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Paper: Hydrolic structure:

Q=No 1 A) Differentiate between culvert and causeway.

Ans **Culvert:-**

Culvert is of a tunnel shape carrying a stream of water under a road or railway. It works as a bridge to pass on it. It is normally use for natural flos of water for contralling it.

Causeway:-

A causeway is of course a raised road. It is built on an ambankmant. It is supported mostly by earth or stone. and it is not a bridge becaure it supports a roadway between piers.

QNo 1B:- Define cross drainage work......
.... work in detail.

Ans In an Irrigation project when the network of main canals. branch canals distributories etc are provided then these canals may have to cross the natural drainages like rivers, streams, nallahs, etc at different points within the command area of the project. The crossing of the canals with such obstacle cannot be avoided. So suitable structures must be constructed at the crossing point for the easy flow of water of the canal and drainge in the respective directions. These structures are known as cross-drainge works.

Necessity of Cross Drainage Works:

CD works are required to dispose of the drainage water so that the canal supply remains uninterrupted. The canal at a cross drainge work is generally taken either over or below the drainge. However it can also be at the same level as the drainge.

It is not possible to avoid the drainage in the initial reach of a main canal because it takes off from a diversion headworks located on a rivers which is a valley. In this initial reach the canal is usually a contour canal and it intercepts a number of natural drainges flowing from the watershed to the rivers. After the canal has mounted the watershed no cross-drainge work will normally be required. because all the drainge originate from the watershed and flow away from it. It maybe necessary for the canal to leave the water shed for a short distance where the watershed takes a sudden small loop and it is not possible to align the canal along the loop.

In that case the canal intercepts the drainges which carry the water of the pocket between the canal and the watershed and hence the cross-drainge works are required.

Types of Cross Drainge work:

There are three types of cross drainge works structures:

Type 1: Cross Drainge work carrying canal over the drain:

The structures falling under this type are:

Aqueduct:

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

Syphon Aqueduct:

In a syphon aqueduct canal water is carries above the drainge but the high flood level (HFL) of drainge is above the canal through, the drainge water flows under syphonic action.

Type-2 : Drainage over Canal:

Super Passage:

Super Passage structure carries drainage above canal as the canal bed level is below drainage bed level.
This is simply a reverse of Aqueduct structure

Canal syphon:

In a canal syphon drainage is carried over canal similar to a super passage but the full supply level of canal is above than the drainage trough.
This structure is a reverse of syphon aqueduct

Type-3: Drainage Admitted into canal

In this type the silt clearance and maintainance of canal water becames really difficult.

Level crossing:

When the bed level of canal is equal to the drainage bed level, then level crossing is to be constructed. This consists of following steps.

(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 Drainge.

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. Hence this type of structure is rarely constructed.

Q No 2 A): Differentiate between weir and barrage.

Ans **Weir:-**

Weir are commonly used to control the flow roles of rivers during periods of high discharge.

Sluice gates are used to Incross or decross the volume of water going out.

Barrage:-

It is used to convert tidal energy into electricity by forcing water through turbines by activating generater.

Q:No 2 B): Define Reynod's number, ... higher critical velocity

Ans **Reynolds number:-**

The product of density times length divided by visosily coefficient.

This is proportional to the ratio of inertial forces and viseous froces in a fluid flow.

Laminar:

The flow in a pipe is laminar if the reynolds number is less than 2100.

Turbulant:

If the reynolds number is greater than 4000 than It is turbulant.

Naither laminar nor turbalant flow:

When the Reynolds number is between 2000 and 2800, the flow is neither Laminar nor turbulent.

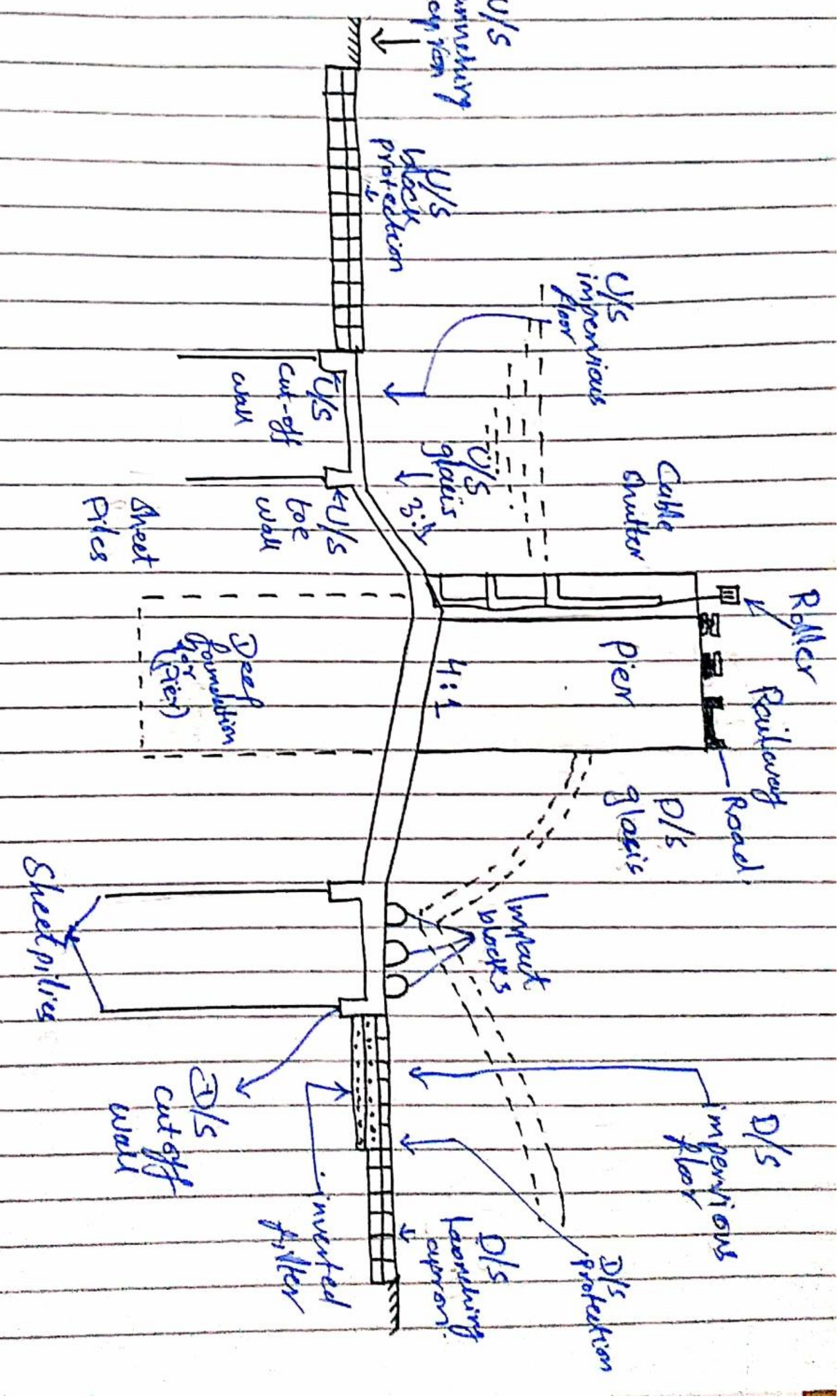
Lower Critical velocity:

The velocity at which flow changes from Laminar to transition is called Lower critical velocity.

Higher Critical velocity:

The velocity at which flow changes from transition to turbulent as called Higher Critical velocity.

Q: 3 A) Draw neat sketch of barrage showing its different components.



Q:3B) How would you predict/analyze ----- ---------- -------- experimental formulas?

Ans **Scour depth under the bridge:-**

If the contracted which (i.e the lenght, L) is less the regime width, W the normal scour depth D_N under bridge is given by

$$D_N = R_s (W/L)^{0.61}$$

Where R_s is the regime scour depth.

The maximum scour depth in a single-span bridge (no pies) with a straight approach (case 1) is about 25% more than the normal scour given by. Whereas in the case of a multispan structure with a curved approach reach (case 2) it is 100% more than the normal scour. If the constriction is predominat. the maximum scour depth is the maximum of case 1 or case 2 or the value given by

$$D_{max} = R_s (W/L)^{1.56}$$

Q: 4 :- A box culvert is to be designed having inside
.... ----- . — .. Design the box culvert

Ans Give Data:

L.L = 1.5 kip/ft^2

D.L = 300 lb/ft^2

θ = 30°

Unit weight of soil = 100 lb/ft^2

Dimensions = 15' x 15'

fy = 60 ksi steel

Concrete = 1 : 2 : 4 = M_{15}

D = 0.92 m thickness.

Solution:

(1) Load:

Total Load on Top = self weight + L.L + D.L

Self weight = 3x15 = 45 kN/m^2

45 kN/m^2 = 0.939 kip/ft^2

W = 1.5 + 0.939 + 0.3

w = 2.739 kip/ft^2

(2) Coefficient of Earth pressure:

$$K_2 = \frac{1 - \sin\theta}{1 + \sin\theta}$$

$= \frac{1 - \sin(30)}{1 + \sin(30)}$

$\boxed{K_2 = 0.33}$

(3) Lateral pressure due to (Dead Load + live load):

= Total verticle Load x K_2

$= (L.L + DL) \times K_2$

$= (1.5 + 0.3) \times 0.33$

$= \boxed{0.594 \text{ kip/ft}^2}$

or

$= \boxed{28.4 \text{ kN/m}^2}$

(4) Lateral pressure due to soils:

$= K_2 \times \gamma_{soil} \times h$

$= 0.33 \times 0.1 \times 18$

$= \boxed{0.594 \text{ kip/ft}^2}$

or

$\boxed{= 28.4 \text{ kN/m}^2}$

(5) Lateral pressure at Bottom:

= Lateral pressure due to (LL + DL) + Lateral pressure due to soil.

$= 0.594 + 0.594$

$= 1.188\ kip/ft^2$ or

$= \boxed{56.88\ kN/m^2}$.