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QNo 1 Differentiate b/w calvert and causeway?

Ans

Calvert	Causeway
1) A culvert is a structure that allows water to flow under a road, railroad, trail from one side to another.	1) A causeway is a track, roads or railway on the upper point of an embankment accross low, or wet place or piece of water.
2) Made of pipe, reinforced concrete or other material	2) Made of concrete, Masonry, Earth fill
3) The length of culvert is not more than 6 meter.	3) Causeway is Route rised up on an embankment.
4) No need of deep foundation	4) it may or may not have opening for low water to flow.
5) Culverts can be pre-constructed or built at the site.	5) In masonry causeway construction equal to the width of route and desired height may provided.
6) Construction can be done in low budgets.	6) Longer and narrower.

QNo 3 Define cross drainage work. why it is necessry?. Explain different types of cross drainge work in detail.

(B)

Ans **Cross drainage work.** A cross drainage work is a structure carrying the discharge from a natural stream across a canal intercepting the stream is know as cross drainage work.

or Irrigation structure constructed for carrying the canal water safly or under the drainage water are called cross drainage works.

Why it is necessary?

① The water-shed canals do not cross natural drainage

② When slop of ground suddenly changes to steeper slope permissible bed slope cannot be maintained

3) Slop of ground is more or Less uniform and slop is greater Than permissiblo bed slope of canal

④ it is necessary That Irrigation water donot mix with wastewater or canal water.

Explain different types of cross work drainage. in detait.

Ans Type-I: Cross drainage work carrying canal over the drain

(a) Aqueduct
(b) Siphon Aqueduct

Type-II (Drainage passes over the Irrigation canal)

(a) Super passage
(b) Siphon super passage

Type-III (Drainage and canal intersection earch other of the same level.)

(a) Level crossing
(b) Inlet and outlet

Type 1 (A) ~~Adu~~ Aqueduct

In an aqueduct, The canal bed is above the drainage bed Level so canal is to be constructed abovet drainge. A canal is to be constructed in which canal water flows from upstream to downstream. The canal water is referred as Full Supply level (FSL) and drainage water Level is reffered as hight flood level (HFL) The HFL is below the Canal bed Level.

Syphon Aqueduct. In a syphon aqueduct, canal water is carrier above the drainage but the hight flood level (HFL) of drainage is above the canal through. The drainage water flows under syphonic action and there is no presence of atmospheric pressure is the natural drain-

Syphonic aqueducts are more often constructed and better preferred than simple Aqueduct through eatlier.

Type 2

Supper passage. Super passage structure carries above canal as bed level is below drainage bed level The drainage trough is to be constructed at road level and drainage water flows through this from upstream to downstream and canal water through the piers which are constructed below this drainage trough as supports.

Siphon super passage: The hydraulic structure which the drainage is take over the Irrigation canal is known as Super prassage. The structure is suitable when the bed level of drainage is above the full supply of canal. The water of the canal passes below the drainage.

Type-3

(a) Level crossing

when the bed level of canal is equal to the drainage bed level, then level crossing is to be constructed. With help of regulators both in canal and steam. water is disposed Through canal and stream in required quantity.

(b) Inlet and outlet. when Irrigation canal meets a small stream or drain of same level, drain is allowed to enter the canal as in Inlet. At some distance from this Inlet point a part of water is allowed to drain outlet. point

Q No 2

Differeinte b/w weir and barrage.

Weir	Barrage.
Impervious barrier constructed across a river to rise water Level. on upstream side	adjustable gates Installed over weir to maintain the water surface at differet level. at different time.
① Low cost .	① High cost
2) No provision for tranport communication accross the river	2) Usually a road or rail bridge can be convenfiently and economically combined by barrage
3) Chance of ~~silt~~ silting on the upstream side is more	3) Silting may be contolled by Judicial operation of gates

ⓑ **Reynolds Number** Reynold's number is the ratio of Inertial force to viscous force is called

Reyndd's Number. $Re = \frac{\rho V L}{\mu} = \frac{VL}{\nu}$

Limits of Reynold's number for Liminar.

Limit of ~~for~~ Reynold's number ~~for~~ is ~~2100~~ for liminar flow is less Than 2100.

Limit of Reynold's number for turbulent.

limit of Reynold's number for turbulent ~~flow~~ flow is greater that 4000.

Transitional Flow Limit

Fr. Limits of transitional flow is lies b/w 2100 and 4000.

Lower critical velocity

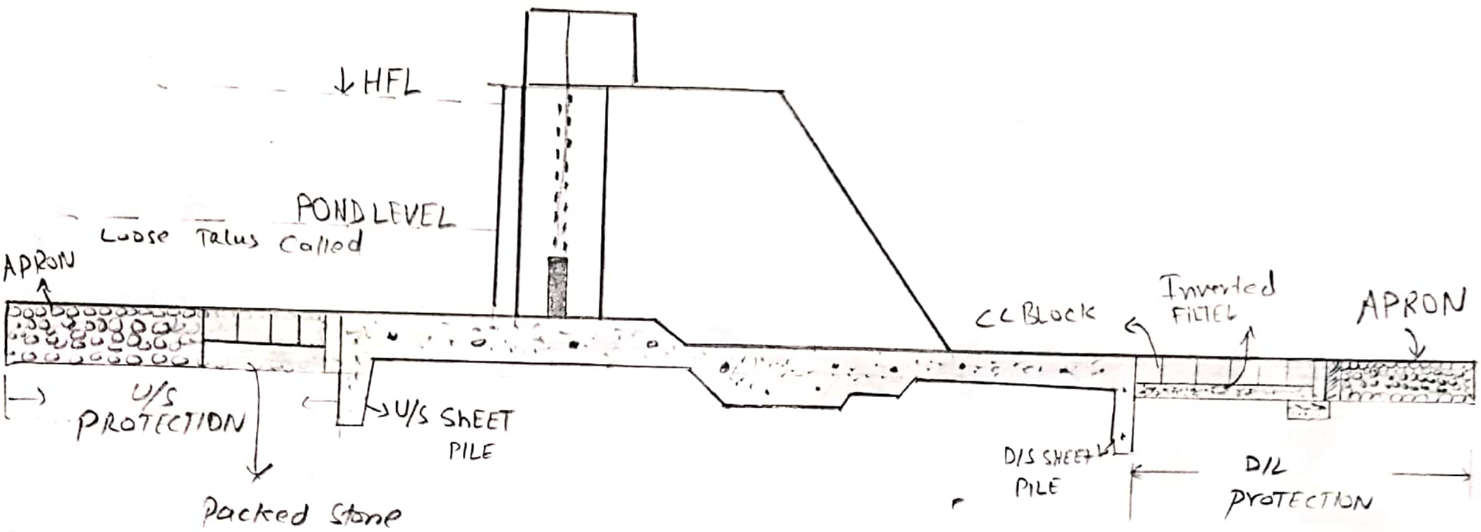
The velocity at which the flow enter from liminar to transition period is known as Lower critical velocity.

higher critical velocity.

The velocity at which the flow enter from transition period to turbulent flow is known as higher critical velocity.

Q No 3

Neat sketch of barrage and showing their component.



Barrage

Q3 Part B How would you predict/analyze max or, equilibrium scour depth based on experimental formulas.

Several formulae based on experimental results have been proposed to predict the maximum or equilibrium scour depth (y_s, below general bed level) around bridge piers. In general these assume the relationship

$$y_s/b' = \phi(y_0/b', Fr, d/b')$$

where b' is the pier width y_0 is the upstream flow depth d is the sediment size, and Fr is flow froude number.

Laursen's (1962) experimental result underestimate the scour depth compared to many Indian experiments (Inglis 1949) which suggest the formula.

$$y_s/b' = 4.2\left(y_0/b'\right)^{0.78} Fr^{0.52}$$

The Indian field data also suggest that scour depth be take as twice ~~scou~~ regime scour depth.

In case of live beds (a stream with bedload

$$y_s/y_0 = \left(B/b'\right)^{5/7} - 1$$

Ban fort the formula predicts the max scour depth ~~y_s/y_0~~ =

$$y_s = 2.3\, K_0\, b'$$

where K_0 = angularity coefficent which is function of the pier aligment ie angle of attack of approach flow.

Q No 4

Given data

Length = 15 ft

Width = 15 ft

Live Load = LL = 1.5 kip/ft^2

Dead load = DL = 300 lb/ft^2 = 0.3 kip/ft^3

Unit weight of soil is 100 lb/ft^3 = 0.1 kip/ft^3

Thickness = 0.92m

Angle θ - 30°.

Mix design/Ratio of concrete = 1 : 2 : 4

f_y = 60 ksi steel

Required

Design box culvert.

Sol Total load carrying on top slab.

for self wt of slab = $\gamma * h$ = 150 x 3.02

= 453 lb/ft

= 0.453 Kip/ft

W = total load = 1.5 + 0.3 + 0.453

$W = 2.253$

(2) Coefficent of earth pressure.

$Ka = \frac{1 - Sin\varphi}{1 + Sin\varphi} = Ka = \frac{1 - Sin 30}{1 + Sin 30}$

$Ka = 0.333$

[illegible]

(3) Lateral pressure due to (DL.LL)

= total vertical load

$= (L.L + D.L) * ka$

$= (1.5 + 0.3) \times (0.333)$

$= (0.5994) * (0.333) = 0.599 =$ [illegible]

(4) Lateral pressure due to soil.

$= ka \times \gamma \times h$

$= 0.333 \times 0.1 \times 18.02$

$= 0.6 \ kip/ft^2$

Lateral pressure @ top = Letral pressure due to (DL + LL)

$= 0.5994 \ kips/ft^2$

@ Bottom lateral pressure due to (DL+LL) + Lateral pressure due to soil.

$= 0.5994 + 0.6$

$= 1.2 \ Kip/ft^2$