Q1) Part (a)

Ans) A reservoir is an artificial lake or large fresh water body. Reservoir is generally used to store a large supply of water for use in several purposes.

* Mainly there are three types of reservoir:
  1- valley - dammed reservoir
  2- Bank - side reservoir
  3- service reservoir
* In above three, the most economical reservoir is service reservoir because there is no need of diversion of any natural body.
* Its frame construction is also easy as compared to valley-dammed reservoir & Bank-side reservoir.
* service reservoir also gives suitable pressure for the distribution system and also reduce the pressure fluctuations.
* It also gives a steady or different phased out.

Q.NO1. Part-(b)

Ans) Rock fill embankment dam is suitable in hilly areas because:

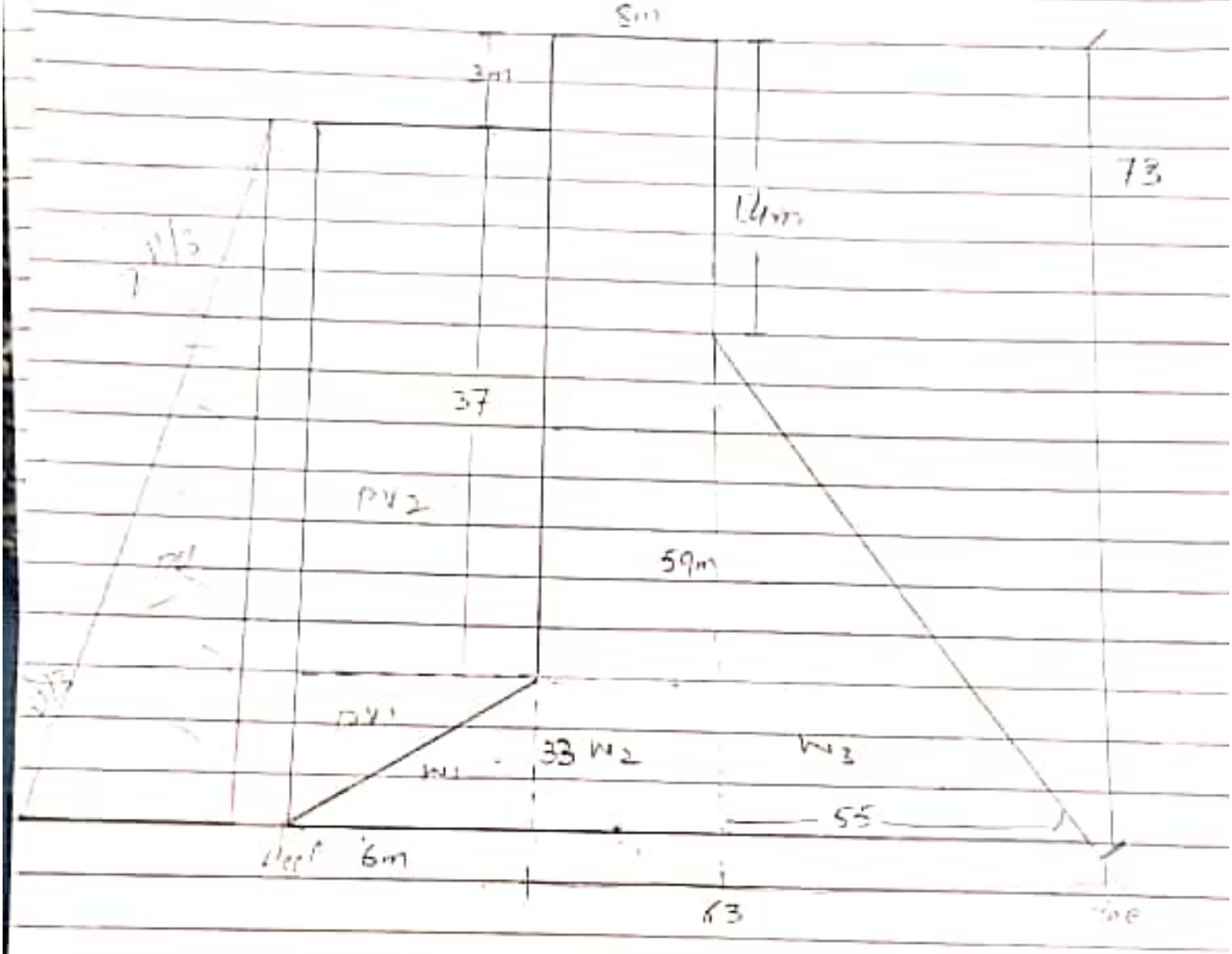
* It consist over 50% rock fill material which are more strengthen than earth fill embankment dam.
* The structure are more effective because the force of the water from hilly area's sloping hits the impervious zone and is transfered to the packed transition zone where water can slowly begin to filter through the dam.
* It is easily to construct in hilly areas because the materials (rocks) is easily available in hilly areas.
* Rock fill embankment dam it can bear the pressure of water coming from the hill areas.

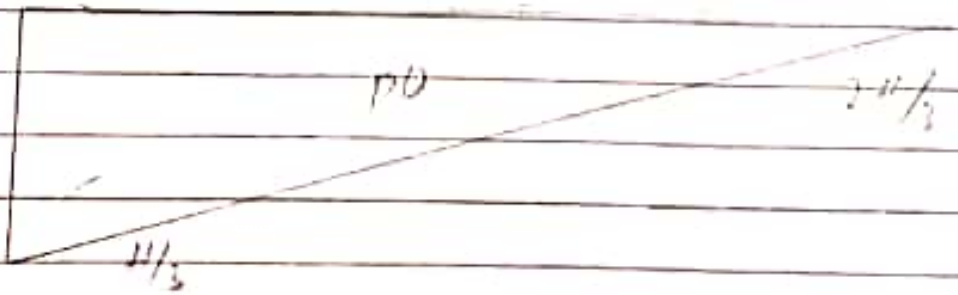
Q NO. 27 ✱

Ans) Different type of spillways:

1. Strength drop spillway
2. Ogee spillway
3. Shaft spillway
4. Chute spillway
5. Side channel spillway
6. Siphon spillway
7. Labyrinth spillway.

* Ogee spillway is generally more efficent in a condition where freezing point of water is less than -10 degree centigrade because the downstream profile of the spillway is made to coincide with the shape of the lower nappe of the free falling jet from the sharp crested weir. In this shape the lower nappe is similar to a projectile and hence downstream surface of the ogee spillway will follow parabolic path where "O" is the origin of parabola.
* ogee spillway is also best for this condition because in this temperature the head is maximum and when spillway runs with maximum head, the overflowing water just follow the curve profile of the spillway and there is no gap b/w the water spillway surface so discharge is maximum.





Item	Forces calculation	FV	FH	L.A	MY	Mo
W_1	$\frac{1}{2}\times6\times33\times24$	2376		$63+6/3=65$	154440	
W_2	$8\times73\times24$	14016		$55+8/2=59$	826944	
W_3	$\frac{1}{2}\times55\times59\times24$	38940		$55\times2/3=36.67$	1427929.8	
PV_1	$\frac{1}{2}\times6\times33\times10$	990		$63+\frac{2\times6}{3}=67$	66330	
PV_2	$6\times37\times10$	2220		$63+6/2=66$	146520	
PU	$-\frac{1}{2}\times69\times70\times10$	-24150		$69\times2/3=46$		1110900
PH	$-\frac{70^2}{2}\times10$		-24500	$70\times1/3=23.3$		570850

$\sum FV = 34392$ $\sum FH = 24500$ $\sum MY = 2622163.8$ | 1681750.0

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

$$\bar{x} = \frac{2622163.8 - 1681750.0}{34392}$$

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

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

$$e = 7.16m$$

Condition:

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

$$e < \frac{69}{6}$$

$7.16 < 11.5$ ok safe.

$\gamma_{heel} > 0$

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

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

$\gamma_{toe} = 508.76\ kN/m^2$

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

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

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

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

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

$= 1.56 \not> 2$ Not safe.

$\Sigma M_Y > \Sigma M_O$

$2622163.8 > 1681750.0$ safe.

$$\frac{0.75 \times \Sigma Ev + B \times V}{\Sigma T_H} > 1$$

$$\frac{0.75 \times 36392 + 69 \times 1400}{24500}$$

$4.99 > 1$ ok safe.