Name	Manzoor Khan
ID	7678
Section	C
Paper	Hydraullic Structure
Exam	Final term.
Submitted to	Engr. Adeed Khan
Deptt	BE Civil
Date	24/06/2020

QNo 1:

Ans: (a) **Culvert:**

Culvert is a tunnel carrying a stream under a roadway or railway. A culvert may act as a bridge for traffic to pass on it. They are typically found in a natural flow of water and serves the purpose of a bridge or current flow controller.

No deep foundation is required for a culvert. Culvert are totally enclosed structures that can be semi circular, rectangular, elliptical or pear shaped.

Cause way:

Causeway is a road or railway route across a broad body of water or wetland raised up on embankment. Some causeways may only be useable at low tides and distinction between Causeway and via-ducts can become blurred when flood-relief Culvert are incorporated in the structure.

Causeway were Constructed in ancient time by the people to Save the enormous Cost of Construction bridges and Culvert at many location where a single highway Crosses many water bodies.

QNo 1

Ans (b) **Cross drainage work:**

A Cross drainage work is a Structure Carrying the discharge from a natural Stream across a Canal intercepting the Stream.

Necessity of Cross drainage work:

The water Shed donot Cross natural drainages. But in actual orientation of the Canal network, This ideal condition may not be available and the obstacles like natural drainages may be present across the Canal. So the Cross drainage work must be provided for running the irrigation System.

At the Crossing point, the water of the Canal and the drainage get inter-mixed. So, for the Smooth running of the Canal with its design discharge the Cross drainage works are required. The site condition of the Crossing point may be such that without any suitable structure, the water of the Canal and drainage cannot be diverted to their natural directions. So the Cross drainage works must be provided to maintain their natural direction of flow.

Types of Cross drainage Works:

(1) **Type I: (Irrigation Canal passes over the drainage).**

This condition involves the Construction of following.

(a) **Aqueduct:**

The hydraullic structure in which the irrigation Canal is taken over the drainage (such as river, stream etc...) is known as aqueduct. This structure is Suitable when bed level of Canal is above the highest flood level of Canal is above the highest flood level of drainage. In this case, the drainage water passes clearly below the Canal

(b) Siphon Aqueduct:

In a hydraullic Structure Where the Canal is taken over the drainage water Cannot pass Clearly below the Canal. It flows under Siphonic action. So, it is Known a Siphon aqueduct. This Structure is Suitable When the bed level of Canal is below the highest flood level.

(2) Type II. Drainage passes over the Irrigation Canal:

(a) Super passage:

The hydraullic Structure in Which the drainage is taken over the irrigation Canal is Known as Super passage. The Structure is Suitable when the bed level of drainage is above the full Supply level of the Canal. The water of the Canal passess clearly below the drainage.

(b) Siphon Super passage: The hydralic Structure in which the drainage is taken over the irrigation Canal, but the Canal Water passes below the drainage under Siphonic action is Known as Siphon Super passage. This Structure is Suitable when the bed level of drainage is below the full Supply level of the Canal.

(3) Type III. Drainage and Canal Intersect each other at same level.

(a) **Level of Crossing:**

When the bed level of Canal and the Stream are approximately the Same and quality of water in Canal and Stream is not much different, the Cross drainage work Constructed is Called level of Crossing where water of Canal and Stream is allowed to mix.

With the help of regulators both in Canal and Stream in required quantity.

Level of ~~ed~~ Crossing Consist of following Components. (i) Crest wall (ii) Stream regulator (iii) Canal regulator.

(b) **Inlet and Outlet:**

When irrigation Canal meets a Small Stream or drain at 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 as outlet which eventually meet the original stream. Stone pitching is required at the inlet and outlet. The bed and banks between inlet and outlet are also protected by stone pitching. This type of ~~CTN~~ cross drainage work is called inlet and outlet.

Q2)

Ans (a)

Barrage	Wier
* Low Set Crest	* High Set Crest
* Ponding is done by means of gates.	* Ponding is done against the raised Crest or partly against Crest and partly by Shutters.
* Gated over entire length	* Shutter in part length
* Gates are of greater height	* Shutter are of Smaller height, 2m.
* Perfect Control on river flow	* No Control of river in low floods.
* High floods Can be passed with minimum afflux.	* Excessive afflux in high floods.
* Less Silting upstream due to ~~set~~ low set Crest.	* Raised Crest Causes Silting upstream.
* Longer Construction period.	* Shorter Construction period.
* Silt removal is done Through under Sluices.	* No means for Silt disposal.
* Costly Structure.	* Relatively cheaper Structure.

Q2)

Ans (b) **Reynold number:**

It is the ratio of inertial force to viscous forces within a fluid ~~wthi~~ flow.

=> **Laminor:**

If Reynold number is less than 2100, Then it is laminor flow.

=> **Turbulen Flow:**

If the Reynold number is greater than 4000 Then it turbulant flow.

=> **Neither Laminor nor Turbulant flow:**

The Reynold number in between 2100 and 2800, when The flow is neither laminor nor Turbulant.

=> **Lower Critical velocity:**

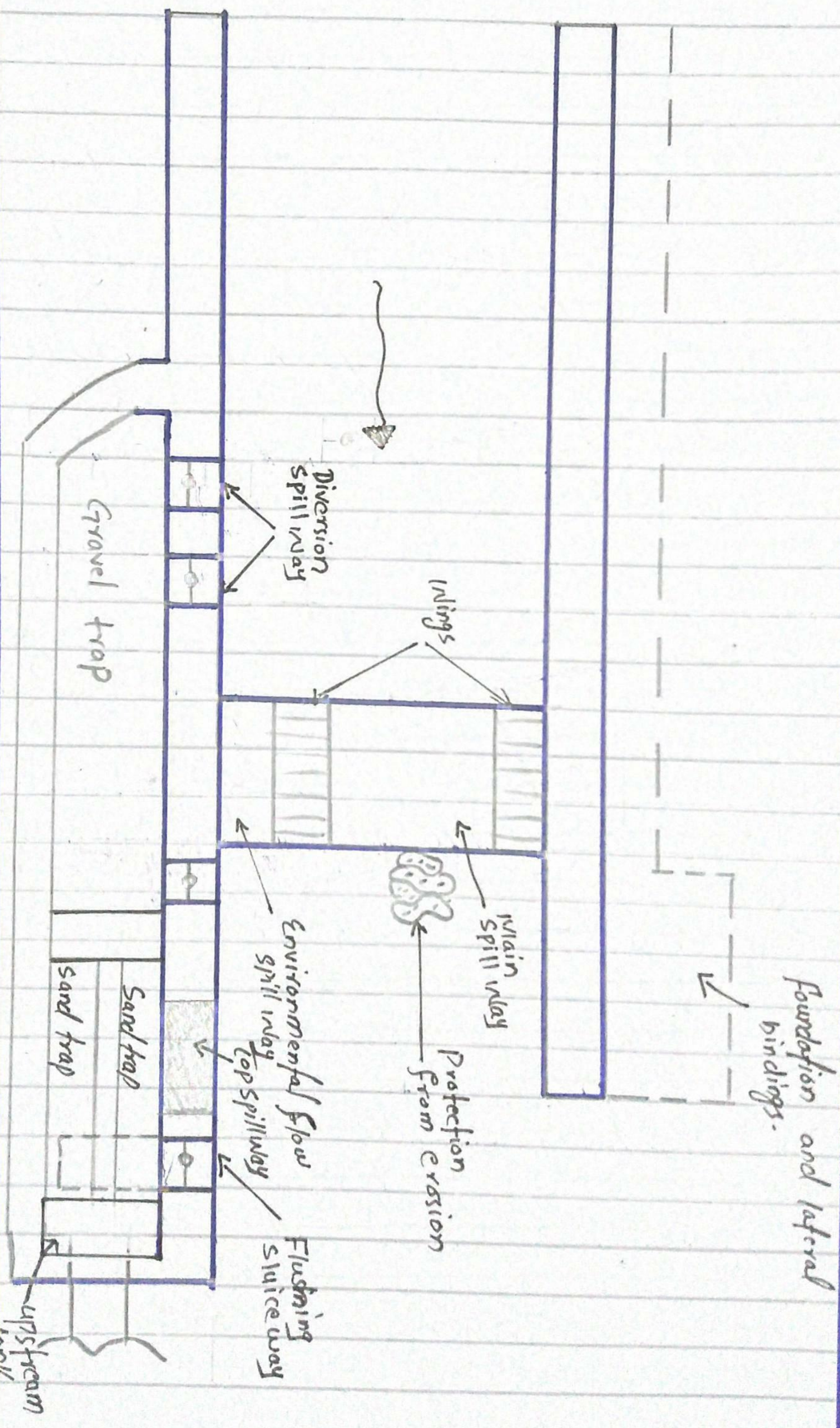
The velocity at which flow changes from laminar to transition is called lower critical velocity.

=> **Higher Critical velocity:**

A velocity in which flow changes from transition to turbulent flow is known as higher critical velocity.

Q No3

Ans (a) Sketch of a river barrage:



QNo 3
Ans (b) We can predict the maximum equilibrium Scour depth around bridge piers from Several formulas based on experimental results which assume the relationship as;

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

Where b' is the pier of width, y_0 is the upstream flow depth, d is the Sediment Size and F_r is the Froude Number.

Lawrsen's Experiment:

Lawrsen's (1962) experiment result" Under estimate the Scour depth Compared to many Indian Experiment which Suggested the formula (approach flow is normal to the bridge piers).

$$y_s/b' = 4.2\,(y_0/b')^{0.78}\,F_r^{0.52}$$

Indian Field data:

The Indian field data also Suggested that the Scour depth Should be taken as twice ~~as~~ the regime

Scour depth.

In Case of line beds (a Stream with bed load transport) the formula

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

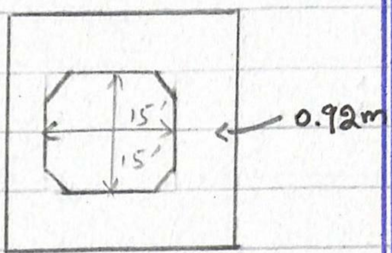
QNo 4
Answer

Given data:

⇒ Dimensions = 15′ × 15′
⇒ L.L = 1.5 Kip/ft^2
⇒ Thickness = 0.92m = 3 ft
⇒ D.L = 300 lb/ft^2 = 0.3 Kip/ft^2
⇒ Unit wt of soil = γ = 100 lb/ft^3

⇒ ϕ = 30°

Required data:



⇒ Design Box Culvert = ?

Solution:

(1) Load Calculation:

⇒ Total load carry on top slab = Self wt of slab + L.L + D.L

⇒ Self wt of slab = 3 × 150

= 450 lb/ft^2

⇒ W = 450 + 1500 + 300

⇒ **W = 2250 lb/ft^2**

(2) Co-efficient of Earth pressure:

$$\Rightarrow K_a = \frac{1 - \sin(\phi)}{1 + \sin(\phi)}$$

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

⇒ **K_a = 0.33**

3: Lateral Pressure due to (D.L + L.L):

$= \text{Total vertical load } (DL + L.L) \times K_a$

$= (1500 + 300) \times 0.33$

$= 594 \; lb/ft^2$

4: Lateral pressure due to Soil:

$= K_a \times \gamma h$

$= 0.33 \times 100 \times 18$

$= 594 \; lb/ft^2$

5: Lateral Pressure:

@ Top;

$= \text{lateral pressure due to } (DL + L.L)$

$= 594 \; lb/ft^2$

@ Bottom;

$= \text{lateral pressure due to } (DL + LL)$
$+ \text{ lateral pressure due to soil.}$

$= 594 + 594$

$= 1188 \; lb/ft^2$

Answer.

Sketch;