HURRAIRAH KABIR
7718
Sec B
BE (Civil)
Hydraulic Structure
Engr. Adeed

## Question No 1
### Part (1)

## Reservoir

A reservoir is a man-made lake or large body of freshwater, but people consider reservoir as a lake but the difference between a lake and reservoir is lakes are natural and reservoirs are artificial.

## TYPES of Reservoir

* Bank-Side reservoir.
* Valley dammed reservoir.
* Service Reservoir.

## Economical Reservoir

In the above three types, Service reservoir is economical because its entirely man-made. It is frame easily constructed as well as no need of any water body diversion. Less space is required for service reservoir.

Part (2)

## Types of EMBAKMENT DAM:-

- Earth fill embankment.
- Rock fill embankment.

### Embankment in hilly area:-

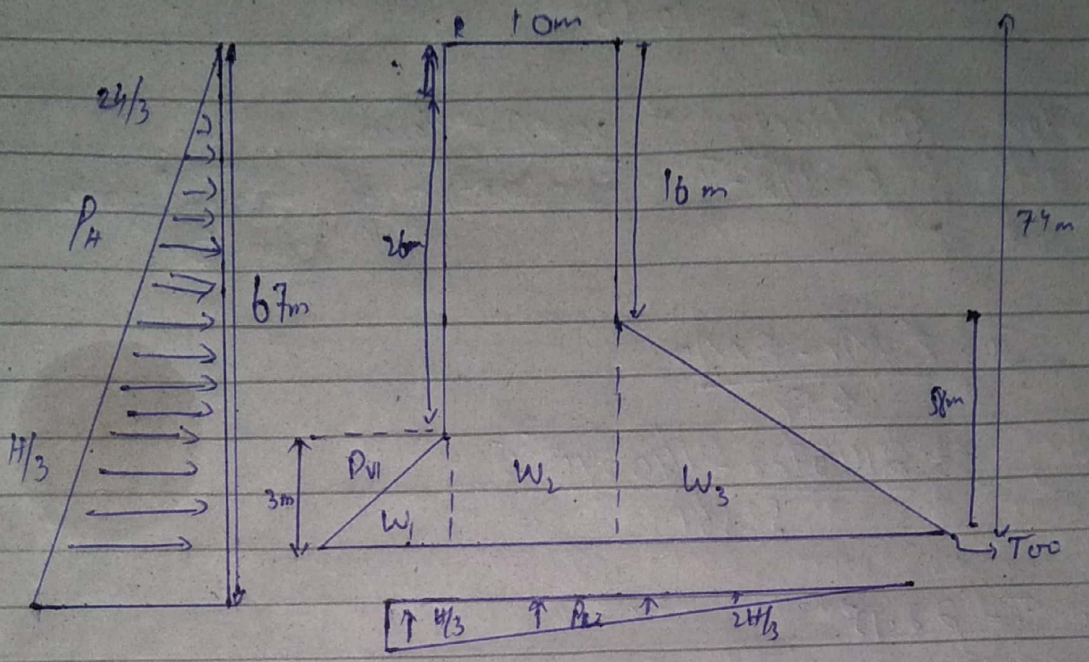
They earth fill embankment consists of 50% or more soil and the rock fill embankment consist of 50% or more rocks. If we have to choose embankment in hilly area, we have to built rock fill embankment because in hilly area rocks are easily available it would have more strength and due to the easily available material our project will be economical and save.

## Question No (2)

### Types of SPILLWAYS:-

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

# Question No 3:-




| Forces | Forces formula | $F_V$ (kN) | $F_H$ (kN) | Level force (m) | MV $F_V \times L.A$ |
|---|---|---|---|---|---|
| $W_1$ | $1/2 \times L \times w \times \gamma_d$ | 2376 | 0 | 57.00 | 135432 |
| $W_2$ | $L \times W \times \gamma_d$ | 17760 | 0 | 50.00 | 888000 |
| $W_3$ | $1/2 \times L \times W \times \gamma_d$ | 31320 | 0 | 30.00 | 939600 |
| $P_{V1}$ | $1/2 \times L \times w \times \gamma_w$ | 990 | 0 | 59.00 | 58410 |
| $P_{V2}$ | $L \times w \times \gamma_w$ | 2160 | 0 | 58.00 | 58410 |
| $P_U$ | $-1/2 \times L \times w \times \gamma_w$ | -2104 | 0 | 40.67 | 0 |
| $P_H$ | $-1/2 \times L \times w \times \gamma_w$ | - | -23805 | 23.00 | 0 |
| | $\Sigma$ | 33561 | -23805 | | 246722 |

Assume unit weight of concrete = 24k
Assume unit weight of water = 10k

Now Factor of safety against tension

Condition $e < B/6$

$B/6 = 10.16$

Now eccentricity of resultant forces.

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

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

$$= \frac{2146722 - 1403415.15}{53561}$$

$\bar{x} = 22.15$

So

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

$e = 8.35 m$

Condition of tension (ok).

⇒ For Fos against stres.

Condition : $\gamma_{heel} > 0$

As

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

for toe:

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

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

$\gamma_{toe} = 1002.049$

Also

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

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

$\gamma_{heel} = 98.31 \text{ kN/m}^3$

Condition is safe in stress.

=) For Factor of safety against over turning

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

=) $\frac{2146722}{1403415.15} = 1.53 < 2$ not ok

So Condition

$(\Sigma M_r > \Sigma M_a)$

$2146722 > 1403415.15$ (ok)

=) For Factor of safety against sliding

Condition, $\frac{\mu \Sigma F_v + B + v}{\Sigma F_H} > 1$ $\therefore v = 1400$

$\mu = 0.7$

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

So condition is safe in sliding.