NAME: MIRZA ALI KHAN

ID : 7767

SECTION A

Subject : Hydraulic Structure

Q NO 01. (a)

Reservior :-

A reservior is a man made lake or large freshwater body of water

Many people Think of a reservior as a lake and might even use the words interchangeably However The key difference is That reservior are artifical and lakes are naturally.

Main Three types of reservioUr

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

More economical Reservoirs-

Service reservoir is more economical because Service Reservoir Store fully potable water close to the point of distribution

P.T.O

→ Service reservior are man made
→ Service reservior perform several function including ensuring sufficient head of water in the water distribution system.
→ Service Reservoir providing water capacity to even out peak demand from Consumers enabling the treatment plant to run of optimum efficiency
→ Large Service Reservoirs can also be managed to reduce The cost of pumping by refilling the reservior at time of day when energy costs are low
→ Service reservior also required Less space.

Q NO 1 B :-

There are basically two types of embankment :

- Earth fill embankment :-
- Rock fill embankment :-

The embankment which is suggested in a hilly area is rock fill embankment.

P.T.O

Because it is one which Contains about 50% or more rock fill materials of the Total volume of materials thus can be easily provided in hilly areas and are economical.

Similarly it is Constructed on hard rock Type foundation which can be easily provided in hilly area as well as rock form best foundation material which are free from faults Seams of Soft Shale or clay etc Additionally Shoulders of rock fill also provide Structural Stability.

Q NO # 02

Different Types of Spillway :-

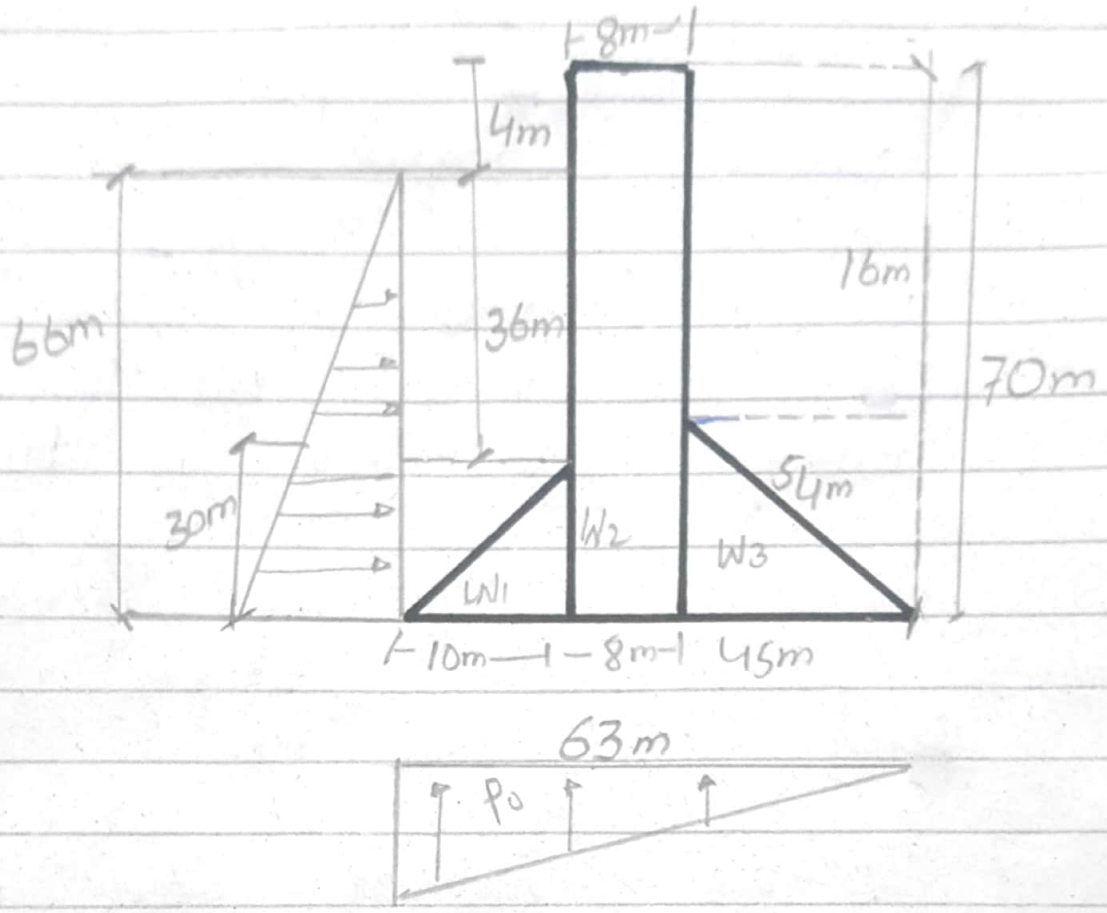
1) Straight Drop Spillway
2) Ogee Spillway
3) Shaft Spillway
4) Chute Spillway
5) Side Channel
6) Siphon Spillway
7) Labyrinth Spillway

In a condition where freezing point of water is less than -10 degree Centigrade in winters the most efficient Spillway is Chute Spillway Because chute Spillway disposed water from upstream to the downstream Through a 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 dissipators are also prouded in this type of spillway thus the Temperature of water will go high and it will not allow water to freeze and stop. So the will move freely in this cold area.

Q NO # 3

DESIGN A GRAVITY DAM :-



- Assume unit wt for Concrete = 24 KN/m³
- Assume unit wt for water = 10 KN/m³

N/O W Moment force Calculation

Forces	Force formula	Fv(KN)	FH(KN)	Lever Arm (m's)	Mr	Mo
W_1	½ L×W×γd	3600	0	56.33	202800	0
W_2	L×W×γd	13440	0	49.00	658560	0
W_3	½×L×W×γd	2916.0	0	30.00	874800	0
P_{V_1}	½×L×W×γd	1500	0	59.67	89500	0
P_{V_2}	L×W×γd	3600	0	58.00	208800	0
Pv	(-(½)×L×W×γw	-2079.0	0	42.00	0	873180
Pn	(-½)×L×W×γw	0	-2178.0	22.00	0	479160
	Σ	30510	-21780	Σ	2034460	1352340

For Factor of Safety Against Tension

Condition → $e < B/6$ → $B/6 = 10.50\ m$

eccentricity of the resultant force

$\Rightarrow e = B/2 - \bar{x} \longrightarrow (1)$

$\Rightarrow \bar{x} = 22.36$

Put value in equ- (1).

So $e = 63/2 - 22.36$

$e = 9.14\ m$

Condition → Safe in tension OK

P.T.O

For Factor of Safety Against Stress

→ Condition → $\gamma_{Heel} > 0$

NOW

$$\gamma = (\Sigma F_V / B)(1 \pm 6e/B) \rightarrow (A)$$

NOW from Eq (A) we get

$$\gamma_{Toe} = (\Sigma F_V / B)(1 + 6e/B)$$

$$\gamma_{Toe} = (30510/63)(1 + 6 \times 9.14/63)$$

$$\gamma_{Toe} = 905.97128 \ KN/m^3$$

&

$$\gamma_{Heel} = (\Sigma F_V / B)(1 - 6e/B)$$

$$= \left(\frac{30510}{63}\right)\left(1 - \frac{6 \times 9.14}{63}\right)$$

$$\gamma_{Heel} = 62.72 \ KN/m^3$$

Condition → Safe in Stress → ok

For Factor of Safety Against overturning :-

Condition → $(\Sigma M_r / \Sigma M_o) > 2$

Put value.

$\Rightarrow \frac{2034460}{1352340} = 1.50 < 2$

Condition Not Safe in Overturning [Not ok]

⇒ Condition $\Sigma M_r > \Sigma M_o$

$\Sigma M_r = 2034460$

$\Sigma M_o = 1352340$

Condition → Safe → OK.

For factor of Safety Against Sliding.

Condition = $\frac{(\mu \Sigma F_v + BQ)}{\Sigma F_H} > 1$

We know that ⇒ $\mu = 0.7$ & $Q = 1400$

Put value.

$= \frac{(0.7 \times 30510 + 63 \times 1400)}{21780}$

$= 5.03 > 1 \Rightarrow$ Condition Safe in Sliding