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Paper: Hydraulic Structure
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Q#01:→

Answer: RESERVIOUR: A reservioUr is man-made lake or large freshwater body of water. Many people think of reservioUr as a lake and might even use the word interchangebly. However the key difference is that reservioUr are artificial and made by humans, while lakes are naturally occuring bodies of water. Reserviours are great because they provide a supply of water for when naturally occuring bodies of water, like lakes or rivers, rundry

TYPES OF Reserviours:

Mainly three types of Reserviours;

1) Valley-dammed Reserviour
2) Bank-side Reserviour
3) Service Reserviour

In above three types of reservioUrs, service reservioUr is more economical because it ~~has~~ is entirly man made. Frame construction is easy to Construct as well as no need of any natural water bodies diversion it also require Small Space

Q#1 Part#B

Ans: ~~An Embankments are categorized as Earth embankment and Rockfill embankment~~

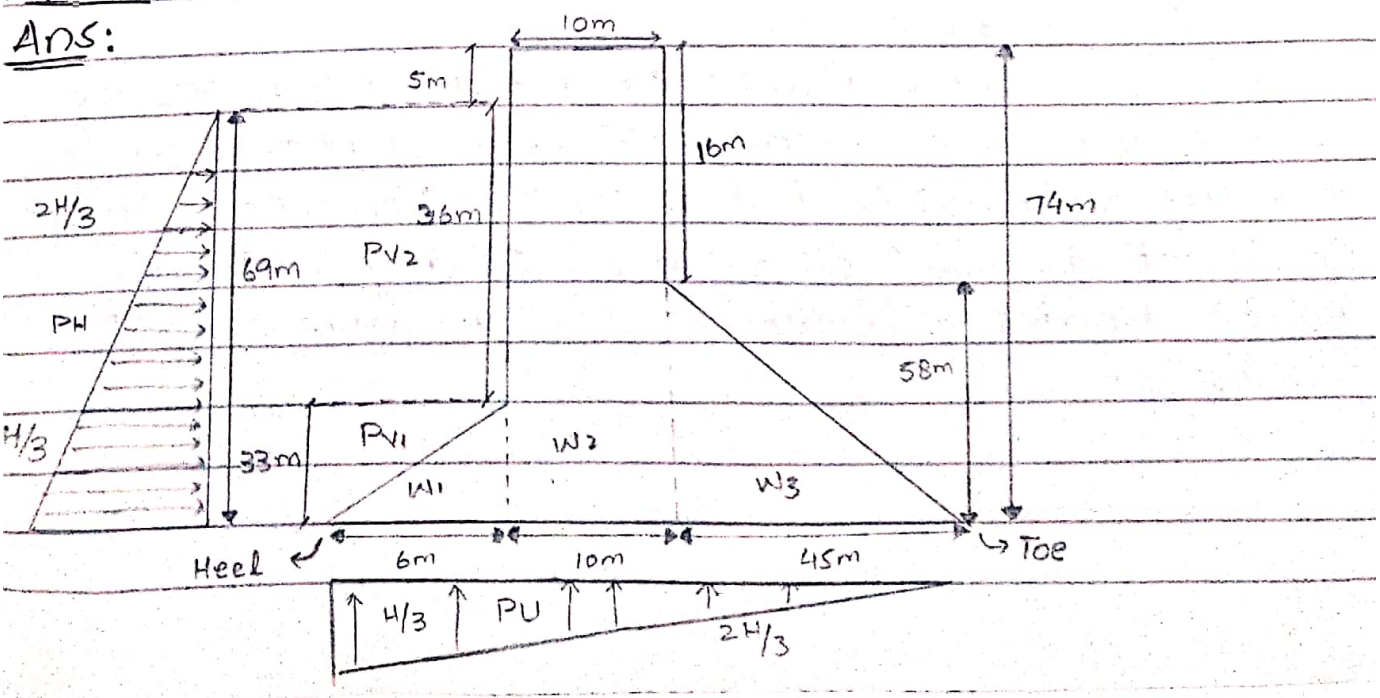
An embankment dam is large artificial dam. It is typically created by placement and Compaction of a complex semi-plastic mound of various Composition of soil, sand, clay or rocks. It has a semi-perious waterproof naturall covering for its surface and a dense, impervious core.

As embankment are categorized as earth fill embankment and Rock fill embankment. Earth fill embankment are the one which consist of 50% or more soil while Rock fill embankment are the one which consist of 50% or more Rocks. If we have to build an embankment on hilly area we should build Rock fill embankment dam because it has more strength then soil fill and in hilly area rocks will be easily available which makes our project economical & save.

X═══O═══X.

Q#03:

Ans:



Force	Force Formula's	FV (KN)	FH (KN)	Lever Arm (m)	Mr (FV x L.A)	Mo
W1	$\frac{1}{2}$ x33 x6 x24	2376	0	57.00	135432	
W2	24x10x74	17760	0	50.00	888000	
W3	1/2 x58x45x24	31320	0	30.00	939600	
Pv1	1/2 x6 x33x10	990	0	59.00	58410	
Pv2	6 x36 x10	2160	0	58.00	125280	
Pu	$-\frac{1}{2}$ x61x10x69	-21045	0	40.67	0	855900.15
Ph	-1/2 x69x10x69	0	-23805	23.00	0	547515
		ΣFv =	ΣFH =		ΣMr =	ΣMo =
		33561	-23805		2146722	1403415.15

Assume Unit weight of Concrete = 24 kN/m^3
Assume Unit weight of water = 10 kN/m^3

Now For Factor of safety Against tension

Condition $e < B/6$

$$\frac{B}{6} = 10.16$$

Now eccentricity e of resultant Forces

$$e = \frac{B}{2} - \bar{x}$$ $\therefore \bar{x}$ = Location of resultant forces from toe.

$$\bar{x} = \frac{\Sigma Mr - \Sigma Mo}{\Sigma Fv}$$

$$= \frac{2146722 - 1403415.15}{33561}$$

$$\boxed{\bar{x} = 22.15}$$

So $e = \frac{61}{2} - 22.15$

$$\boxed{e = 8.35\,m}$$ Condition in tension is [OK]

→ For FOS Against Stress

Condition; $\gamma_{heel} > 0$

As

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

For

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

$$= \frac{33561}{61}\left(1 + \frac{6(8.35)}{61}\right)$$

$$\boxed{\gamma_{toe} = 1002.049}$$

Also

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

$$= \frac{33561}{61}\left(1 - \frac{6(8.35)}{61}\right)$$

$$\boxed{\gamma_{heel} = 98.31\ KN/m^3}$$

Condition is Safe in Stress so [OK]

→ For FOS Against overturning

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

$$\Rightarrow \frac{2146722}{1403415.15} = 1.53 < 2$$

Condition is not okay.

So Condition ($\Sigma M_r > \Sigma M_o$)

$2146722 > 1403415.15$ [OK]

→ For FOS Against Sliding

Condition; $\frac{\mu \Sigma FV + B \times q}{\Sigma FH} > 1$ $\quad \therefore q = 1400$

$\mu = 0.7\ (0.65 - 0.75)$

So $\frac{0.7(33561) + 61 \times 1400}{23805} = 4.57$

So Condition is Safe in Sliding [OK].

Q#02:

Ans: Types of Spillways: They have the following types

1. Straight drop Spillway
2. Ogee Spill way
3. Shaft Spill way
4. Chute Spill way
5. Side Channel Spill way
6. Siphon Spillway
7. Labyrinth Spill way

In Condition where freezing point of water is less then -10 degree Centegrade in winters the most efficient Spill-way is Chute Spillway. Because Chute Spillway disposed water from upstream to down stream through steepy sloped open channel so that the flow will be very fast, the flowing water pressure will be high and will be in Supercritical Condition that will dissipate energy from the falling water, energy dissipates are also provided in this type of Spillway. Thus the temp: of water go high and it will not allow water to freez and stop so the water will move freely in this cold area.