ID	7655
Semester	10th
Subject	Hydraulic Structure
Submitted to	Engr Adeed
Submitted by	Syed Usama Bin Akhtar
Date	24/6/20

Q1)

a) Difference b/w Culverts and Causeways ?

- Culvert

Def;

1) An opening through an embankment for conveyance of water by mean of pipe or an enclosed channel.

or

It is a transverse and totally enclosed drain under a road or railway.

2) Culverts are like pipes but in very large size made of concrete, steel, plastic, Aluminium, high density polythene.

3) The culverts are provided at location where it is economical and used.

- Cause ways

Def;

1) A bridge having its floor flush or little above the bed or stream which allows floods water to pass over its floor.

2) Causeways is a track, road railway on the upper point of embankment accross a low or wet place or piece of water.

3) It can be constructed of earth, masonry, wood or concrete.

4) Types of causeways are;

- Low Level,
- High level causeways.

5) Causeways are provided where heavy discharge flows across for short duration of time No more than 72 hrs.

4) Culvert types;

- Pipe culvert,
- Pipe Arch culvert,
- Box culvert,
- Arch culvert,
- Bridge culverts.

Q1)

b) Cross Drainage Work;

Def; 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 etc, at different points within the command area of project, The crossing of the cannals with such obstacles cannot be avoided. So, suitable structures must be constructed at the crossing points for the easy flow of water of the cannals and drainge in respective directions.

Q1) b)

So basically work required to construct, to cross the drainage works (CDWs).

- **Why CDWs are Necessary ?**
  - Water shed cannals donot cross natural drainages. But in actual orientation of canals network this ideal condition may not be available and the obstacale like natural drainage works must be provided for running the irrigation system.
  - At the crossing point the water of the canal and the drainage gets intermixed. So, for smooth running of the canal with its design 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 cannal and drainge can't be diverted, So CDW is provided for Natural direction of the flow.

- Types of Cross Drainage Works;

- Type 1 (Irrigation canal Passes over the drainage)

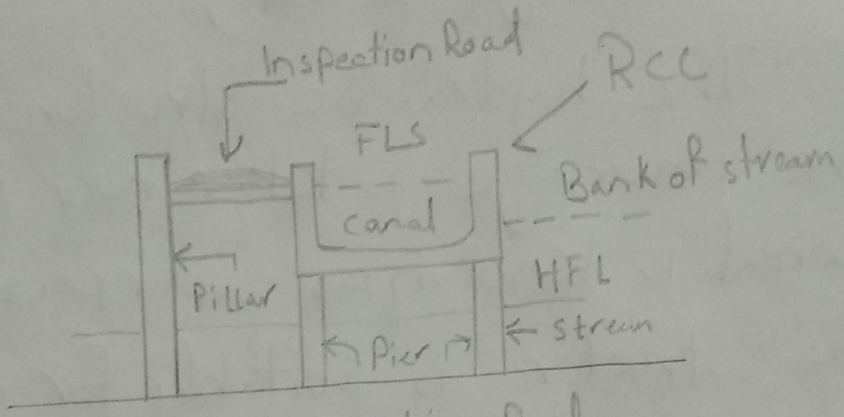
  (a) Aquaduct
  (b) Siphon Aquaduct.

Aquaduct; The hydraulic structure in which the irrigation cannal is take over the drainage is known as aquaduct. This structure is suitable when bed level of canal is above the highest flood level of drainage. In case the drainge water passes clearly below the canal.

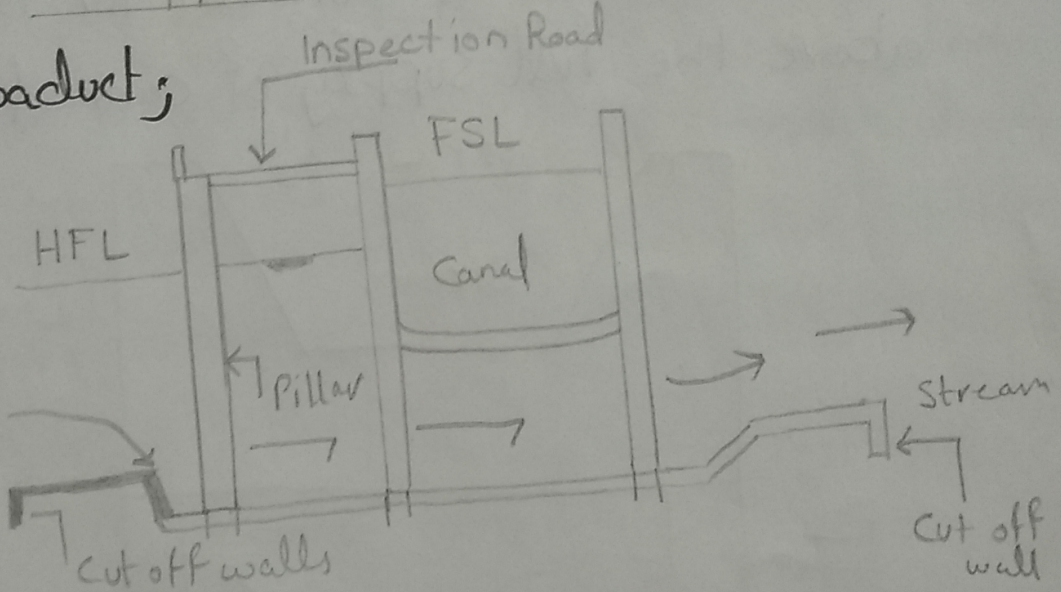
Siphon duct; In a Hydraulic structure where canal is taken over the drainage, but the drainage water cant pass clearly below the canal, It flows under siphonic action hence called siphonic Aquaduct.

Figures for

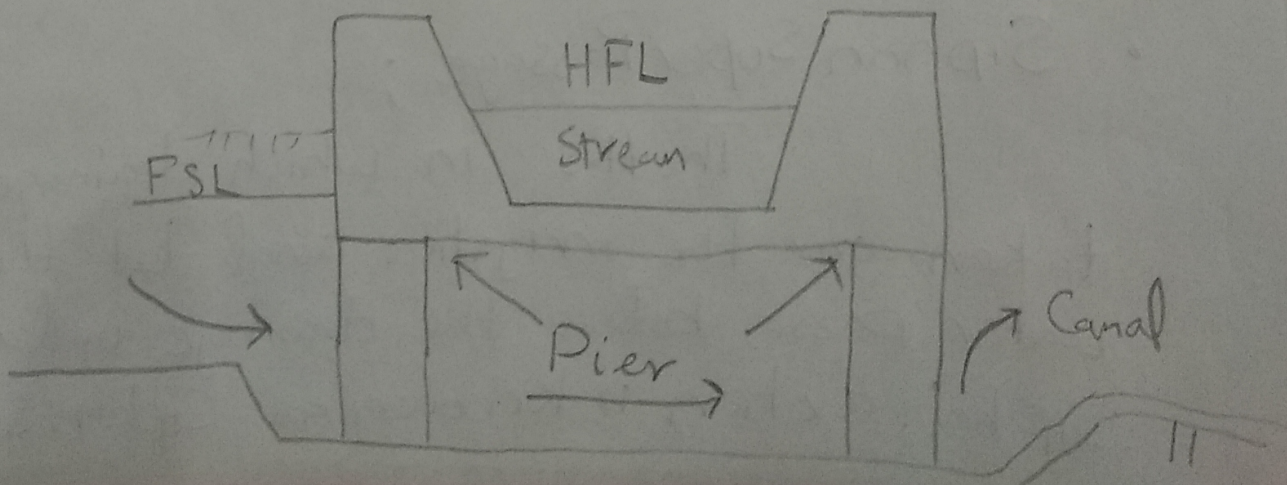
- Aquaduct ;



- Siphon Aquaduct ;



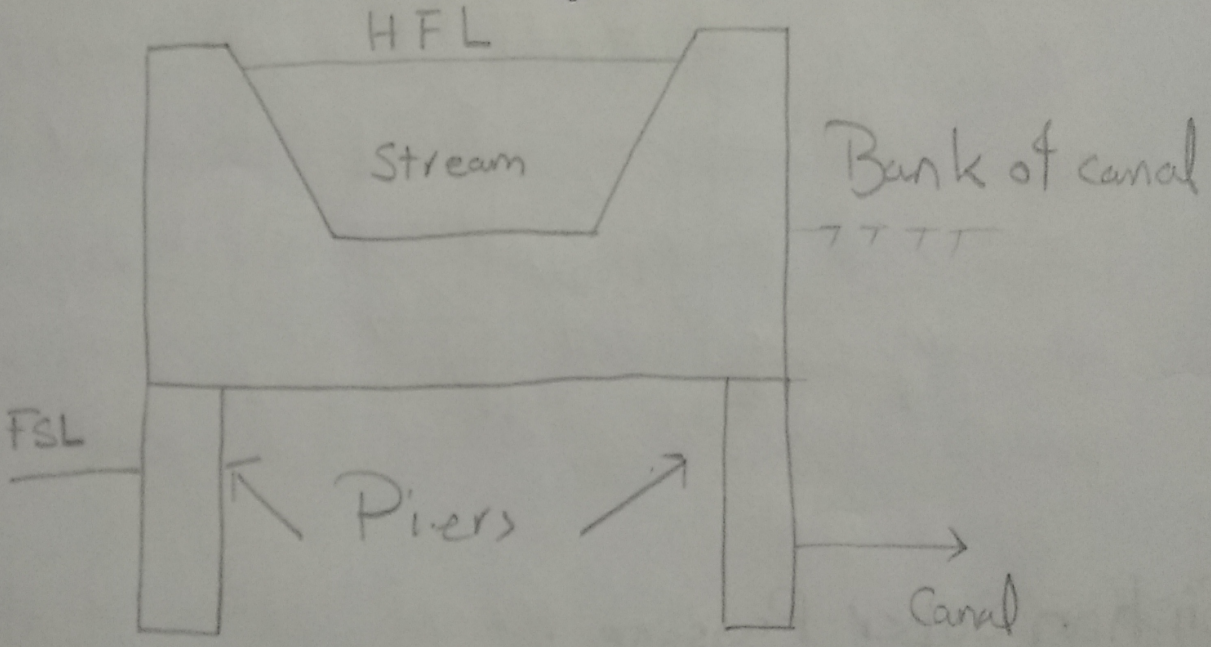
Siphon Super Passage ;



- Type II Drainage Passes over the Irrigation cannal ;

- Super Passage ;

The hydraulic structure in which the drainage is taken over the irrigation cannal is known as super passage. The structure is suitable for drainage above the full supply of cannal



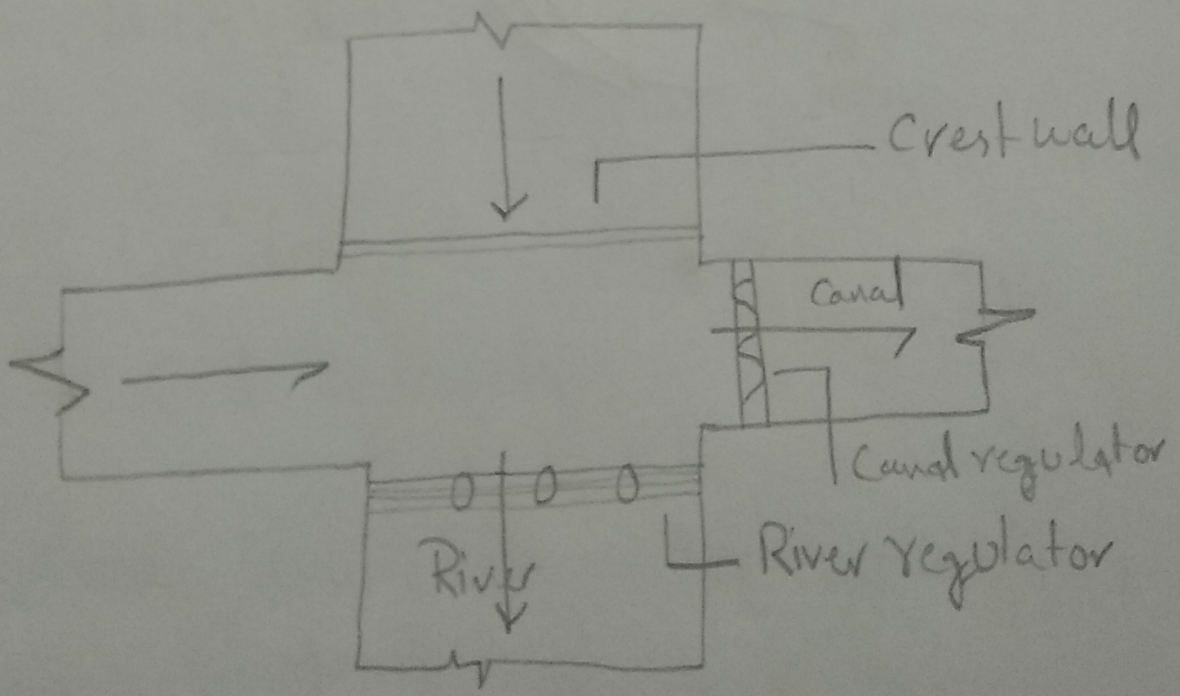
- Siphon Super Passage ;

The H.S in which drainage is taken over the irrigation canal but the canal water passes below the drainage under Siphon action is known as Siphon Super.

- Types III Drainage and Canal intersect each other at same level;

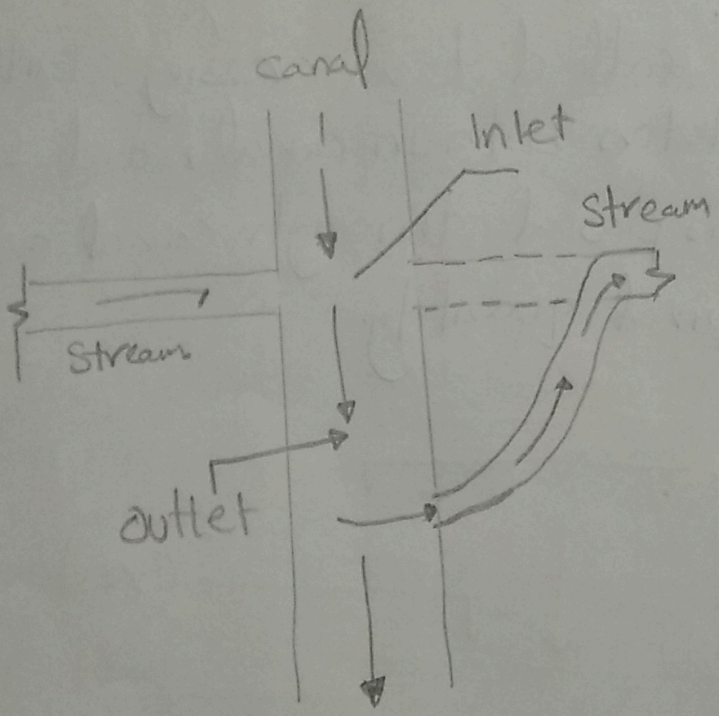
Level crossing;

When bed level of canal and Stream are approximatly the same and quality of water in canal and stream is not much different. The cross drainage constructed is called level crossing. With help of regulators both in canals and stream water is disposed through canal and stream. required quantity



Inlet and Outlet ;

When irrigation canal meets stream at same level drain is allowed to enter canal as inlet. At some distance from this inlet point a part of water is allowed to drain as outlet which meets original stream.



Q2

a) Difference b/w

Weir	Barrage
• Weirs are commonly used to control the flow rates of river during periods of high discharge.	Barrages are used to convert tidal energy into electrical energy by forcing water through turbines by activating a generator.
• Sluice gates are used to increase or decrease the volumn of water going out.	

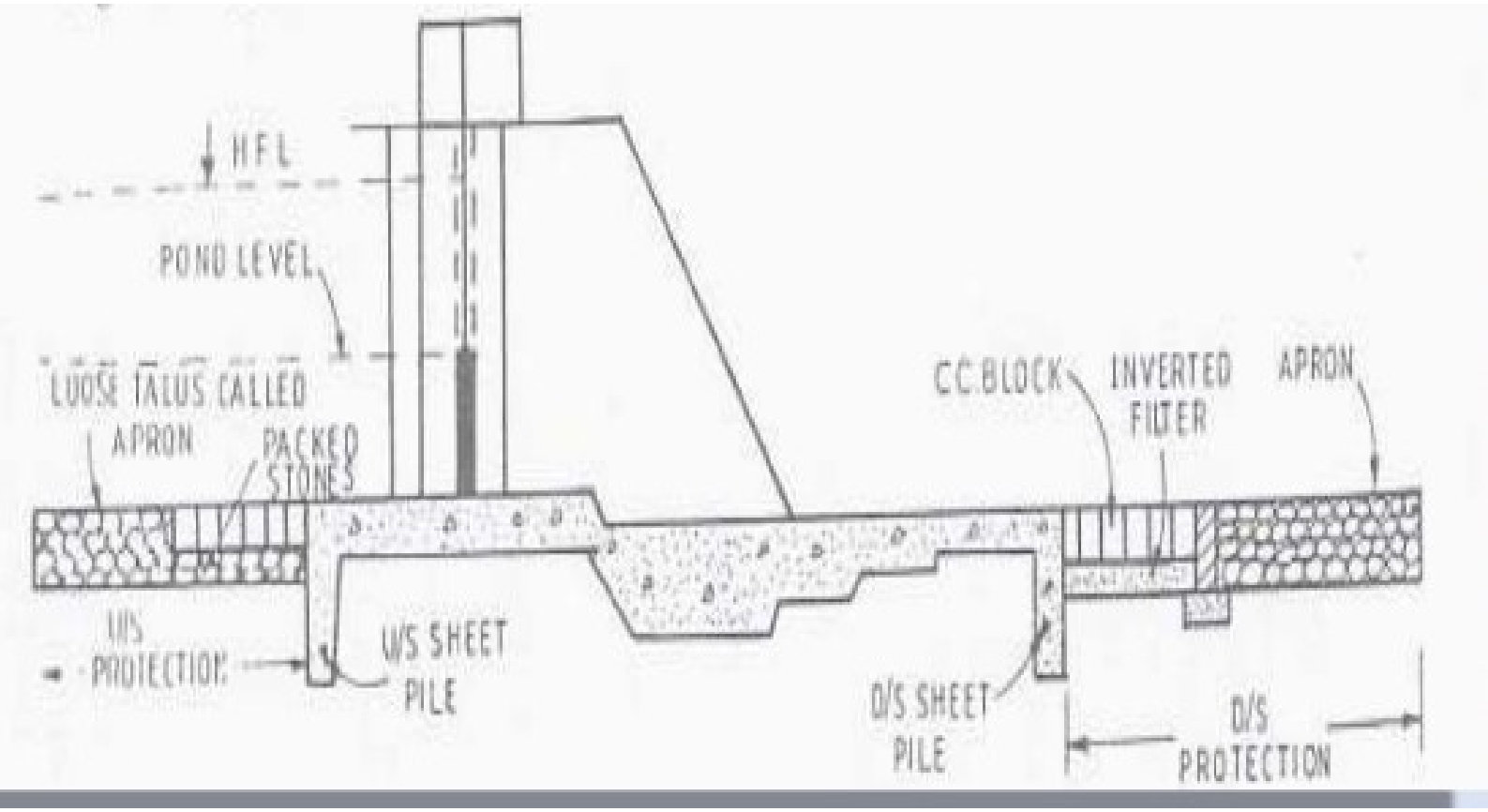
Q2

b) Reynold's Number;

It is the ratio b/w inertial force and viscous forces, it basically number by which we deter the flow if it is laminar or turbulant.

- The fluid is in "laminar flow" if it's Reynold's No is less then 2000.
- If the flow's number is more then 3500 then it will be "turbulant flow".
- if flow is b/w 2000 and 4000 then it will be "transition flow".

- Lower Crit Velocity; The velocity at which flow changes from ~~transition~~ laminar to transition.
- Higher Crit Velocity; The velocity at which flow changes from Transition to turbulant.


HFL
POND LEVEL
LOOSE TALUS CALLED APRON
PACKED STONES
CC BLOCK
INVERTED FILTER
APRON
U/S PROTECTION
U/S SHEET PILE
D/S SHEET PILE
D/S PROTECTION

Q3)
b

Ans) Serveral formulas based on Experimental result have been proposed to predict maximum or equilibrium scour depth around bridge peirs.

In general these assume relation ship

$$y_s^{1b'} = \phi\,(y_o 1b', Fr, d1b')$$

Now b is pier width, y_o is the uniform upstream flow depth, d is sediments size, Fr is Froud's Number.

The Reild data suggests that scour dept should be taken as twice the regime scour dept,

In case live bed,

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

Predicts the max scour dept.

In relativly deep flow a first order estimate of clear local scour may obtain by

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

where K_a = angularity coefficient.

Q4) Given data;

L.L = 1.5 Kip/ft²

D.L = 300 lb/ft²

$\phi = 30°$

Unit weight of soil = 15 × 15

fy = 60 Ksc steel

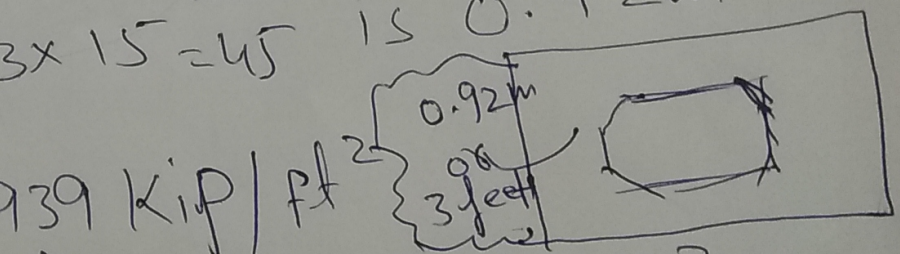
Soil concrete = 1:2:4 = M_{15}

① Load calcution

Total load on top = DL + selfweight + L.L

consider thickness is 0.92m

selfint = 3 × 15 = 45 KN/m² = 0.939 Kip/ft²



w = Total load = 1.5 + 0.939 + 0.3

w = 2.739 Kip/ft²

② Coefficient of earth portion

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

$K_a = 0.33$

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

= Total vertical load (L.L+D.L) × Ka

= (1.5+0.3) 0.33

= 0.594 kip/ft² or 28.4 kN/m²

Lateral pressure due to soil

= Ka × γ soil × h

= 0.33 × 0.1 × 18

= 0.594 kip/ft² or 28.4 kN/m²

Lateral pressure at top

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

= 0.594 kip/ft² or 28.4 kN/m²

at Bottom Lateral pressure due to (L.L+D.L)

+ Lateral pressure due to soil

= 0.594 + 0.594

= 1.188 kip/ft² or 56.88 kN/m²