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ID # 7767

SEC # A

Subject :- Hydraulic Structure

Submitted :- Engr Adeed Khan

QNO 1 Part a

1) CULVERT :-

Culvert is define is a transverse Channel under a road or railway for the draining of water

OR

An opening Through an embankment for the conveyance of waater by mean of pipe or an enclosed Channed.

* Culvert is a tunnel structural Constructed under roadways or railways to provide cross chrunge or to Take electrical or other Cables from one side to other.

(2) Causeway

Causeway is define is a road that is raised, as to be above water marshland etc is called causeway.

⇒ Causeway is a road paved dip which allow the floods to pass over it. it may have or may not have opening or vent to allow low water to flow.

Q NO 3 B (3) 2

CROSS DRAINGE WORK :-

In an irrigation project when the network of main canals branch, canals distributries etc are provided then these canals may have to cross the natural drainges like rivers Stream nallahs etc at different points within the command area of the project the crossing of 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 & drange in the respective directions these structures are known as cross drainge work.

Necessary of Cross Drainge work.

- The water-shed canals donot cross natural drainages But in actual orientation of the canal work this ideal condition may not be avaible & the obstacles like natural drainages may be present across the canal So the cross drainge works must be provided for running the irrigation. System.
- At the crossing point the water of the canal and the drainge get intermixed. So for smoth running of the canal with its design discharge the Cross drainge works are required.

Types of cross Drainge Works

- Type-1 Irrigation canal passes over the Drainge.
- This condition involves the construction of the following

- **Aqueduct :-** The hydraulic structure in which the irrigation canal is taken over the drainage is known as aqueduct this structure is suitable when bed level of canal is above the highest flood level of drainge. In this case the the drainge water passes clearly below the canal.

Siphon Aqueduct :- In hydraulic structure where the canal is taken over the drainge. but drainge water cannot pass clearly below the canal it flows under sipphonic Action so it is called Siphon Aqueduct.

Type II Drainge passes OVER the Irrigation Canal :-

- **SUPER PASSAGE:-**

The hydraulic structure is which The drainge is Taken over the irrigation canal is known as super passage.

- **Siphon Super passage :-**

- The hydraulic structure in which the drainge is Taken over the irrigation canal water passes below the drainge under siphonic action is called Super Pussage.

Types III Drainge & Canal Interseet Each other at Same level.

• LEVEL CROSSINGS:-

When the bed level of canal & the Stream are approximately the same & quality of water in Canal and Stream is not much different the Cross drainge work constructed is called level Cross.

INLET & OUTLET:-

When irrigation Canal meets a small Stream or drain at 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 orignal Stream Stone pitching is required at The Inlet & outlet The bed & bank bth inlet & outlet are also protected by Stone pitching. this Type of CDW is called Inlet & outlet.

Q NO # 02

Reynold Number:

It is a number which is used during the flow of liquid. & It is related to Enggineering is called Reynold number

Laminar flow:

The flow of a fluid when each particle of fluid flows a smooth path. paths which never interfere with one another

∓ The flow in a pipe is laminar if the reynold number is less Than 2100

Turbulent:-

If the reynold number is greater than 4000 than it is called turbulent number

Neither Laminar nor turbulent flow:-

When the Reynolds number is in between 2000 and 2800 the flow is neither laminar nor turbulent

LOWER CRITICAL VELOCITY:-

The velocity at which flow change from laminar to transtion is called lower Critical velocity.

HIGHER CRITICAL VELOCITY

The velocity at which flow changes from transtion to turbulent is called higher Critical velocity.

Q NO # 02 A

WEIR :-

A weir is an impervious barrier constructed across a river to raised the water level on the upstream side the water is raised upto required hight and then flow over the ~~river~~ weir. weir have traditionaly been used to create. mill pond.

Weir is also used to prevent flooding measure discharge and help render a River navigable. The crest of an overflow Spillways on large dam is often called weir. weir can be build of wood concrete or marine matenal.

BARRAGE:-

A River barrage is low headed diversion dam that is built to allow diversion of part of the water flow.
A barrage determines a little increase of upstream water profile & a little upstream Reservoir. the purpose of barrage is essentially to stablized the upstream water level & river profile in order to ensure a long Technical Life to diversion facilities

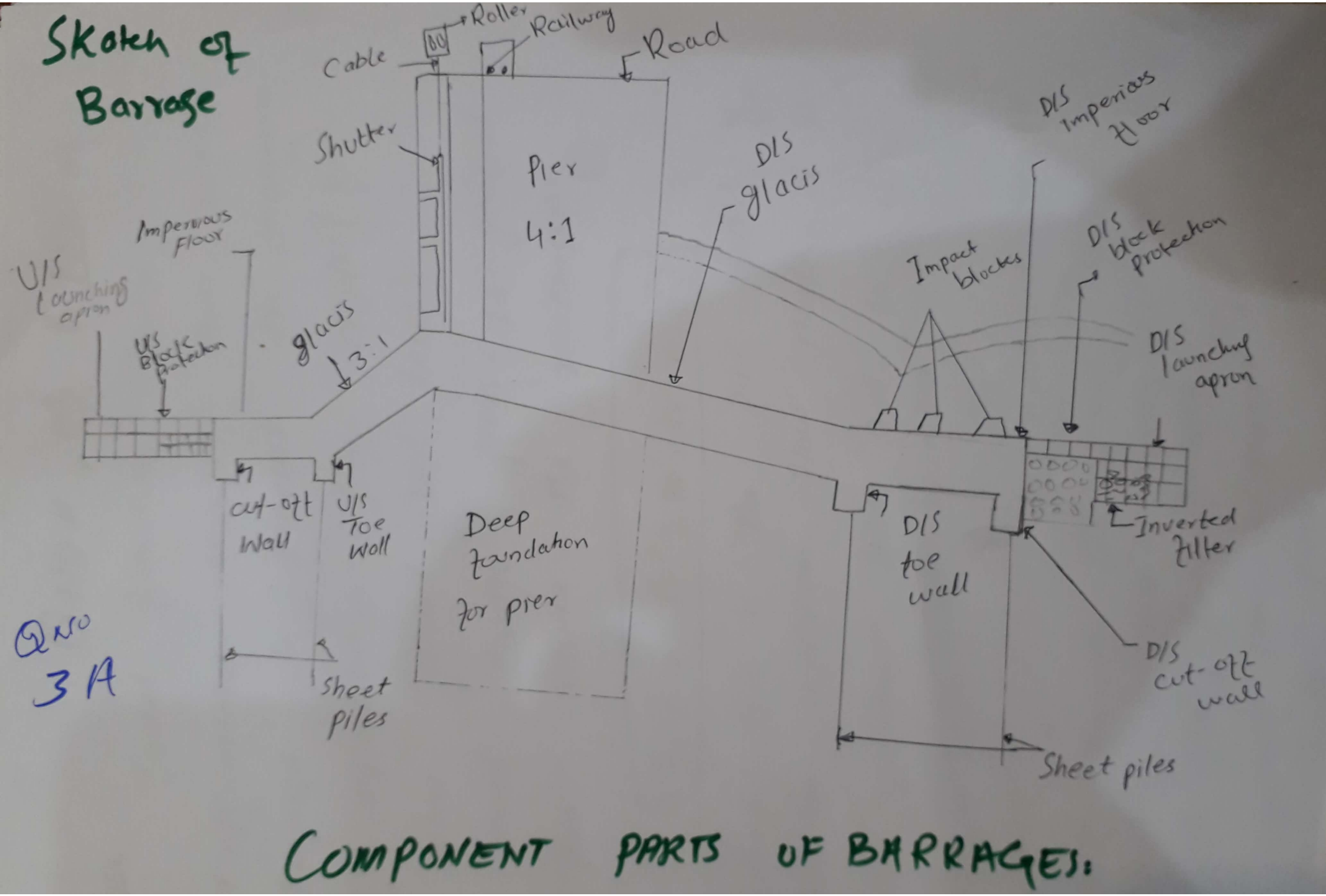
DIFFEREITATE BIT INEIR & BARRAGE

INEIR

1) Having low cost
2) low control on flow
3) weirs are constructed to raise the water level in dry season

BARRAGE

1) Having high cost
2) Relatively high control on flow and water level by operation of gate.
3) Barrage are generally constructed to control the water flow in flood season.


Sketch of Barrage
Roller
Railway
Road
Cable
Shutter
Pier
4:1
DIS glacis
DIS Impervious floor
Impervious Floor
U/S Launching apron
U/S Block protection
glacis 3:1
Impact blocks
DIS block protection
DIS launching apron
cut-off Wall
U/S Toe Wall
Deep foundation for pier
DIS toe wall
Inverted filter
DIS cut-off wall
Sheet piles
Sheet piles
Q No 3A
COMPONENT PARTS OF BARRAGES:

Q NO # 03 B PART:-

Ans:

Several formula 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

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

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) the formula / Approach flow is normal to the bridge piers.

P.T.O

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

The indian field data also suggest that the scour depth should be taken as twice the regime scour depth

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

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

Predicts the maximum equilibrium scour depth

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

$$y_s = 2.3 K a b'$$

Where Ka = angularity coefficient which is a function of the pier alignment ie. angle of attack of Approch flow

Q NU # 04

GIVEN DATA :-

$L.L = 1.5 \text{ kip/ft}^2 = 1500 \text{ lb/ft}^2$

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

Unit wt of soil is $= 100 \text{ lb/ft}^3$

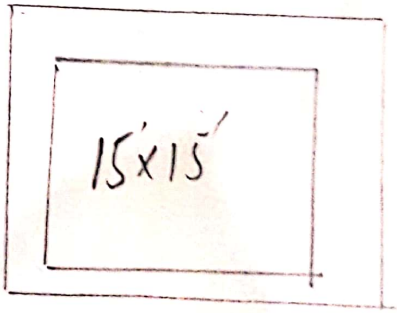
Angle of Response $= 30^\circ$

$f_y = 60 \text{ ksi}$

Thickness $= 3 \text{ ft}$

Solution :-

Selt wt of Slab



Thickness x Unit of Concrete.

$\Rightarrow 3 \times 150 = 450 \text{ lb/ft}^2$

Total load :-

$= (L.L + D.L + \text{Selt wt})$

2) Co-efficient of Earth pressure

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

$$Ka = \frac{1 - \sin(30)}{1 + (\sin)(30)} = 0.33$$

3) Lateral pressure due to (D.L + L.L)

Total vertical load $(L.L + D.L) \times Ka$

$= (1500 + 300) \times 0.33$

$= 594 \text{ lb/ft}^2$

4) Lateral pressure due to Soil

$= Ka \times \gamma h$

$= 0.33 \times 100 \times 18$

$= 594 \text{ lb/ft}^2$

5 Lateral pressure

(a) **Top** :- = lateral pressure due to (D.L + L.L)

$= 594 \text{ lb/ft}^2$

(b) **Bottom** :-

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

$= 594 + 594$

$= 1188 \text{ lb/ft}^2$ Ans