(1)

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QNO(1);

(a) Define reservoir also explain which type of reservoir will be more economical and why?

Ans * Reservoir;

The word reservoir refers to place where large amount of water get stored. It can also be used to describe great amount of other things, such as when you refer to trivia expert as a reservoir of useless knowledge

OR

A reservoir is man made lake or large fresh water body of water. Many people think of a reservoir as a lake and might even use the word interchangeably. However the key difference is that reservoir are artificial and made by humans.

* Service reservoir is more economical because service reservoir perform several functions including ensuring sufficient head of water in the water distribution system and providing water capacity to even out of peak demand from consumers enabling the treatment plant to run at optimum efficiency. Large service reservoir can also be managed to reduce the cost of pumping because service reservoir constructed at high elevation.

(b) Which type of embankment dam you will suggest in a hilly area and why?

Ans; I will suggest rock fill embankment dam for hilly areas because,

(1) Rock fill dam is constructed from impervious material such as made of masonary, concrete, asphalt

concrete, sheet pile and transition layer. etc. The impervious membrane is employed as a waterproof and can be placed either within embankment or on the upstream side.

(2) In hilly areas the chance of rain is maximum because due to its altitude. So if we construct earth fill embankment dam the maximum capacity or intensity of rain will demage its downstream of earth fill dam So because of this reason I suggest to construct rock fill dam in hilly areas.

(3) Structural failure of rock fill dam is 15 % and structural failure of earth fill dam is better 25 %. It is because due to the quality of material is better than that of earth fill dam. Therefore I will suggest to construct rock fill dam because in hilly areas a compared with earth fill dam.

because re-construction of dam in hilly areas is quite difficult and costly if structure failure occur.

(4) Earth fill dam is relatively small in height as compared to rock fill embankment dam. Earth fill embankment dam is failed in foundation because it construct on all type of foundation. While rock fill embankment dam is construct on hard foundation. Sliding in foundation may occur more in earth fill dam as compared with rock fill dam. Therefore I will suggest to construct rock fill dam in hilly areas.

QNO(2);

List down different type of spillways will be more efficient in a condition where freezing point of water is less than -10°c degree centigrade in winter why?

Ans Types of Spillays~

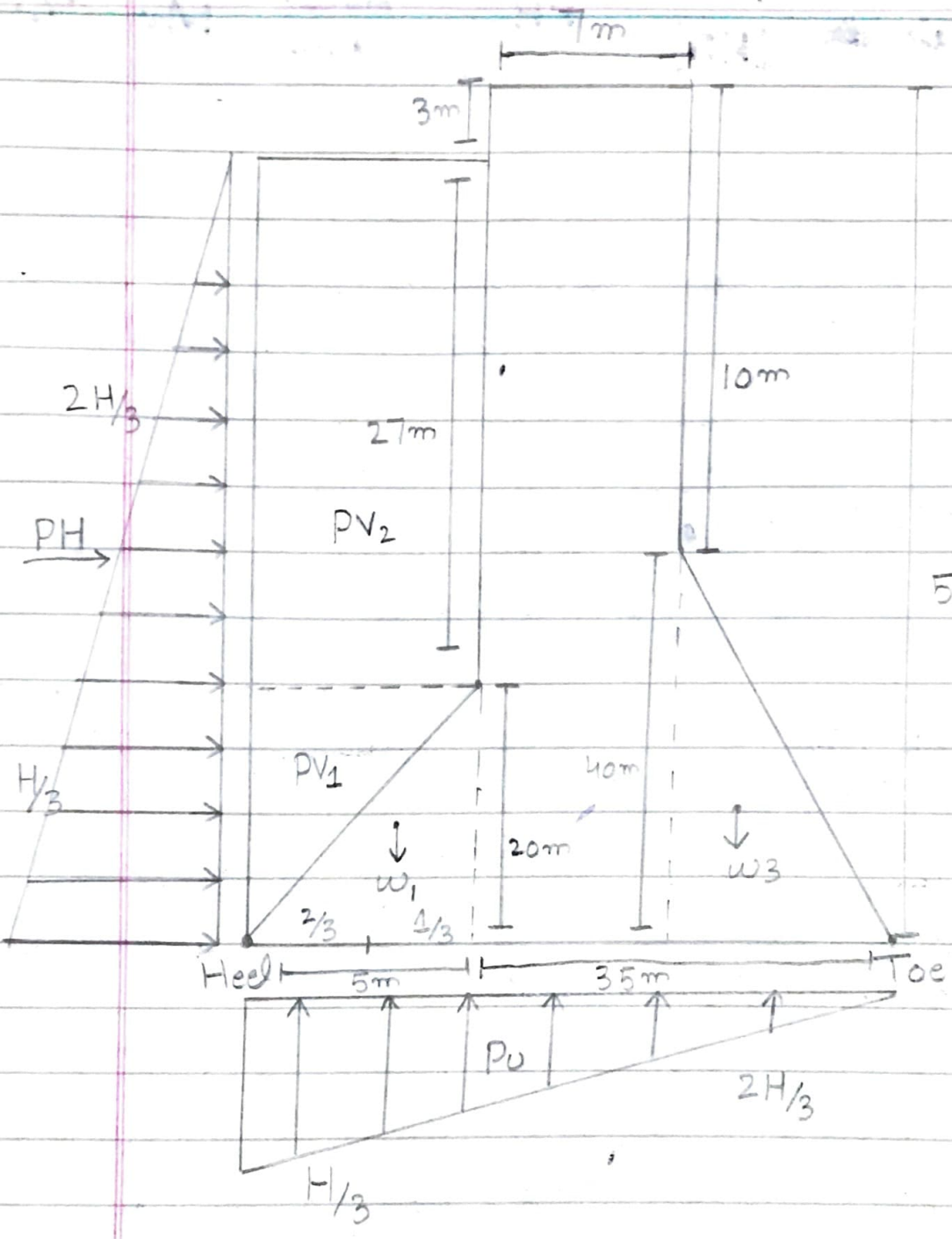
(1) Straight drop spillway.
(2) Ogee spillway.
(3) Shaft spillway.
(4) Chute spillway.
(5) side channel spillway.
(6) Siphon Spillway.
(7) Labyrinth Spillway.

→ In condition where freezing point of water is less then -10 degree centigrade in winters the most efficient spillway is chute spillway. Because chute spillway disposed waters from upstream to downstream 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 are also provided in this type of spillway. Thus the temprature of water go high and it will not allow water to freeze and stop - so this wates will move freely in this cold area.

QNO(3);

Design the gravity dam by assuming the dimensions. Find all the stabillity checks at least three of them must be in a safe condition and economical. In reservoir full condition considering weight of dam, water pressure and uplift pressure?



Given data

$\gamma_d = 24\ KN/m^3$

$\gamma_w = 10\ KN/m^3$

Forces	Force calculation	F_V (kN)	F_H	Lever arm	M_r	M_o
W_1	$\frac{1}{2} \times 5 \times 20 \times 24$	3000		$35 + \frac{1}{3} \times 5 = 36.67$	110010	
W_2	$7 \times 50 \times 24$	8400		$28 + \frac{7}{2} = 31.5$	264600	
W_3	$\frac{1}{2} \times 28 \times 40 \times 24$	13440		$28 \times \frac{2}{3} = 18.67$	250924.8	
P_{V_1}	$\frac{1}{2} \times 5 \times 20 \times 10$	500		$35 + \frac{2}{3} \times 5 = 38.33$	19165	
P_{V_2}	$27 \times 5 \times 10$	1350		$35 + 5/2 = 37.5$	50625	
P_U	$-\frac{1}{2} \times 40 \times 47 \times 10$	-9400		$40 \times \frac{2}{3} = 26.67$		250698
P_H	$-\frac{(47)^2}{2} \times 10$		-11045	$47 \times \frac{1}{3} = 15.67$		173075.15
		$\Sigma F_V = 17290$	$\Sigma F_H = 11045$		$\Sigma M_r = 695324.8$	$\Sigma M_o = 423773.15$

→ **Essentricity of resultant force;**

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

$$\bar{x} = \frac{\Sigma M_r - \Sigma M_o}{\Sigma F_v} = \frac{6975324.8 - 423773.1}{17290}$$

$$\boxed{\bar{x} = 15.70\,m}$$

$$\boxed{e = \frac{40}{2} - 15.7 = 4.3\,m}$$

→ Factor of safety against tension

$$e < B/6$$

$$e < 40/6$$

$$\boxed{e < 6.67}$$ safe in tension.

* **Stress Yheel > 0**

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

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

$$\gamma_{toe} = \frac{17290}{40}\left(1 + \frac{6 \times 4.3}{40}\right)$$

$$\boxed{\gamma_{toe} = 664.55}$$

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

$$\gamma_{heel} = \frac{17290}{40}\left(1 - \frac{6 \times 4.03}{40}\right)$$

$$\boxed{\gamma_{heel} = 158.78}$$ Ok Safe

* **Factor of safety against Overturning.**

$$\frac{\Sigma M_r}{\Sigma M_o} \geq 2$$

$$\Rightarrow \frac{695324.8}{423773.15}$$

$$= 1.64$$ Not Safe

$$\Sigma M_r > \Sigma M_o$$

$695324.8 > 423773.15$ Ok Safe.

* **Factor of safety against sliding;**

$\mu = 0.7$

$q = 1400$

(0.65 to 0.75)

$$\frac{\mu \Sigma F_V + B \times q}{\Sigma F_H} > 1$$

$$\frac{0.7 \times 17290 + 4 \times 1400}{11045}$$

$$= 6.17 > 1 \quad (\text{OK Safe})$$