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Q.No 1

(a) Difference b/w culvert and causeway.

Ans:- Causeway is a road that is raised, as to be above water marshland etc.
while culvert is transverse Channel under a road or railway for the draining of water.

Causeway	Culvert
(1) it is a transverse and totally enclosed drain under a road or railway.	(1) A culvert is generally a tunnel-like structure that allow water to pass under a roadway.
(2) it is typically found in nature Flow of water.	(2) Culvert are buit as less than 20 feet high over the obstruction
	(3) The length of culvert is typically not more than 6 meter.

(3) it purpoce is control bridage or culvert Flow.

(4) In modren usage a causeway is a road or railway on top of an embankment usually across a board body of water.

(2)

(4) No deep foundation is required for a culvert.

(5) the construction of a culvert can be done ~~by~~ with a low budget.

(b) Define cross drainage work. Why it is necessary? Explain different types of cross drainage work in detail.

Ans:- Cross drainage :-

Cross drainage work is a structure constructed when there is a crossing of canal and natured drain, to prevent the drain water from mixing into canal water. This type of structure is costlier one and need to be avoided as much as possible.

Necessity of cross drainage work.

The cross-drainege work is required to dispose of the drainage water so that the canal supply remain uninterrupted. A cross-drainage work is also called as drainage crossing. The canal at a cross-drainage work is generally taken over or below the drainage.

Types of cross Drainage works.

There are three type of cross drainage work structure.

Type 1:-

Cross drainage work carrying canal over the drain.

The structure Falling under this type are

(a) Aqueduct

(2) Syphon Aqueduct.

① Aqueduct :-

In aqueduct the canal bed level is above the drainage bed level so canal is to be constructed above drainage.

② Syphon Aqueduct :-

In Syphon Aqueduct, canal water is carrier above the drainage but the high Flood level of drainage is above the canal trough.

Type 2:- Cross Drainage work carrying Drainage over the canal.

The structure falling under this type are.

1. Super passage
2. Canal Syphon.

Super passage:-

Super passage structure carries drainage above the canal as the canal bed level is below drainage bed level.

Canal syphon:-

In a canal syphon drainage is carried over canal is ~~above~~ similer to a super passage, but the full supply level of canal is above than the drainage trough.

Type 3:-

Cross drainage work admitting canal water into the canal.

The structure falling under this type are.

① level crossing

② Canal inlets

level crossing :-

when the bed level of canal is equal to the drainage bed level. then level crossing is to be constructed.

① Construction of weir to stop drainage water behind it.

② Construction of canal regulator across a canal

③ Construction of head regulator across a Drainage.

Canal Inlets :-

In a canal Inlet structure, the drainage water to be admitted into canal is very less. The drainage is taken through the banks of a canal at inlet.

Q No 2:-

(a) Differentiate b/w weir and barrage.

Ans:-

weir	barrage
① low Cost	① high cost.
② low control on Flow	② Relatively high control on Flow and water level by gate operation of ~~glass~~ gates
③ No provision for transport communication across the river.	③ usually a road or a rail bridge can be conveniently and economical combined with a barrage wherever necessary.
④ Chances of silting on the upstream is more.	④ Silting may be controlled by Judical operation of gates.
⑤ Afflux ~~Created~~ created is high due to relatively high weir crest.	⑤ Due to low crest of the weir. The afflux during high Flood is low. since the gate may be lifted up fully.

QNo2

(b) Define Reynold number. what will be the limit of Reynod' number for laminar, turbulent and neither laminar nor turbulent flow? also define lower and higher critical velocity.

Ans:- Reynod number:-

The Reynold number is the ratio of Inertial Forces to viscous force within a Fluid which is subjected to relative Internal movement due to different Fluid velocities. ~~The~~ A region where these forces Change behavior is know as boundry layer.

The Reynold number is denoted by Re.

Formula.

$$Re = \frac{\rho v L}{\mu}$$

Limit of laminar :-

if $Re < 2000$ the Flow is called laminar.

Limit of turbulent :-

if $Re < 4000$ the Flow is called turbulent.

Limit of transition :-

if $2000 < Re < 4000$ the Flow is called transition-

lower critical velocity:-

The velocity at which the Flow enter from laminar to transition period is known as lower critical velocity.

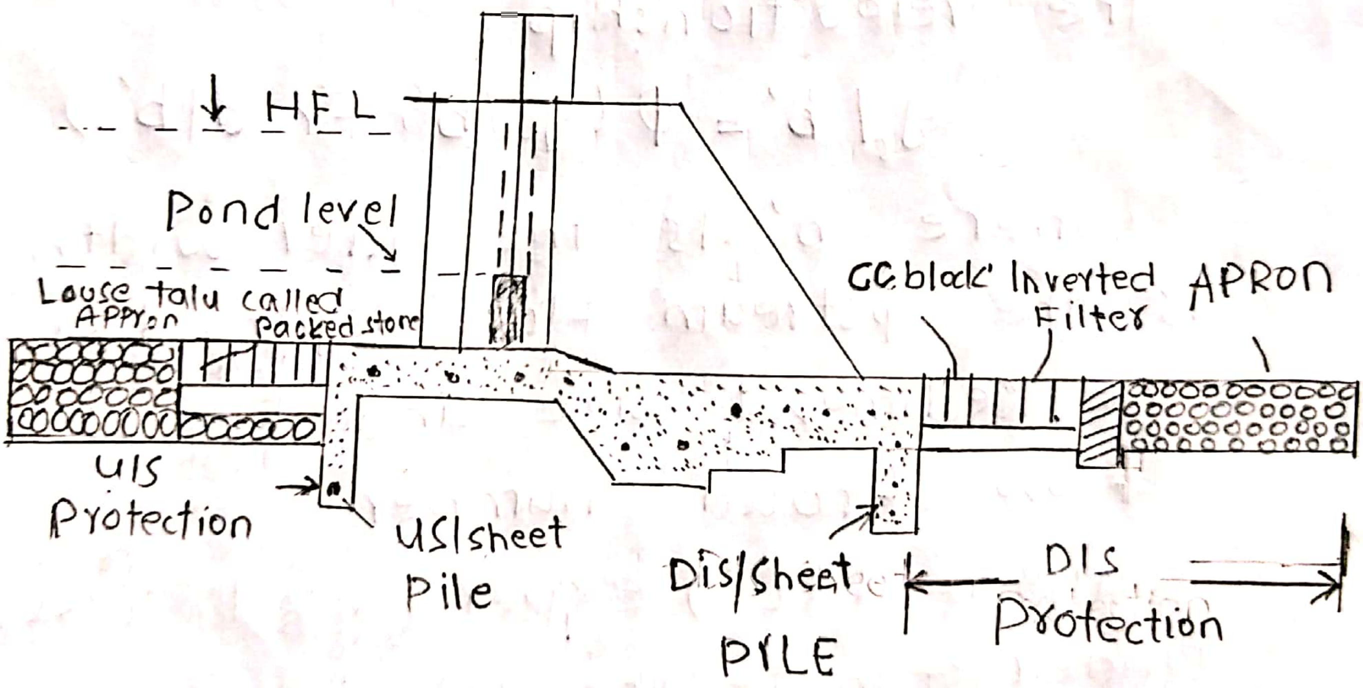
higher critical velocity :-

A velocity in which Flow enter from transition period to turbulent Flow as know as upper or higher critical velocity.

Q No 3:

(a) Draw neat sketch of barrage showing it difference components.

Ans:-



Question No 3
(b)

Ans:- Scour depth :-

Serval Formula base on experimental result have been proposed to predict maximum or equilibrium Scour depth.
(y_s below general bed level)
around bridge peir.

→ $y_s / b' = \Phi (y_0 / b', F_r, d / b')$

b' = peir width
y_0 = upstream flow depth
d = Sediment size
F_r = Froude number

Laursen's (1962) experimental result underestimate the scour depth compared to many Indian experiment.

P.T.O

This suggest Flow is normal to the bridge peirs

$$* \; Y_s / b' = 4.2 \, (y_o / b')^{0.78} \, Fr^{0.52}$$

In case of live bed where a stream with bedload transport we use this Formula

$$Y_s / y_o = (B / b')^{5/7} - 1$$

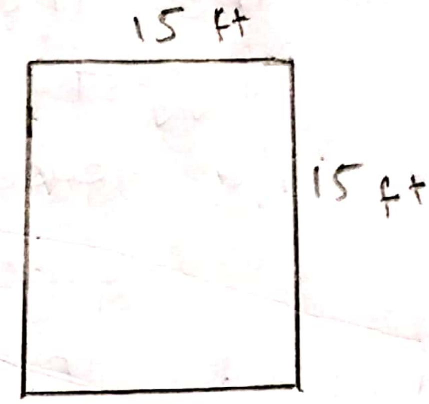
In deep Flow estimate of local scour is obtained through

$$* \; Y_s = 2.3 \, K_a b'$$

Where

K_a = angular co-efficient ~~of~~ is function of peir Allignment.

Q No 4



Given data:-

Length = 15 ft

width = 15 ft

Dead load = D.L = 300 lb/ft^2 = 0.3 kip/ft^3

Live load = L.L = 1.5 kip/ft^2

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

Angle φ 30°

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

Fy = 60 ksi steel

2.17 kips = 26 kip/ft^2

Required:-

Design box culvert

Solution:-

load calculation:-

self wt of slab = $\gamma \times h$

= 150 x 3.02

453 lb/ft^2

= 0.453 kip/ft^2

P.T.O

Question (4) part

w = total load = 1.5 + 0.3 + 0.453

w = 2.253

(2) Coefficient of earth pressure

$$Ka = \frac{1 - \sin Q}{1 + \sin Q}$$

$$Ka = \frac{1 - \sin 30}{1 + \sin 30}$$

$$\boxed{Ka = 0.333}$$

(3) lateral pressure due to (D.L + L.L)

= total vertical load (L.L + D.L) × Ka

(1.5 + 0.3) × (0.333)

$$\boxed{0.5994 \text{ kip/ft}^2}$$

(4) lateral pressure due to soil.

= Ka × γ × h

= 0.333 × 0.1 × 18.02

$$\boxed{0.6 \text{ kip/ft}^2}$$

Lateral pressure at top = lateral pressure due to (D.L + L.L)

$= 0.5994 \ kip/ft^2$

at Bottom lateral pressure due to (D.L + L.L) + lateral pressure due to Soil.

$= 0.5994 + 0.6$

$1.2 \ kip/ft^2$