Hydraulic structure

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Final Assignment

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Qno2:
Ans:

a: Culvert	Causeway
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 uses for natural flow of water for controlling it	A causeway 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.

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What is Cross Drainage Works?

- In an Irrigation project, when the network of main canals, branch canals, distributaries, 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 drainage in the respective directions. These structures are known as cross-drainage works.

Cross Drainage Works

- Irrigational Canals while carrying water from headworks to crop field, have to cross few natural drainage streams, nallaha, etc.. To cross those drainages safely by the canals, some suitable structures are required to construct. Works required to construct, to cross the drainage are called Cross Drainage Works (CDWs). At the meeting point of canals and drainages, bed levels may not be same. Depending on their bed levels, different structures are constructed and accordingly they are designated by different names.

Necessity of Cross Drainage Works

- The water-shed canals do not 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 works must be provided for running the irrigation system.
- At the crossing point, the water of the canal and the drainage get intermixed. 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 can not 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

- **Type III Drainage and Canal Intersect each other at the same level.**
- **Level Crossings**
- 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 crossing where water of canal and stream is allowed to mix. With the help of regulators both in canal and stream, water is disposed through canal and stream in required quantity. Level crossing consists of following components (i) crest wall (ii) Stream regulator (iii) Canal regulator.

Types of Cross Drainage Works

- **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 meets 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 CDW is called Inlet and Outlet.

Siphon Super Passage

- The hydraulic 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.

Qno2:
Ans:

a:
Weir:-
Wiers are commonly used to control the flow rates of rivers during periods of high discharge.
Sluice 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.

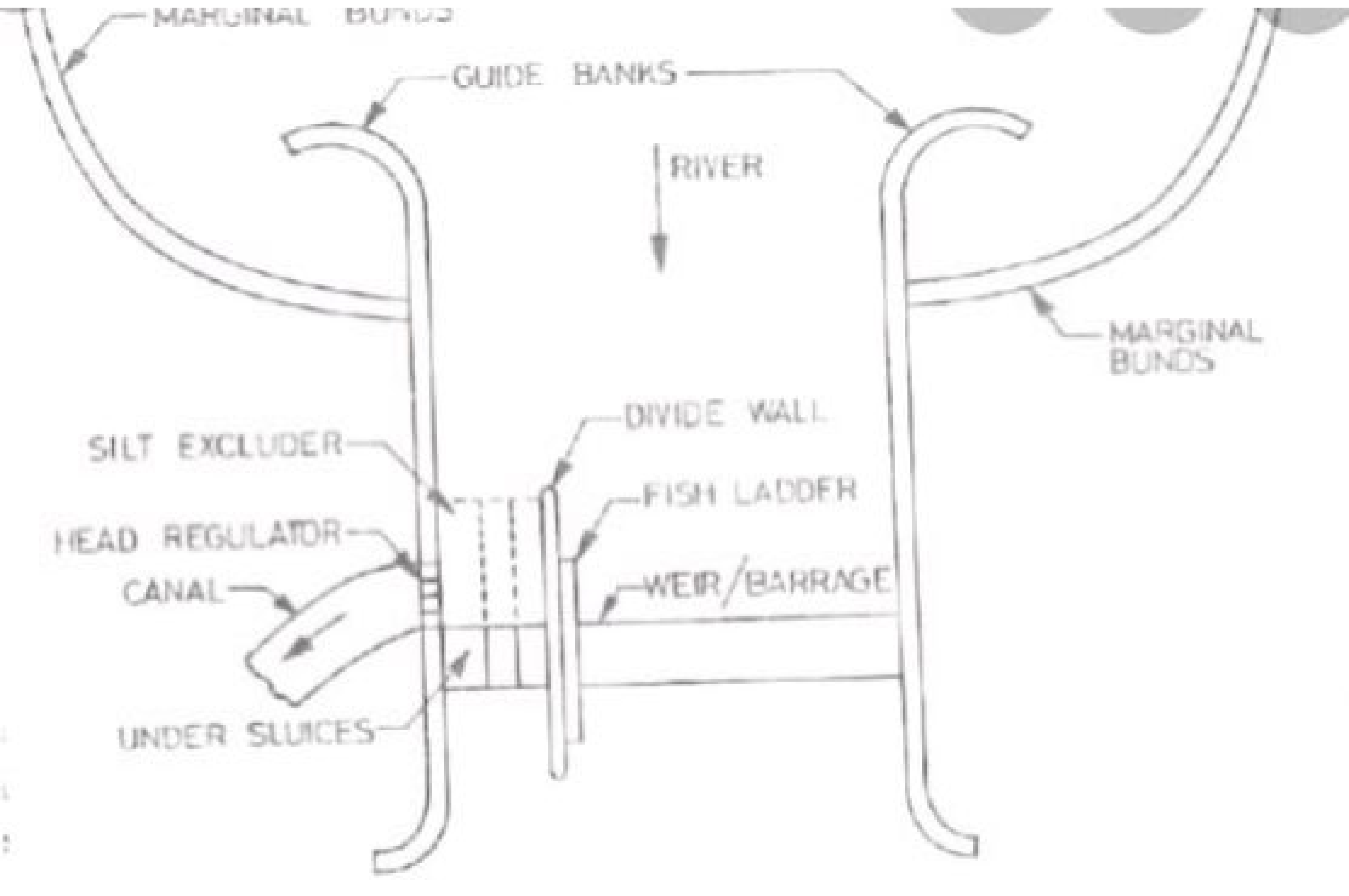
Q no 2:
b: Ans:

Reynold's Number:
The product of density times length divided by viscosity coefficient.

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 turbulant.


MARGINAL BUNDS
GUIDE BANKS
RIVER
MARGINAL
BUNDS
DIVIDE WALL
SILT EXCLUDER
FISH LADDER
HEAD REGULATOR
CANAL
WEIR/BARRAGE
UNDER SLUICES

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

$$y_s/b' = \phi(y_0/b', Fr, d/b') \tag{10.20}$$

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 piers)

$$y_s/b' = 4.2(y_0/b')^{0.78} Fr^{0.52}. \tag{10.21}$$

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

In the case of live beds (a stream with bedload transport) the formula

$$y_s/y_0 = (B/b')^{5/7} - 1 \tag{10.22}$$

predicts the maximum equilibrium scour depth.

In a relatively deep flow a first-order estimate of (clear) local scour (around pier) may be obtained by

$$y_s = 2.3 K_\alpha b' \tag{10.23}$$

where K_α = angularity coefficient which is a function of the pier alignment, i.e. angle of attack of approach flow.

Given data

L.L = 1500 lb/ft^2

D.L = 300 lb/ft^2

section = 15' × 15'

~~depth~~

thickness = 3 ft

unit of soil = 100 lb/ft^3

Q = 30°

unit wt of concrete = 150 lb/ft^3

fy = 60 ksi

Solution

Self wt of slab

Thickness × unit weight of R.C.C. Concrete

(i) Vertical pressure at Top

(L.L + D.L) Ka

(1500 + 300) 0.33 = 494 lb/ft^2

(ii) Pressure of soil