Final Assignment / Quiz

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Subject: Hydraulic Structure

Section: B

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Q. NO 1:

Part (a):

Culvert	Causeway
(1) Culvert may be made from concrete, pipe or other materval	Causeway made from earth, masonry, wood or concret
(2) A small bridge having total length Length of span 6m or less than it b/w the forces of abutment	A bridge having its floor flush or little above the stream bed of the stream which allows flood water to pass over its floor
(3) It is constructed under a road	(3) It is constructed above a road
(4) It normally uses for natural flow of water for controlling it	(4) A causeway is the track or road on the upper side of an embankment across a water
(5) A culvert is the bridge which is under on road to cross the water	It is normally uses for to sopports a roadway between piers.

Q.No 2:

(2)

Part (B):

Cross Drainage work

Cross drainage work is a structure constructed when there is a crossing of canal and nutural drain to prevent the drain water from mixing into canal water

why it is necessary

→ When a nutural drain crosses or intercepts an irrigation cannal it becomes necessary to construct some suitable structure to carry forward the canal safely.

→ The obstacles like natural drainage may be present across the canal. So cross drainage work must be provided for remaining the irrigation system.

→ At the crossing point, the water of the cannal and the drainage get intermixed so for the smooth rumming of the canal with it design discharge the cross drainage work are required

→ cross drainage work are provide to maintain natural direction of flow.

Types of Cross Drainage work

Type 1: Canal Passess over the Drainage

(a) Aqueduct

(b) Syphon Aqueduct

Type-2: Drainage passes over the Canal:

(a) Super passage

(b) ~~Syphon~~ Siphon Super passage or Canal passage

Type 3:: Drainage And Canal At Same Level

(a) Level crossing

(b) Inlet and outlet

(9) Aqueduct:

→ The Canal water level is reffered as full supply level (FSL) and the drainage water level is reffered as high flood level HFL)

→ When the HFL of the drain is sufficiently below the bottom of the cannal suct that the drainage water flows freelly under gravity and prossessing atmospheric pressure the structure is known as Aqueduct

(b) Syphon Aqueduct.

In a Syphon aqueduct canal water is carried above the drainage but the high Flood level (HFL) of drainage is above the canal through. The drainage water flows under Syphonic action and there is presence of atmospheric pressure in the natural drain.

Type - 2:

(a) Super passage:

→ The FSL of canal is below the drainage through in this structure. The water in canal flows under gravity and possess the atmospheric pressure

This is simply a reverse of Aqueduct structure

(B) Syphon Super passage or Cannal passage

→ In a cannal system, drainage is carried over cannal similar to a super passage

Type 3:

(a) Level ~~cor~~ Crossing:

→ When the bed level of canal and the stream approximately the same and the quality of water in canal and stream is not much different the CDW constructed is called level crossing.

(b) Inlet And OUTLET:

→ When irrigation canal meet drain at same ~~level~~ level, drain is aboved to enter the canal as in inlet. At some distance from this inlet point a part of water is allowed to drain

Q.2

Part (A):

Weir	barrage
Low cost	High cost
Low control on flow of water	Relatively high control on flow of water level by operation gates
No provision for transport ~~commu~~ communication across river	usually a road on rail bridge can be added convinently
Chances of silting on the upstream is more	Silting may be controlled by judicial operation of gates

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Q. No 2

(Part) (B)

Reynold Number

It is the ratio of inertial forces to ~~[illegible]~~ viscous forces is reynold number

OR

The product of density times length density times length divided by viscosity coefficient

This is proportional to the ratio of internal forces and viscous forces in a fluid flow

$$R = \frac{FI}{FV}$$

✯ Laminar:

The flow of water at same direaction

OR

The flow in which layer of fluid move in straight and obgervable path not change direction is called laminar:.

If the reynold ~~nor~~ number is less than 2000 ~~it means~~ it is laminar.

Turbulant:

It is opposite of laminar flow

The velocity of the fluid is not costant at any given point of fluid

→ If reynold number > 2000 then it is turbilont

⇒ Neither laminar nor turbulant flow:

When the reynold number is between 2000 and 2800, the flow is neither laminar nor turbulant

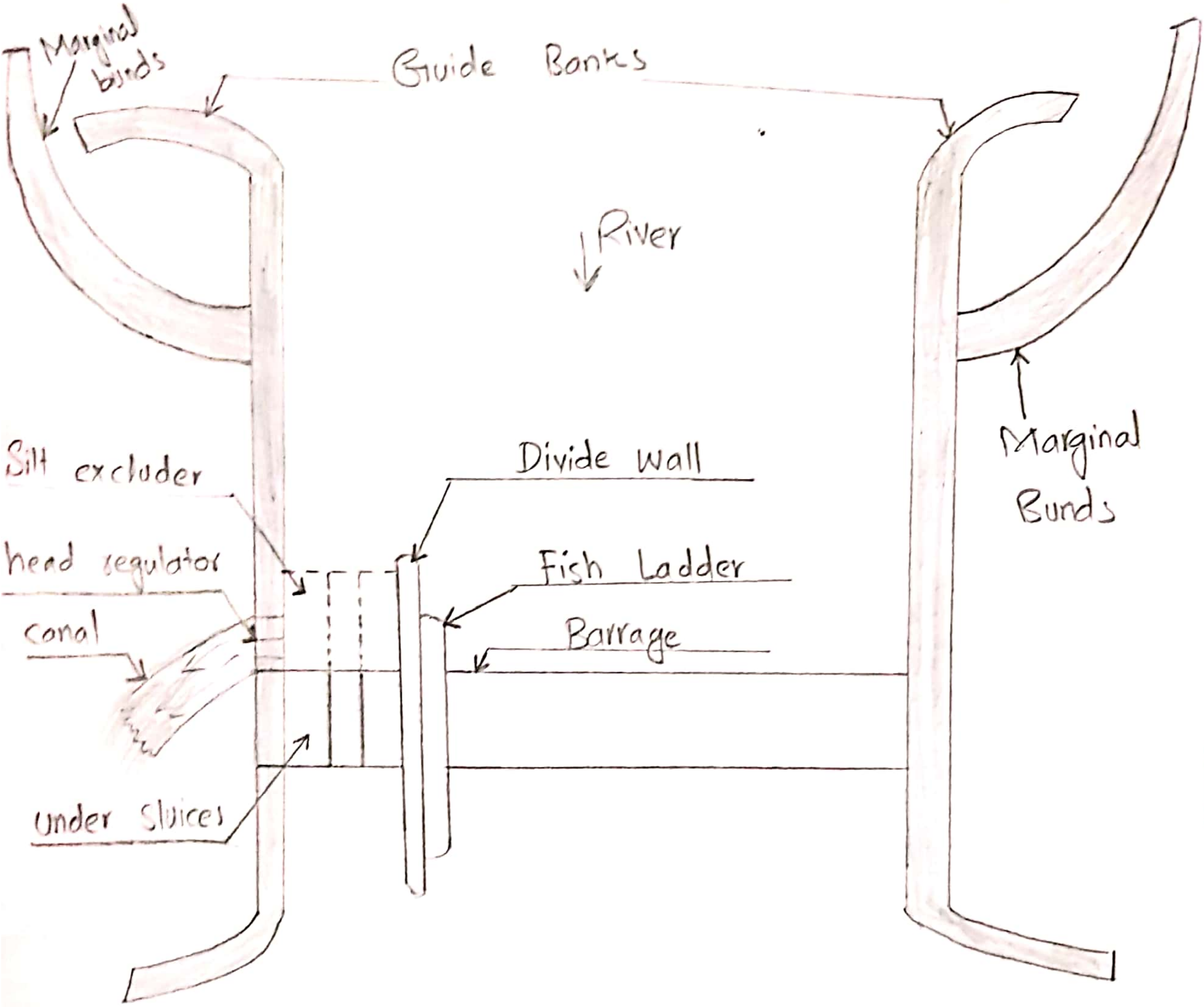
Lower critical velocity:

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 to turbulant is called higher critical velocity:

Q No. 3 :~ Part (a):



⇒ **Barrage And its Components**

Q. No (03)

Part (B)

Several formula based on experimental resoults have been proposed to predict the maximum or equilibrium) Soor depth (ys, below general bed level) around bridge piers. In general, these assume the relation ship

$$y_s/b' = Q(y_o/b', Fr, d/b')$$

where b' is the pier width y_o 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

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

The indian field data also suggest that the ~~So~~ scour depth should be taken as twice the regima scour depth

In case of live ~~a~~ beds (a stream with bed load transport) the formula

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

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

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

$$y_s = 2.3 K_\alpha b'$$

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

Q.NO4:

Given data:

L.L = 1500 lb/ft^2

D.L = 300 lb/ft^2

Section = 15' x 15'

Thickness = 3ft

Unit of Soil = 100 lb/ft^3

Q = 30"

Unit wt of Concrete = 156 lb/ft^3

fy = 60 Ksi

Sol:

→ Self wt of Slab

= thickness × Unit wt of RCC Concrete

= 3 ~~ft~~ × 156 lb/~~ft~~ ~~3~~ 2

= 468 lb/ft^2

→ Total load

L.L + D.L + Self wt

1500 + 300 + 468

= 2268 lb/ft^2

→ Co-efficient of earth pressure

$$\frac{1 - \sin\phi}{1 + \sin\phi}$$

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

= 0.33

Lateral Pressure

→ vertical pressure at top

(L.L + D.L) Ka

(1500 + 300) 0.33

= 594 lb/ft²

→ pressure of soil

Ka × h × unit wt of soil

0.33 × (15' × 3') × 100

= 594 lb/ft²

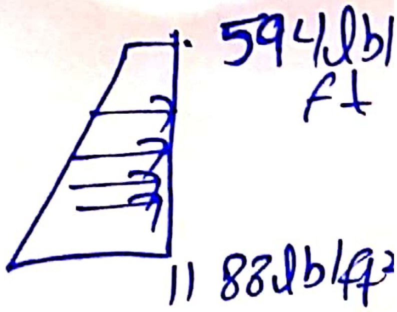
→ Lateral pressure at top = 594 lb/ft²

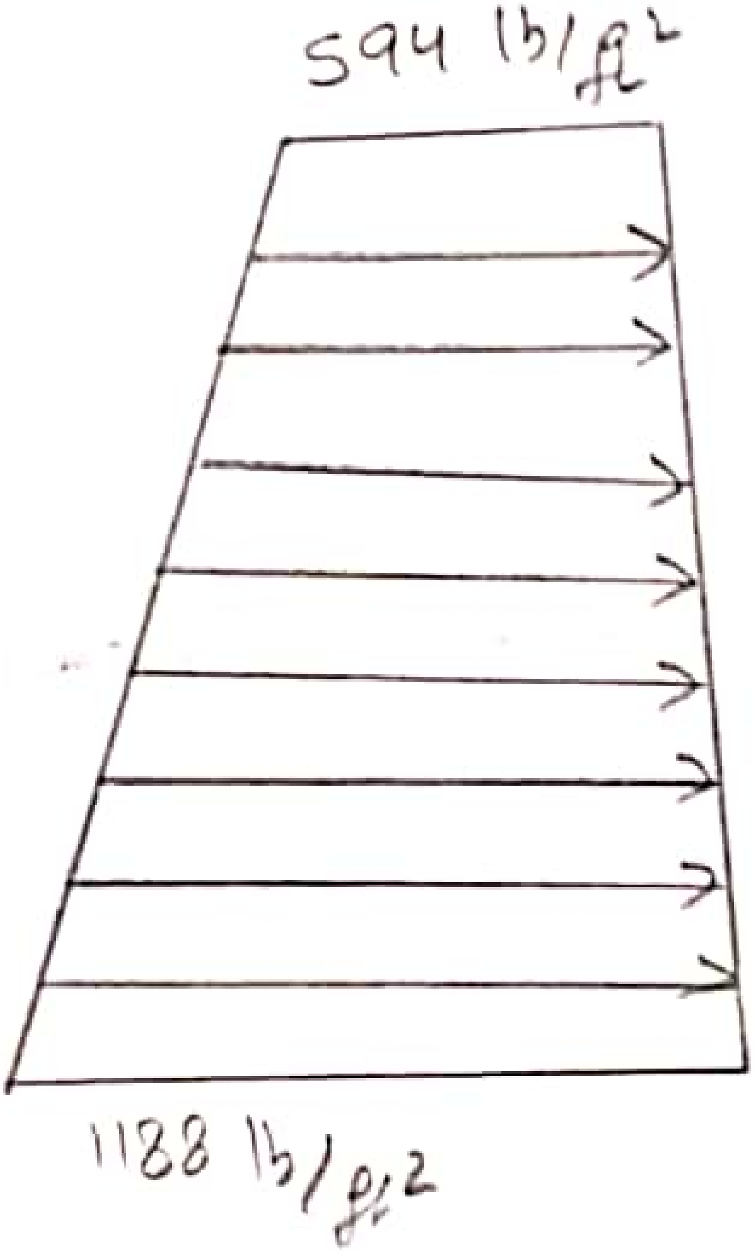
→ Pressure at bottom

= top + pressure of soil

= 594 + 594

= 1188 lb/ft²




594 lb/ft²
1188 lb/ft²