

"Hydraulic Structures"

Submitted by :- Muhammad Usama

I-D :- 7731

Section :- A

Submitted to :- Engr Azeed Khan

Question # (1) Part "A"

Answer: "Reservoirs"

Reservoir is define as "A large natural or artificial lake Used as a source of water supply.

OR.

"A reservoir is a man-made lake or large fresh water body of water. Many people think of reservoirs as a lake and might even use of the words interchangeably. However the key difference is that reservoirs are artificial and lakes are naturally.

Following type of reservoirs are.

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

In above three types of reservoirs, Service reservoirs is most economical because they are entirely made by man. His frame construction is easily as

Well as no need of any natural water body diversion.
It also required small space.

Question # ① Part B

Answer :- Types of Embankment Dam

Types of embankment dam are (Earth fill) embankment and (Rock fill) embankment.

- Earth fill embankment are the one which consist of 80% or more soil while rock fill embankment are the one which consist of 50% of rock or more.
- If we have to build an embankment in hilly area, we should build rock fill embankment because rock fill embankment have more strength than earth fill embankment and in hilly area rock will be easily available. which will make over project economical and safe.

Answers:-

Types of spillways

Types of spillways are as following;

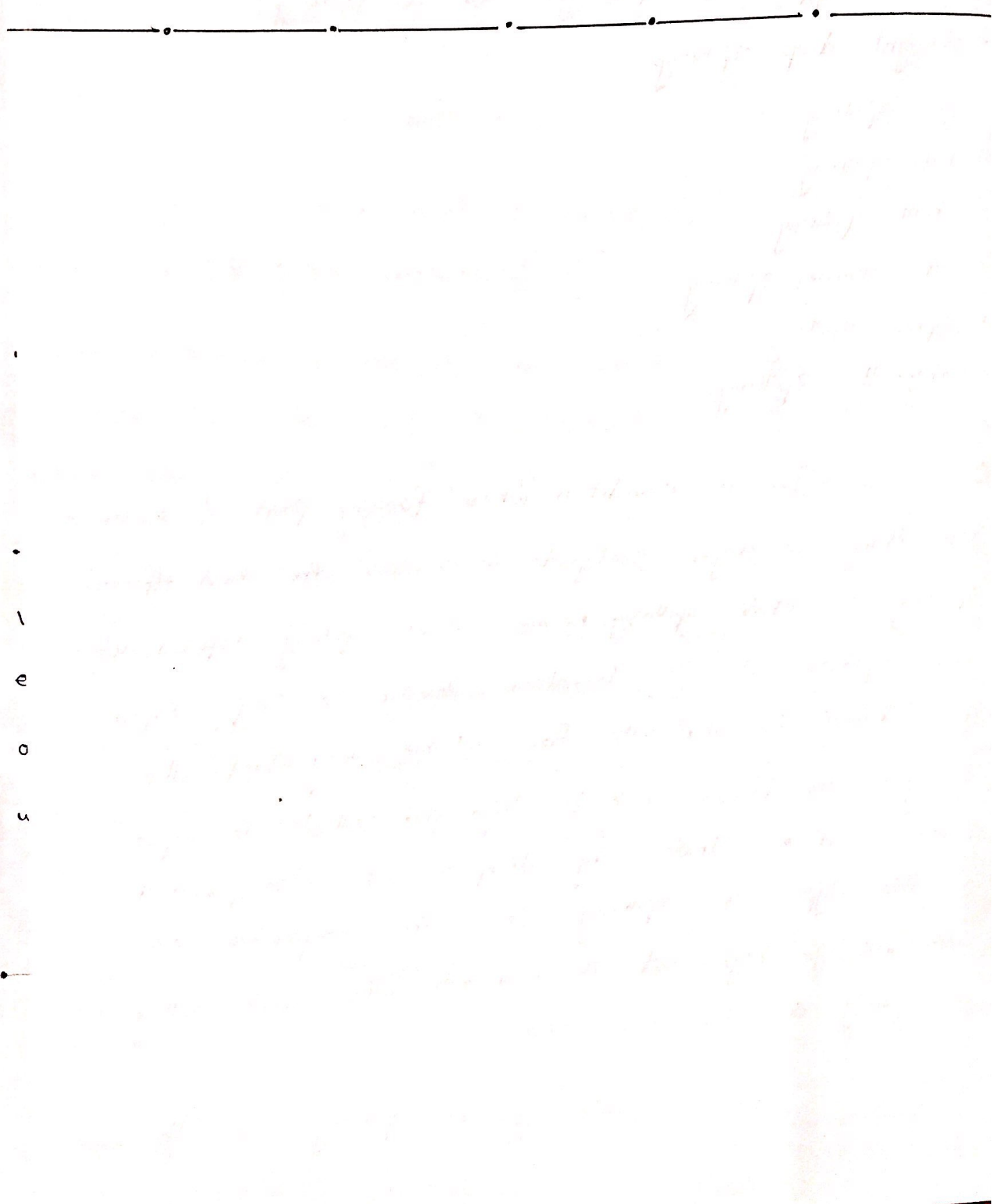
- Straight drop spillway.
- Ogee spillway.
- Shaft spillway.
- Chute spillway.
- Side channel spillway.
- Siphon spillway.
- Labyrinth spillway.

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 steeply sloped open channel so that the flow will be very fast the flowing water pressure will be high and will be in super critical condition. That's why dissipaters are also provided in this type of spillway thus the temperature of water will go high and it will not allow water will go move freely in this cold area.

Also in this type of spillways as the water

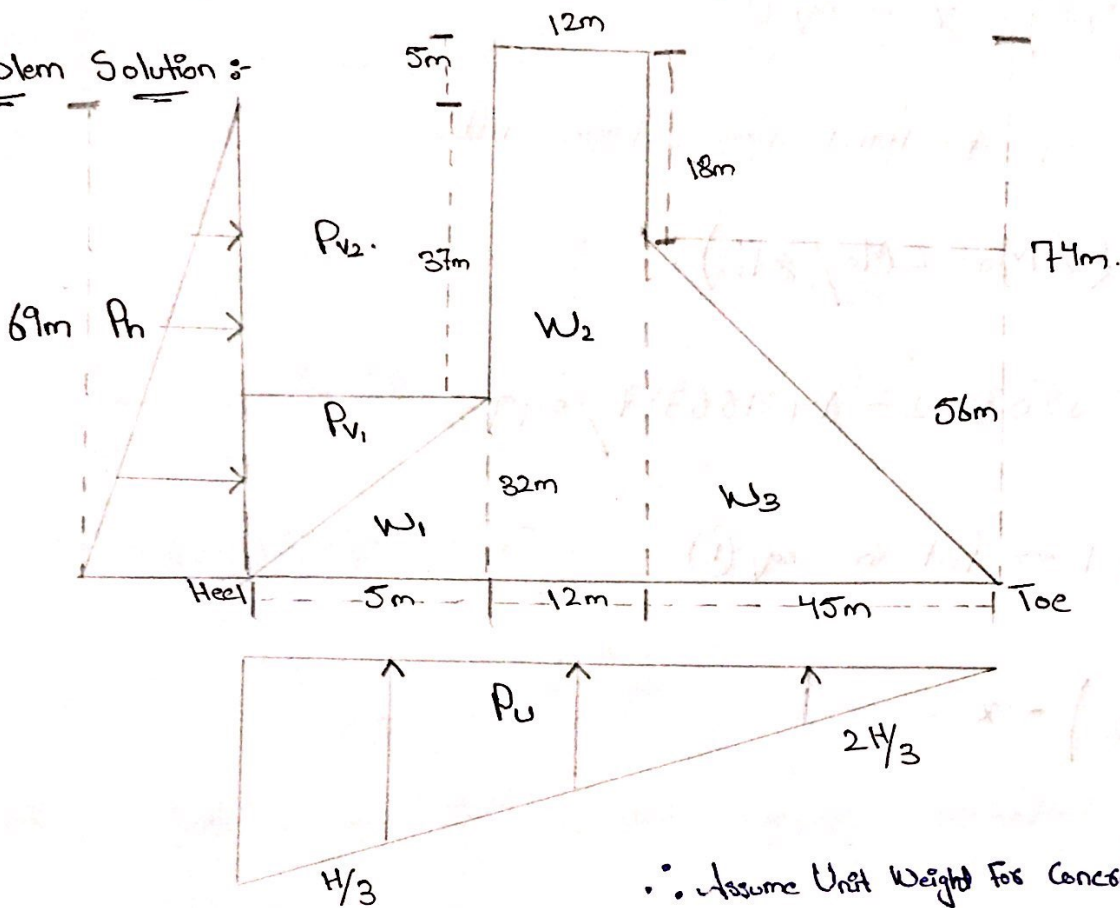
Flow from ~~steep~~ channel so that the kinetic energy
will take place and increases the temperature of water.

2000



Design a gravity dam by assuming the dam dimensions ?

Problem Solution :-



∴ Assume Unit Weight For Concrete = 24 kN/m³

Assume Unit Weight For Water = 10 kN/m³

Force	Force calculation	F _y	F _x	Lever Arm	M _x	M _o
• W ₁	(1/2) × L × W × γ _d	1920	0	58.66	112627.2	-
• W ₂	L × W × γ _d	21312	0	51	1086912	-
• W ₃	(1/2) × L × W × γ _d	30240	0	30	907200	-
• P _{v1}	(1/2) × L × W × γ _w	800	0	60.33	48264	-
• P _{v2}	L × W × γ _w	1850	0	59.5	110075	-
• P _u	-(1/2) × L × W × γ _w	-21390	0	41.33	0	884048.7
• P _h	-(1/2) × L × W × γ _w	0	-23805	23	0	547515
		ΣF _y = 34732	ΣF _x = -23805		2265078.2	1431563.7

• Eccentricity of the Resultant Force :-

$$e = (B/2) - \bar{x} \quad \text{--- eq (1)}$$

\bar{x} = location of Resultant Force from table.

$$\bar{x} = (\sum M_x - \sum M_o) / \sum F_v$$

$$\bar{x} = 2265078.2 - 1431563.7 / 34732$$

$$\bar{x} = 23.1 \rightarrow \text{Put in eq (1)}$$

$$e = (b/2) - \bar{x}$$

$$e = 7.9$$

• For Factors of Safety Against Tension Condition $e < B/6$.

$$e < B/6$$

$$B/6 = b/3 = 10.33$$

So $e < B/6$ condition is satisfied "Safe"

• Factors For Safety Against stress.

Condition $\sigma_{Toe} > 0$

$$\sigma_{Toe} = (\sum F_v / B) (1 \pm (be / B)).$$

$$\sigma_{Toe} = (\sum F_v / B) (1 + (be / B)).$$

$$\sigma_{Toe} = (34732/62) (1 + (6(7.9)/62)).$$

$$\sigma_{Toe} = 988.46 \text{ KN/m}^3.$$

$$\sigma_{Heel} = (\sum F_v/B) (1 - (6e/B)).$$

$$\sigma_{Heel} = (34732/62) (1 - (6(7.9)/62)).$$

$$\sigma_{Heel} = 131.91 \text{ KN/m}^3.$$

So condition is satisfied.

• Condition for Factor of Safety against Overturning.

$$(\sum M_s / \sum M_o) > 2$$

$$= (2265078.2 / 1431563.7)$$

$$= 1.58 < 2 \quad \text{not safe.}$$

So $\rightarrow (\sum M_s > \sum M_o)$.

$$\sum M_s = 2265078.2$$

$$\sum M_o = 1431563.7$$

Condition Satisfied So Safe. \Rightarrow

• Fos Factor of Safety Against Sliding.

81

$$\text{Condition } \frac{(\mu \Sigma F_v + B \times q)}{\Sigma F_h} > 1$$

$$= \frac{(0.7 \times 34732 + 62 \times 1400)}{34732}$$

$$\therefore q = 1400$$

$$\mu = 0.7$$

$$= 3.199 > 1 \quad \text{So Condition Satisfied.}$$