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Subject

Hydraulic Structure

Submitted to

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①

Q.No: 1

Part (a)

Reservoir:

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 the words interchangeably. However, the key difference is that reservoirs are artificial and made by humans, while lakes are naturally occurring bodies of water. Reservoirs are great because they provide a supply of water for when naturally occurring bodies of water, like lakes or rivers, run dry.

Main Types of Reservoir:

There are three main types of reservoir,

Bank-side Reservoir

Valley-dammed reservoir

Service reservoir

More economical reservoir: ~~is~~ a

In all above reservoir Bank Side reservoir is most economical.

Bank Side reservoir is that which is made by diverting water from local reservoirs or streams to an existing reservoir. It is economical because in this only water is diverted from a local river. There is no need of large construction of reservoir only construction is done for diversion of water.

Q. No 1

Part (b)

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 or other materials which is not available in hilly areas. because there are more chances of rains in mountain areas and Rockfill dam does not allow water to pass through embankment as compared to earthfill embankment in which water may Penetrate. It is also called ^{gravity} rigid structure which are easily to build and they are self supported by their ^{rigid structure} weights.

Q: 2

Ans: Spillway:-

A spillway is a hydraulic structure built at a dam site for diverting the surplus water from a reservoir after it has been filled to its maximum capacity. Spillways are classified into different types on the basis of the arrangement of control structure; following are the most commonly used spillway

- Side channel Spillway
- Labyrinth Spillway
- chute Spillway
- Shaft Spillway
- Ogee Spillway (More efficient)
- Straight Drop Spillway
- Siphon Spillway

Spillway More Efficient in condition
Where Freezing Point of Water is
Less than -10°C in Winter

OGEE SPILLWAY:

Saline water have Freezing
Point less than -10 centigrade in
Winter so the dam constructed on
river with high salinity is
mostly concrete Gravity dam. For
concrete gravity dam ogee spillway
are often most commonly used,
and is located within the dam
body hence whenever there there
is surplus water it will be
freely disposed of through ogee
spillway along its ogee shaped
crest.

Why:

As the Spillway is an improved form of drop Spillway and also it is most commonly used in concrete gravity dam.

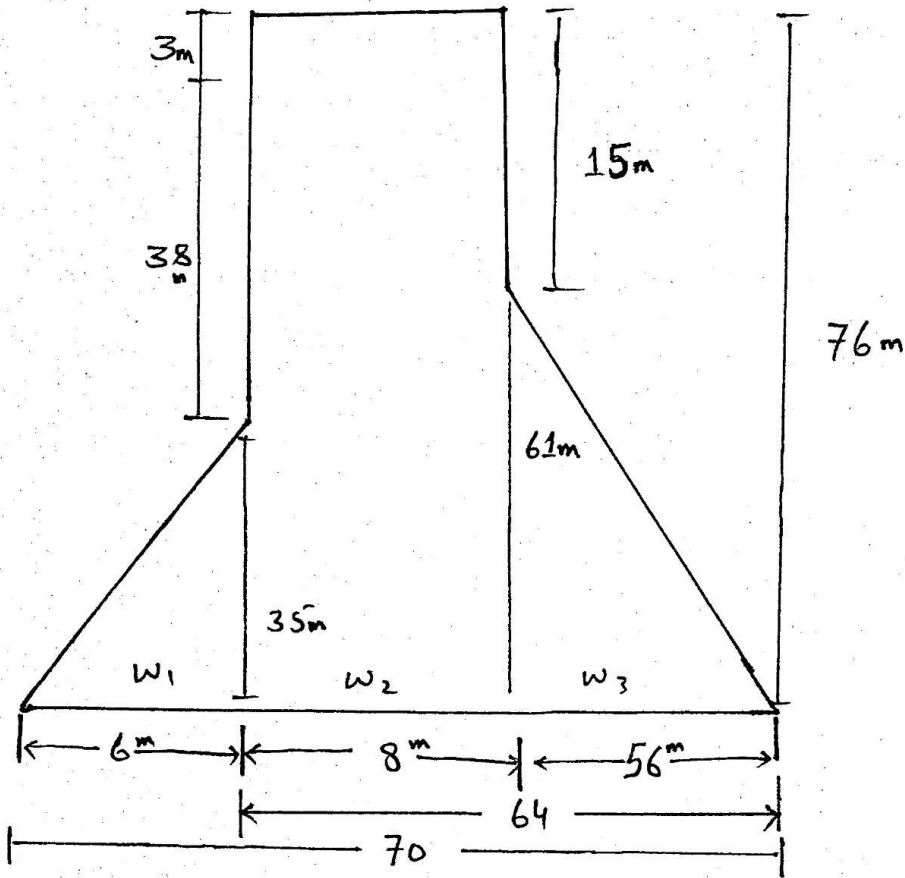
Following are the key features.

- Ogee Spillway is an improved have very high discharging efficiency
- Have stable overflow pattern.
- Easy Pass Floating debris.

"Chute Spillway" is also efficient. It disposed water from upstream to the downstream through a steeply sloped open channel so that the flow will be very fast the following

Water Pressure will be high and
will be in Supercritical
condition.

④



Force	Force calculation	FV	FH	L.A	M _y	M _o
W ₁	$\frac{1}{2} \times 6 \times 35 \times 24$	2520		$64 + \frac{6}{3} = 66$	166320	
W ₂	$8 \times 76 \times 24$	14592		$56 + \frac{8}{2} = 60$	875520	
W ₃	$\frac{1}{2} \times 56 \times 61 \times 24$	40992		$56 \times \frac{2}{3} = 37.3$	1530231.36	
P _{V1}	$\frac{1}{2} \times 6 \times 35 \times 10$	1050		$64 + \frac{2 \times 6}{3} = 68$	71400	
P _{V2}	$6 \times 38 \times 10$	2280		$64 + \frac{6}{2} = 67$	152760	
P _V	$-\frac{1}{2} \times 70 \times 73 \times 10$	-2550		$70 \times \frac{2}{3} = 46.66$		1192163
P _H	$-\frac{73^2}{2} \times 10$		-26645	$73 \times \frac{1}{3} = 24.3$		647473.5
		ΣF_V	ΣF_H		ΣM_y	ΣM_o
		35884	26645		2796231.36	1839636.5

(2)

$$\Sigma FV = 35884$$

$$\Sigma FH = 26645$$

$$\Sigma M_v = 2796231.36$$

$$\Sigma M_o = 1839636.56$$

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

$$\bar{x} = \frac{2796231.36 - 1839636.56}{35884}$$

$$\bar{x} = 26.65 \text{ m}$$

$$e = 70/2 - 26.65$$

$$e = 8 \text{ m}$$

Condition

$$e < \frac{B}{6}$$

$$8.35 < 70/6$$

$$8.35 < 11.6 \quad \text{OK safe}$$

$$\gamma_{\text{net}} = 0$$

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

$$\gamma_{\text{toe}} = \frac{35884}{70} \left(1 + \frac{6(8.35)}{70} \right)$$

③

$$\gamma_{toe} = 879.52$$

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

$$\gamma_{Heal} = 145.732$$

$$\gamma_{toe} \text{ \& } \gamma_{Heal} > 0$$

OK safe

$$\frac{\sum M_L}{\sum M_0} = \frac{2796231.36}{1839636.5}$$

$$1.51 < 2 \quad \text{Not safe}$$

$$\sum M_L > \sum M_0$$

$$2796231.36 > 1839636.5$$

OK safe ✓

$$\frac{u \sum FV + B \times Q}{\sum FH} > 1$$

$$\frac{0.75 \times 35884 + 70 \times 1400}{26645}$$

$$4.68 > 1 \quad \text{safe } \checkmark$$