed by constructing dams across rivers.

A Reservoir can also be formed from a natural lake whose outlet has been dammed to control the water level.

"OR"

A Reservoir is a man made lake or large fresh water body of water.

Difference b/w lake and Reservoir:

Lake: Lake is naturally occuring of body of water.

Reservoir: Reservoir is artificially made by humans.

* economical Reservoirs:

Service Reservoirs are more economical than the others the reason are given below;

(1) Several Reservoirs perform several function including ensuring sufficient head of water in the distribution system of water.

(2) Service Reservoirs also provide water capicity to even out of peak demand from consumers.

(3) Service Reservoirs also reduce the coast of pumping b/c service reservoirs constructed at a high elevation or location.

(1)

Ans part (b) "Which type of embakement you will suggest in a hilly area and why?

Ans: I will suggest rock fill

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embakment dam for hilly area because;

(1) Rock fill embakment dam is constructed from impervious material such as, mansonary Concrete, Asphaltic Concrete, Sheet of steel pile timber and other materials and Transition Layers. Because the impreviis membrane is employed as the water prevf and can be placed either with in the embakment or on the upstream slope.

(2) in hilly area the chances of rain is maximum because of high attitude so if we construct earth fill embakment dam capicity or intensity of rain will demage its down of earth fill dam so because of this reason I will suggest to construct Rock fill dam in the hilly area.

2

Q:: List down different types of spillways also mentioned which type of spillway will be more efficient in a condition where freezing point of water is less than -10° degree centrigrade in winter and why.?

2

Ans: Types of spillways :- They have the following types:-

- ★ Straight drop spillway
- ★ Ogee spill way
- ★ Shaft spill way
- ★ Chute spill way
- ★ Side channel spill way
- ★ Siphon spill way
- ★ Labyrinth spill way

In condition where freezing point of wates is less then -10 degree centrigrade in winters. The most efficient spillway disposed water from upstream to down stream through steepy sloped open channel so that the flow will be very fast. The flowing

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water pressure will be high and will be in super critical condition that will dissipate energy from the falling water, energy dissipaters are also provide in this type of spillway. Thus the temperature of water go high and it will not allow water to freeze and stop so the water will move freely in this cold area.

3

Q:. Design the gravity Dam by assuming the dam Dimension, find all the stability checks at least three of them must be in safe condition and economical. in reservoir full condition considering weight of dam, water pressure and uplift pressure?

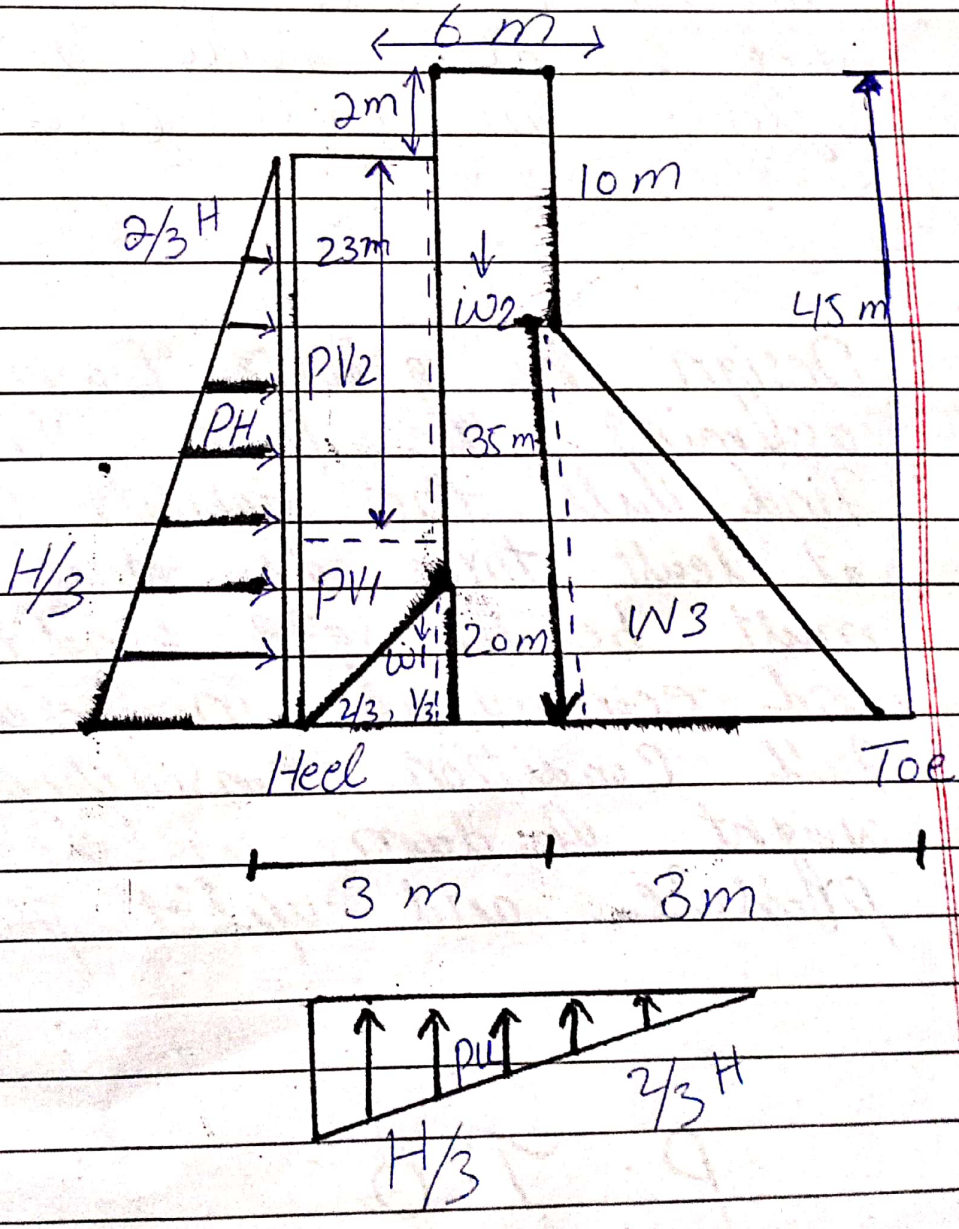
Ans

P.T.O

(6)

"Graph Dam:"

"For the Graph-Dam as shown in the figure, we will check the stability in reservoir full condition considering weight of dam, water pressure, and weight pressure."



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Moment Calculation

Assume $\gamma_d = 24\ kN/m^3$ (conc)

$\gamma_{wet} = 10\ kN/m^3$ (water)

Forces	Force Calculation	FV (kN)	FH	Lever arm (LA)	M_x	M_0
W1	$\frac{1}{2} \times 3 \times 20 \times 24$	720		$31 + 3 \times \frac{1}{3} = 32$	23040	
W2	$6 \times 45 \times 24$	6480		$25 + 6/2 = 28$	181440	
W3	$\frac{1}{2} \times 25 \times 35 \times 24$	10500		$31 + 2/3 = 21$	220500	
PV1	$\frac{1}{2} \times 3 \times 20 \times 10$	300		$31 + 3 \times 2/3 = 33$	9900	
PV2	$3 \times 23 \times 10$	690		$31 + 3/2 = 32.5$	22425	
PL	$-\frac{1}{2} \times 34 \times 42 \times 10$	-7140		$33 \times 2/3 = 22$		157080
PH	$-\frac{43^2}{2} \times 10$		-9245	$43 \times \frac{1}{3} = 14.33$		1324808.5
		$\Sigma FV = 11550$	$\Sigma FH = 9245$		$\Sigma M_x = 457380$	$\Sigma M_0 = 2895480.5$

P.T.O →

" Essentricity :-

Given as,

$$e = B/2 - \bar{x} \quad -(A)$$

$$\bar{X} = \frac{\Sigma M_R - \Sigma M_O}{\Sigma FV} = \frac{457305 - 289560.85}{11550}$$

$$\Rightarrow \boxed{\bar{X} = 14.52}$$

By put values (A)

$$e = 34/2 - 14.52 = 17 - 14.52$$

$$\Rightarrow \boxed{e = 2.48}$$

∴ (1) " Factor of safty for Tension

$$e < B/6$$

$$2.48 < 34/6$$

$$= \boxed{2.48 < 5.67}$$

∴ (2) " Stress :-

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(2) Stress :,

$$\gamma_{heel} = 0$$

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

$$\gamma_{Toe} = \frac{\Sigma FV}{B}\left(1 + \frac{6e}{B}\right)$$

$$= \frac{11550}{34}\left(1 + 6\frac{(2.48i)}{34}\right)$$

$$= (339.71)(1 + 0.48)$$

$$= (339.71)(1.48)$$

$$\Rightarrow \boxed{\gamma_{Toe} = 502.778}$$

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

$$= \frac{11550}{34}\left(1 - 6\frac{(2.48)}{34}\right)$$

$$= 339.71\,(1 - 0.44)$$

$$\Rightarrow \boxed{\gamma_{heel} = 190.24} > 0 \quad \text{OK}$$

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(3) Factor of Safety Against:
(Over Turning)

Given as;

$$\frac{\Sigma M_R}{\Sigma M_O} > 2 \qquad \Sigma M_R > \Sigma M_O$$

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

$$= \boxed{1.58 > 2} \qquad \boxed{457305 > 289560.85}$$

Not Safe — Safe

(4) Factor of Safety Against Sliding:

$$= \frac{LR.\Sigma F_V + B_V}{\Sigma F_H} > 1$$

Given
$LR = 0.7$
$\phi = 1400$
0.65-0.75

$$= \frac{(0.7)(11550) + (34)(1400)}{9245} > 1$$

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

$$= \boxed{6.02 > 1}$$

Thus over Design is Safe.