

Answer # 1(a)

Reservoir:- A reservoir is a basin constructed in a valley of a stream to store the water during the excess stream flow of water. Reservoir can be natural or artificial. man made used as a source of water supply.

Three types of Reservoir

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

Service Reservoir:-

The service reservoir is more economical because it is entirely man made. The service reservoir are required small space. It is easy to construct and no need of any natural water body diversion.

Answer # 1 (b)

Embankment dam:-

Types of Embankment dam:-

- 1 = Earth fill dam.
- 2 = Rock fill dam.

Rock fill dam:-

In hilly area I suggest rock fill dam. Rock fill dam can prove to be economically favourable when any of the following conditions exists.

- Large quantity of rock are readily available or will be excavated in connection with the project such as from spillway or tunnel.
- Earth fill material or concrete aggregate are difficult to obtain or require extensive processing to be used.
- The excellent performance of rock fill dam and higher durability to resist the water pressure and impact.

Answer #02

Spill ways :-

When the water in the reservoir increase the large accumulation of water endangers the stability of the dam structure. To avoid this is a structure is provided in the body of a dam or near the dam. This structure is called spill ways.

Types of spillways :-

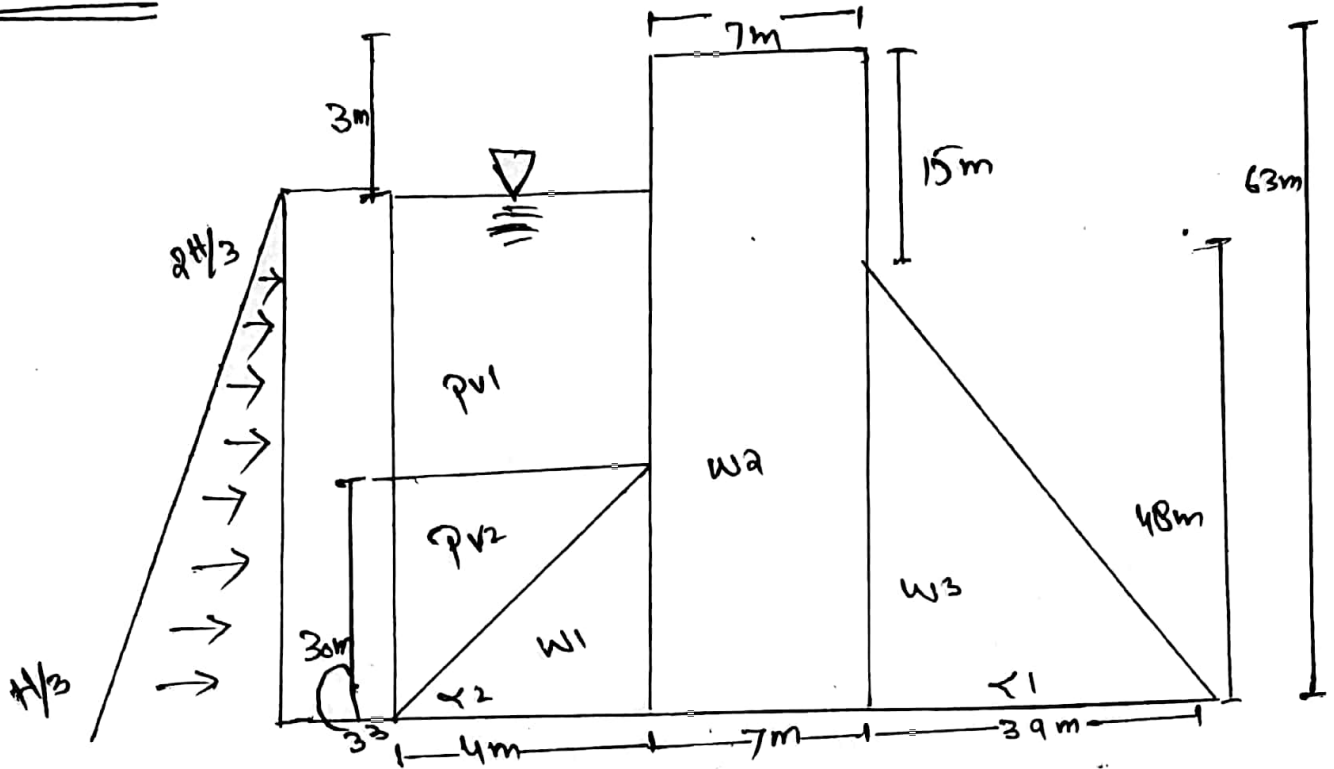
- 1- Side channel spillway
- 2- Siphon spillway
- 3- Tunnel spillway
- 4- Free-overfall spillway
- 5- Shaft spillway
- 6- chute spillway
- 7- ogee spillway

→ Tunnel spillways :-

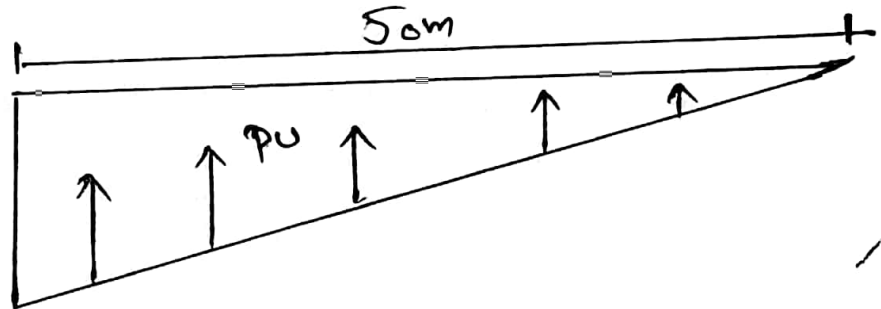
Tunnel spillway will be more efficient in a condition where freezing point of water is less than  $-10$  degree centigrade in winter

→ As we know that spillway is provided in dams to transfer the water from upstream of dam to the downstream from preventing the dam from over topping in float condition. In winter season the upper surface of water in dam is freezed but below the water is normal which can easily passed through tunnel.

Answer # 3



Assume  $\Rightarrow$   
 $\delta d = 24 \text{ kN/m}^3$   
 $\delta w = 10 \text{ kN/m}^3$



Forces	Forces Formula	$F_y$ (kN/m)	$F_x$ (kN/m)	Level (m)	MR (kN/m)	$M_o$ (kN/m)
W1	$\frac{1}{2} \times 4 \times 30 \times 24$	1440	-	47.33	68160	
W2	$7 \times 63 \times 24$	10584	-	42.5	449820	
W3	$\frac{1}{2} \times 39 \times 48 \times 24$	22464	-	26	584064	
PV1	$30 \times 4 \times 10$	1200	-	48	57600	
PV2	$\frac{1}{2} \times 4 \times 30 \times 10$	600	-	48.67	29202	
PH	$-\frac{1}{2} \times 10 \times 60^2$	-	-18000	20	-	3,60,000
PU	$-\frac{1}{2} \times 10 \times 60 \times 50$	-15000	-	33.33	-	5,00,000

$\Sigma F_y = 21288$

$\Sigma F_x = 18000 \text{ kN}$

$\Sigma MR = 1188846 \text{ kN/m}$

$\Sigma M_o = 860000 \text{ kN/m}$



→ For Factor of Safety Against Tension

Condition

$$e < B/6$$

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

$$B/6 = 10.17 \text{ m}$$

$$\bar{x} = \frac{(\sum M_r - \sum M_o)}{\sum f_y}$$

$$\bar{x} = \frac{118846 - 860000}{21288}$$

$$\bar{x} = 15.447 \text{ m}$$

$$e = B/2 - \bar{x} = 50/2 - 15.447$$

$$e = 9.552 \text{ m}$$

$$e < B/6$$

(safe in tension) OK

→ For Factor of Safety Against Stress  
Condition  $\gamma_{heel} > 0$

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

$$= \frac{21288}{50} \left( 1 + \frac{6(9.552)}{50} \right)$$

$$= 913.78 \text{ kN/m}^3$$

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

$$\gamma_{heel} = 98.31 \text{ kN/m}^3$$

(Condition safe in stress) OK.

⇒ For factor of safety <sup>Pg#07</sup> again overturning

Condition

$$\left( \frac{\sum Y}{\sum M_o} \right) > 2$$

So

$$\left( \frac{\sum Y}{\sum M_o} \right) = \frac{1188846}{8601000}$$

$$= 1.38 \text{ (Not safe) Not OK}$$

$$\sum M_r > \sum M_o$$

$$\sum M_r = 1188846$$

$$\sum M_o = 8601000$$

$$\sum M_r > \sum M_o \text{ (safe) OK.}$$

→ Safety against sliding

$$\frac{M \sum V + B \sum V}{\sum H} > 1$$

$$= \frac{(0.7)(21288) + 50(1400)}{18000}$$

$$\Rightarrow 4.716 > 1$$

(Safe in sliding)

OK

THE END