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Section = "A"

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Paper = Hydraulic Structure-

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④

NO1:- @

Define reservoir also explain which types of reservoir will be more economical & why?

A reservoir is a man-made lake or large freshwater body of water - Many people think of a reservoir as a lake & might even use the words interchangeably - However, the key difference is that reservoirs are artificial & made by human, while lakes are naturally occurring bodies of water.

Mainly Three types of reservoir;

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

In the above types of reservoir, In this types of reservoirs, the service reservoirs are the most economical because, they are entirely man-made. Their frame construction is early to as well as no need of any natural water body diversion.

(2)

NO 1 (b)

Which types of Embankment dam you will suggest in a hilly area & why-?

Ans:

There are types of embankment dams - Earth fill embankment & Rock fill embankment earth fill embankment are the one which consist of 50% or more soil while the rock fill embankment are the one which consist of 50% or more rock - if we have to build an embankment in a hilly area, we should build rock fill embankment because rock fill embankment have more strength than earth fill embankment & in hilly area rock will be easily available, which will make our project economical & sure.

(3)

NO2r

List down different types of spillway also mention which types of spillway will be more efficient in a condition where freezing point is less than -10 degree centigrade winter & why?

⇒ Types of spillway are the following-

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

In a condition where freezing point of water is less than -10 degree centigrade in winter the most efficient spillway is chute spillway. Because chute spillway disposed water from upstream to the downstream through a steeply sloped open channel so that the flow will be very fast.

The flowing water pressure will be high & will be in supercritical condition.

That will dissipate energy from the falling water, energy dissipate are also provide in this types of spillway. Thus. The temperature of water will go high & it will not allow water to freeze & stop.

(3) (5)

Condition:

$$e < B/6$$

$$e < 69/6$$

$$7.16 < 11.5 \text{ OK safe.}$$

$\gamma_{heel} > 0$.

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

$$\gamma_{toe} = \frac{\sum F_v}{B} \left(1 + \frac{6e}{B} \right) \Rightarrow \frac{34392}{69} \left(1 + \frac{6(7.16)}{69} \right)$$

$$\gamma_{toe} = 808.76 \text{ kN/m}^2$$

$$\gamma_{heel} = \frac{\sum F_v}{B} \left(1 - \frac{6e}{B} \right) \Rightarrow \frac{34392}{69} \left(1 - \frac{6(7.16)}{69} \right)$$

$$\gamma_{heel} = 188.10 \text{ kN/m}^2$$

$\gamma_{heel} > 0$ OK safe.

$$\frac{\sum M_x}{\sum M_o} > 2$$

$$\sum M_o$$

$$= \frac{2622163.8}{1681750.0}$$

$$= 1.56 > 2 \text{ No safe.}$$

$$\sum M_x > \sum M_o$$

$$2622163.8 > 1681750.0 \text{ safe.}$$

$$\frac{4\sum F_v + B \times q}{\sum F_H} > 1$$

② ⑤ ⑥

Forces	Force calculation	Fv	FH	L.A	Mv	Mo
w ₁	$\frac{1}{2} \times 6 \times 33 \times 24$	2376		$63 \times \frac{6}{3} = 65$	15440	
w ₂	$8 \times 73 \times 24$	14016		$55 \times \frac{8}{2} = 59$	820944	
w ₃	$\frac{1}{2} \times 55 \times 59 \times 24$	38940		$55 \times \frac{7}{2} = 36.57$	142792.98	
Pv ₁	$\frac{1}{2} \times 6 \times 33 \times 10$	990		$63 + \frac{2 \times 6}{3} = 67$	66330	
Pv ₂	$6 \times 37 \times 10$	2220		$63 + \frac{6}{2} = 66$	146520	
Pu	$-\frac{1}{2} \times 69 \times 70 \times 10$	-24150		$69 + \frac{6}{2} = 46$		1110900
Pu	$-\frac{70^2}{2} \times 10$		-24500	$70 \times \frac{1}{3} = 23.3$		570850

$$\Sigma F_v = 34392 \quad \Sigma F_H = 24500 \quad \Sigma M_v = 2622163.8 \quad \Sigma M_o = 1681750$$

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

$$\bar{x} = \frac{2622163.8 - 1681750 \cdot 0}{34392}$$

$$\bar{x} = 27.34 \text{ m}$$

$$e = \frac{69}{2} - 27.34$$

$$e = 7.16 \text{ m}$$

7

9

10

$$0.75 \times 34392 + 69 \times 1400$$

$$24500$$

4.99 > 1. OK safe..