Hurrairah Kabir

7758

Section B

Hydraulic Structure

Final Assignment

Q No 1?

Answer No 1 :-

Culvert:-

-> Culvert is a tunnel shape carrying a stream of water under a road or railway.

-> It works as a bridge to pass on

-> It is normally used for natural flow of water for controlling it.

Cause way:-

→ A cause way is of course a raised road. It is built on an embankment.

→ it is supported mostly by earth or stone.

→ And it is not a bridge because it supports a roadway between piers.

QUESTION Number 1 part (ii)

Answer:-

Cross drainage work:-

In an irrigation project, when the network of main canals, branch canals, distributaries etc are provided then these canal 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 obstacles cannot be avoided. So, Suitable structures must be constructed at the crossing point for the easy flow of water of the canal and drainage in the respective directions. These structures are known

as cross-drainage works.

Necessity of cross Drainage works:-

→ The water shed canals do not cross natural drainges- 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.

→ At the crossing point, the water of the canal and the drainages get intermixed.

→ 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.

Types of Cross drainage works:-

Following are the types of cross drainage work:-

(1) Adequate:-
It carries an irrigation canal over a drain.

(2) Super passage:-
It carries a drain over an irrigation canal.

iii Cevel Crossing:-

This structure makes it possible to dispose off drain water safely at same level as that of a canal.

(iv) Inlet and outlet:-

When possible drain water is taken in the canal to be discharged afterwards into a drain at suitable location.

Question No 2 part (i)

Answer No 2 part (i)

Weir:-

Weir are commonly used to control the flow rates of river during periods of high discharge.

Sluices gates are used to increase or decrease the volume of water going out.

Barrage:-

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

Question No 2 part (ii)

Answer No 2 part (ii)

Reynold's Number :-

The product of density times length divided by viscosity co-efficient.

This is proportional to the ratio of inertial forces and viscous forces 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 turbulent.

Neither laminar nor turbulant flow:-

When the reynold number is between 2000 & 2800 the flow is neither laminar nor turbulant.

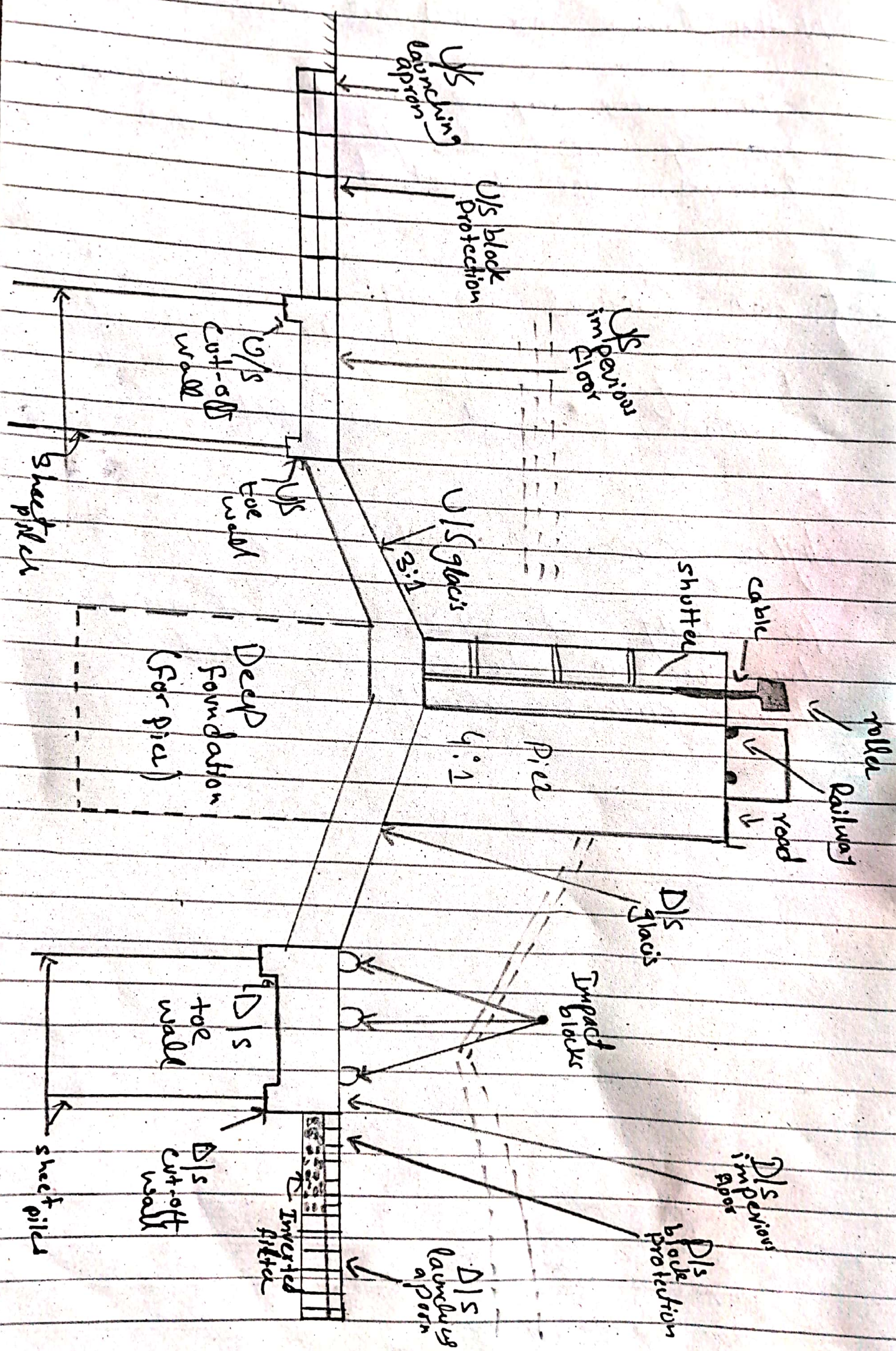
Lower Critical velocity:-

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.

Question No 3 part (i)



Question NO. 3 part (ii)

Answer NO 3 part (ii)

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 the flow Froude number.

Laursen's (1962) experimental results underestimate the scour depths, compared to many Indian experiments (Inglis, 1949) which suggest the formula (approach flow is normal to the bridge pier)

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

The Indian field data also suggest the scour depth should be taken as twice the regime scour depth.

In case of live beds the formula :

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

Predict the maximum equillibrium scour depth.

In relavity deep flow a first order estimate of local scour may be obtained by

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

where k_s = angularity co-efficient which is a function of the pier alignment.

Question No 4

Answer No 4

Given Data

$L.L = 1.5\ kip/ft^2$

$D.L = 300\ lb/ft^2$

$\Theta = 30^\circ$

unit weight of soil $= 100\ lb/ft^2$

Dimension = 15' × 15'

Fy = 60 ksi steel

Concrete = 1 : 2 : 4 = Mix

D = 0.92m thickness.

Sol:- ① Load

total load on top = Self weight + L.L + D.L

Self weight = 3 × 15 = 4 kN/m^2

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

$$w = 1.5 + 0.939 + 0.3$$

$$w = 2.739 \text{ kip/ft}^2$$

2) Co-efficient of earth pressure:-

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

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

$$Ka = 0.33$$

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

Total vertical load $\times$ ka

$$= (L.L + D.L) \times ka$$

$$= (1.5 + 0.3) \times 0.33$$

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

or

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

4) Lateral pressure due to soil:-

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

$$= 0.33 \times 0.1 \times 18$$

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

or

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

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

= 0.594 kip/ft²

= 28.4 kN/m²

6) Lateral pressure at bottom:-

Lateral pressure due to (L.L + D.L) + Lateral Pressure due to soil.

= 0.594 + 0.594

= 1.188 kip/ft²

= 16.88 kN/m²