Day. M T W T F S Date: __/__/__

Name: Muhammad Hamza

ID # 7692

Section: A

Subject: Hydrualic Structures

Department: BE(C)

Instructor: Engr. Adeed

Name: Muhammad Hamza
ID # 7692

Day: M T W T F S

Date: __/__/__

Q.No (01)
(a).
ANSWER:-

A water supply scheme drawing water directly from a river or a stream may fail to satisfy the consumers demands during extremely low flows, while during high flow it may become difficult to carry out its operation due to devastating floods, a barrier in the form of dam is, therefore constructed across the river, so as to form a pool of water on the upstream side of the dam is known as a reservoirs.

As there are three types of reservoirs,

- valley-dammed reservoir.
- Bank-side reservoir.
- Service reservoir.

★ Service reservoir is the most ecnomical reservoir because it

Name: Muhammad Hamza
ID # 7692

Day. M T W T F S Date: __/__/__

is entirely man made. As we are familiar with the large water towers in the country side so the cost for these type of reservoir is very much low than the valley-dammed and bank side reservoir. Also construction is easy and takes very much less time as compared to the other two types.

Q. No (01)
(b).
ANSWER:-

As we know there are two types of embankment dams, earthfill embankment and rockfill embankment. Earth fill are those which contains more than 50% of compacted soils and rock fill contain more than 50% of rocks. So in Hilly areas Rock fill embankments are suggested. Because in Hilly

Name: Muhammad Hamza
ID # 7692

Day. M T W T F S Date: __/__/__

area rock is easily available and also rockfill embankment has more strength and will have more durable and safe as compared to earth fill embankments. Also their cost is low in that area because of the availability of rocks.

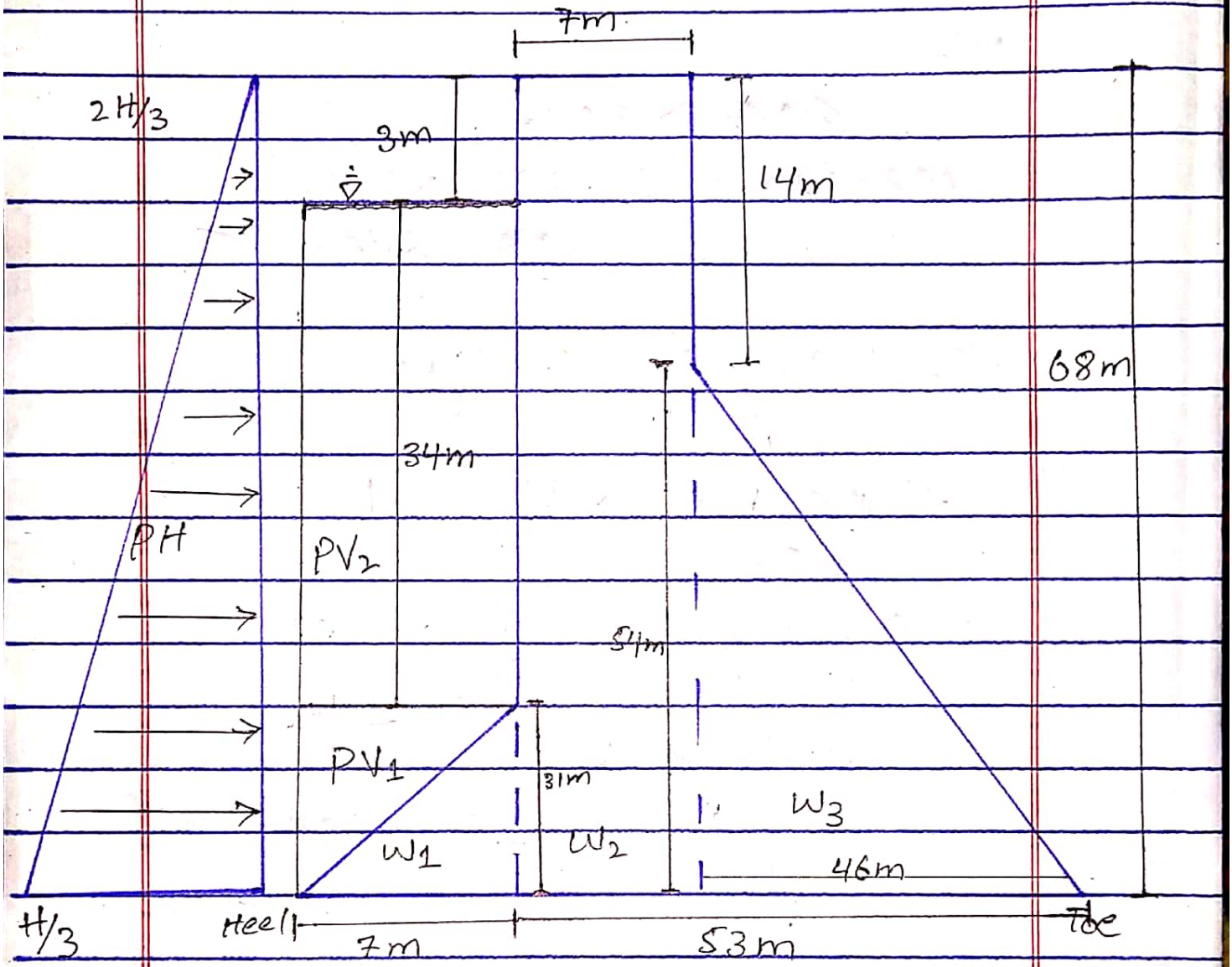
Name: Muhammad Hamza
ID # 7692

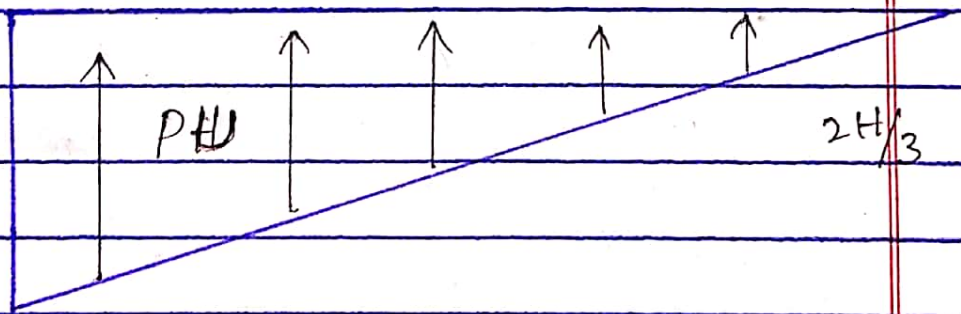
Day: M T W T F S

Date: __/__/__

Q.No.(03).

Solution:-





u = 0.65 - 0.75

q = 1400

unit wt of water = 10 KN/m³.

Assume; unit wt of concrete section = 24 KN/m³

Name: Muhammad Hamza
ID # 7692

Day: M T W T F S

Date: __/__/__

Moment Calculations:-

Forces	Forces calculations	vertical Forces Fv (K.N)	Horizontal Forces FH	Lever Arm L.A	Resisting Moment Mr (Fv x LA)	over-turning moment Mo
W_1	$\frac{1}{2} \times 7 \times 31 \times 24$	2604		$53+7/3 = 55.33$	144079.3	
W_2	$7 \times 68 \times 24$	11424		$46+7/2 = 49.5$	565488	
W_3	$\frac{1}{2} \times 46 \times 54 \times 24$	29808		$46 \times 2/3 = 30.67$	914211.36	
PV_1	$\frac{1}{2} \times 7 \times 31 \times 10$	1085		$53+\frac{2\times7}{3} = 57.67$	62571.95	
PV_2	$34 \times 7 \times 10$	2380		$53+7/2 = 56.5$	134470	
PU	$-\frac{1}{2} \times 60 \times 65 \times 10$	-19500		$60 \times 2/3 = 40$		780000
PH	$-\frac{65^2}{2} \times 10$		-21125	$65 \times 1/3 = 21.67$		457778.75

$\Sigma Fv = 27801$ $\Sigma FH = 21125$ $\Sigma Mr = 1820820.61$

$\Sigma Mo = 1237778.75$

 Name: Muhammad Hamza
ID# 7692

Day: M T W T F S Date: __/__/__

Eccentricity of resultant forces.

$$e = \frac{B}{2} - \bar{x} \quad \text{--- (i)}$$

Where;

$\bar{x}$ = Location of resultant forces from toe.

$$\bar{x} = \frac{\Sigma M_r - \Sigma M_o}{\Sigma F_V}$$

$$\bar{x} = \frac{1820820.61 - 1237778.75}{27801}$$

$$\bar{x} = 20.97 \text{ m}$$

eq – (i).

$$e = \frac{60}{2} - 20.97$$

$$e = 9.03 \text{ m}$$

Factor of safety against Tension:-

Condition;

$$e < B/6$$

$$e < 60/6$$

$$9.03 < 10$$

OK Safe.

Name: Muhammad Hamza
ID # 7692

Day: M T W T F S Date: __/__/__

Stress;

$\gamma_{heel} > 0$

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

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

$$\gamma_{toe} = \frac{27801}{60}\left(1 + \frac{6 \times 9.03}{60}\right)$$

$\gamma_{toe} = 881.76 \ KN/m^2.$

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

$$\gamma_{heel} = \frac{27801}{60}\left(1 - \frac{6 \times 9.03}{60}\right)$$

$\gamma_{heel} = 44.94 \ KN/m^2.$

$\gamma_{heel} > 0$ OK Safe. ✓

Factor of safety against overturning:-

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

$$\frac{1820820.61}{123778.75}$$

Name: Muhammad Hamza
ID # 7692.

Day: M T W T F S

Date: __/__/__

1.47 ≯ 2

Not safe. ✗

Now,

$\Sigma M_R > \Sigma M_O$

$1820820.61 > 1237708.33$

OK Safe. ✓

FOS against sliding:-

$$\frac{\mu \times \Sigma FV + B \times 91}{\Sigma FH} > 1$$

$$= \frac{0.75 \times 27801 + 60 \times 1400}{21125}$$

$$= 4.96 > 1$$

OK Safe. ✓

Name: Muhammad Hamza
ID # 7692

Day: M T W T F S

Date: __/__/__

Q. No (02).

ANSWER:-

Types of spillways:-

Types of spillways are as folloco;

1. Straight drop spillway.
2. Ogee spillway.
3. Shaft spillway.
4. chute spillway.
5. Side channel spillway.
6. Siphon spillway.
7. 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 steepy sloped open channel so that the flow will be very fast, that is the end the

Name: Muhammad Hamza
ID # 7692

Day. M T W T F S Date: __/__/__

the flowing water pressure will be high and will be in supercritical condition. That will dissipate energy from the falling water, energy dissipators are also provided in this type of spillway thus the temperature of water will go high and it will not allow water to freez and stop. So the water will move freely in this cold area.

Also in this type of spillway as the water flow from steepy ~~are~~ channel so that the kinetic energy will take place and increases the temperature of water.