Name Asfandyar Anwar

ID 7274

Subject Hydraulic structure

Teacher Engr, Adeed-

Date 20, 8, 2020.

Batch 2013

Mid exam

Q1 Define reservious.
(a)

* A natural or artificial place where water is collected and stored for use, especially water for supplying a community irrigating land, furnishing power etc.
* A receptacle or chamber for holding a liquid or fluid.
* A place where any thing is collected or accumulated in great amount
* A large or extra supply or stock reserve.

A reservoir is most commonly, an enlarged natural or artificial lake, pond or

impoundment created using a dam or lock to store water.

Reservirs can be created in a number of ways, including controlling a watercourse that drains an existing body of water, interrupting a watercourse to form an embayment within it, through excavation or building any number of retaining walls or levees.

which type of reservioir will be more economical and why?

* Coastal reservoirs:

As the land based reservoir construction is fraught with substantial land submergence, coastal reservoir is preferred economically

and technically since it does not use scarce land area, Many coastal reservoirs were constructed in asia and Europe.

(b) Which type of Embankment dam you will suggest in a hilly area.

There are three principal types of dams used for hydropower projects: concrete dams, arch dams and embankment dams. The simplest of these and the cheapest to construct in the embankment dam.

Embankment dams come in two principal varieties, earthfill embankment dams and rockfill embankment dams.

An earth fill embankment dam is made by building a foundation wall which

is embedded into the rock below the dam to prevent water flowing beneath it and then creating a core of impermeable clay on ~~the~~ top of this.

Earth Fill Embankment:

These may be classified as dam use compacted soil for construction the bulk of the dam vol. An earth fill dam is constructed primarily of selected engineering soil compacted uniformly and intensively in the relatively thin layers and at a controlled moisture content. An ~~em~~ embankment may be categorized as an earthfill dam if compacted soils account for over 50% of the placed volume of material.

Q2. List down different types of spillways

① Straight Drop spillway:

A straight drop spillway consists of low height weir wall having its downstream face roughly or perfectly vertical when the water level in the reservoir rises above the normal pool level the surplus water freely from the crest of the weir and hence it is know as straight drop spillway or free over fall spillway.

2, Ogee-shaped spillway:

An ogee-shaped spill way is the Most commonly used spillway. it is widely used with gravity dams, arch dams and buttress dam. several earth and Rock fill dams are also provided with this type of spillway as a superstructure.

3 Shaft spillway:

A shaft spill way consist of a horizontal crest and vertical shaft, with its top surface at the crest of the spillway and its lower end connected to a vertical shaft. The other end of the vertical shaft is connected to a horizontal or tunnel which extends

through or around the dam and carries the water to the river downstream. A shaft spillway is used at the sites when the conditions are not favorable for an overflow or a chute spill-way.

④ Chute spillway:

Chute spillway is a type of spillway in which surplus water from upstream is disposed to the downstream through a steeply sloped open channel. It is generally constructed at one end of the dam, or separately away from the dam in a natural saddle in a bank of the river.

5) Side channel spillway.

Side channel spillway is similar to chute spillway but the only difference is the crest of side channel spillway is located on one of its side whereas crest of chute spillway is located between the side wall.

6) Siphon spillway:

A siphon spillway is a type of spillway in which surplus water is disposed to downstream through an inverted u shaped conduit, it is generally arranged inside the body or over the crest of the dam.

In both types of siphon spillways air vents are provided at the bent portion of the upper passageway to prevent the entrance of water when the water level is below the normal pool level.

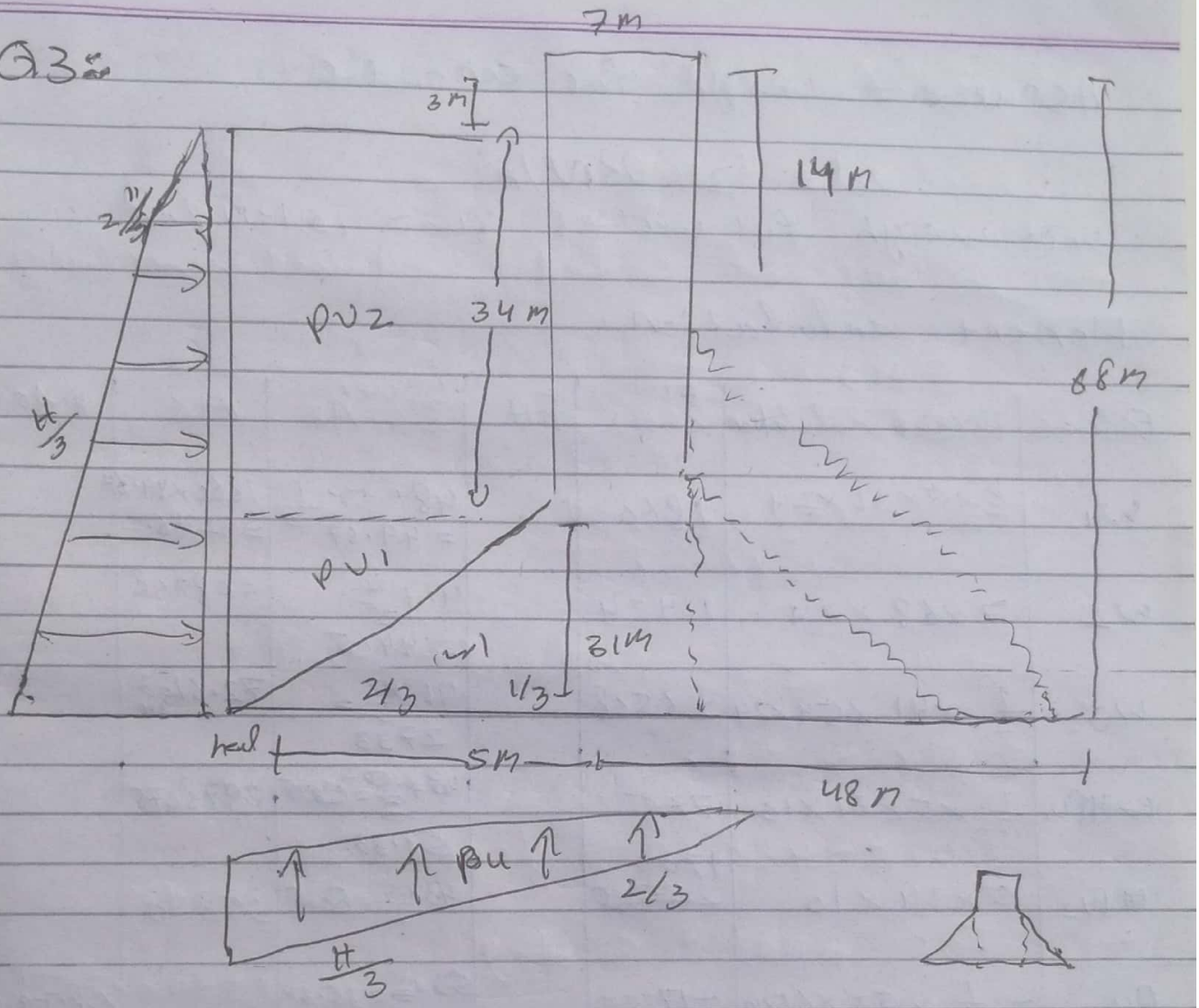
7) Labyrinth spillway:

A Labyrinth spillway is the type of spillway in which the weir wall is constructed in a zig-zag manner in order to increase the effective length of the weir crest with respect to the channel width. This increase in effective length raises the discharge capacity of the weir and hence water flow at small heads can be conveyed to the downstream easily.

which type will be more effected.

Prefed ogee spillway and chute spillway which is more effected in condition of where freezing point of water is loss than ~~0~~ – 15 degree in winter because these two spillway slope is more then the other.

Q3:



Assume = weigh for concrete

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

unit weigh for water $\gamma_w = 10\ kN/m^2$

Moment calulation.

Forces	Forces calulation	FU (kN)	FH	Lever C.A2	MR	MO
W_1	$\frac{1}{2} \times 5 \times 31 \times 24$	1860		$48 + 5 \times \frac{1}{3} = 49.67$	$1860 \times 49.67 = 92386.2$	
W_2	$7 \times 68 \times 24$	11424		$41 + \frac{7}{2} = 44.5$	508368	
W_3	$\frac{1}{2} \times 41 \times 54 \times 24$	26568		$41 \times \frac{2}{3} = 27.33$	$72.61 a^3_{44}$	
~~W_4~~ P_{U_1}	$\frac{1}{2} \times 5 \times 31 \times 10$	775		$48 + \frac{5^2}{3} = 51.33$	3978075	
P_{V_2}	$5 \times 34 \times 10$	1700		$45 \times \frac{5}{2} = 80.5$	858.50	
P_u	$-\frac{1}{2} \times 53 \times 65 \times 10$	−17225		$53 \times \frac{2}{3} = 35.33$		6086525
P_H	$-\frac{65^2}{2} \times 10$		−21125	$\frac{65}{3} = 21.67$		457778.75
		$\Sigma FU = 25102$	$\Sigma FH = 21125$		$\Sigma MR = 1452488.39$	$\Sigma MU = 1061338$

Eccenricty of the resultant force

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

∴ $\bar{x}$ location of resultant force from toe.

$$\bar{x} = \frac{\Sigma M_R \; \Sigma M_O}{\Sigma F_V}$$

$$\bar{x} = 145248.39 - 106633.8 / 25102$$

$$\bar{x} = 15.3 m$$

$$e = \frac{B}{2} - \bar{x} = \frac{53}{2} - 15.38$$

$$e = 11.12 m$$

Factor of safety Against Tension.

condition $e < B/6$

$$e < \frac{53}{6}$$

$11.12 < 8.83$ Not OK

stress wheelze

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

$$\gamma_{toe} = \frac{\Sigma F_V}{B}\left(1 + \frac{6e}{B}\right) = \frac{25102}{53}\left(1 + \frac{6 \times 11.12}{53}\right)$$

$$= 1069.8 \; kN/m^2$$

$$\gamma_{heel} = \frac{\Sigma F_V}{B}\left(1 - \frac{6e}{B}\right) = \frac{25102}{53}\left(1 - \frac{6 \times 11.12}{53}\right)$$

$= -122.6\ KN/m^3$

Wheel is not safe.

→ Factor of safety against overturning

$$\frac{\Sigma M_U}{\Sigma M_O} > 2$$

$$= \frac{1452488.39}{106338}$$

$= 1.36 < 2$ Not safe Faild

$\Sigma M_Y > \Sigma M_O$

$1452488.39 > 106338$

ok safe

→ Fos against Sliding

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

$(0.65 + 0.75)$
$\mu = 0.7$
$Q = 1400$

$$= \frac{0.7 \times 25102 + 53 \times 1400}{21125}$$

$= 4.34 > 1$ safe