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Exam	Final term
SEC	A
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Question - 1 (part A)

Culvert	Cause way
i) Culvert is generally a tunnel which carry the stream under a road or railway.	i) A cross is generally a road, track, railway on the upper point of an embankment across a low or wet place or a piece of water.
ii) Culvert are used in road's to prevent flooding and washing out of roads.	iii) Cause way is used for the transportation purpose.
iii) Culverts are used to minimize the erosion and also provide a pathways to run-off.	iii) It provides access for maintaince as well perhaps, as a public service. It provide a hardened crest for the dike.

Question-1 (Part B)

Cross drainage work:

Cross drainage works are the structures which are constructed on the crossing point of canal, branch of canal or distributies from a natural drainage (river, stream etc) for easy flow of water of the canal and drainage in their own directions.

Necessity:

* When a canal passess to a natural drainage, so at crossing point the water of canal and natural drainage get intermixed. So for the smooth running of the canal with its design discharge the cross drainage works are constructed at the crossing point.

* Cross drainage works are required at crossing point to divert the canal and natural drainage in their natural directions.

* Cross drainage works are provided at the crossing point, so the water and canal and natural drainage can be easily flow in their respective directions.
* It is also provided at crossing point to run the irregation system easily.

Types of cross drainage works:

There are three types of cross drainage works which depends on the bed levels of canals and natural drainage.

1. TYPE-I (Irregation canals passes over the drainage)

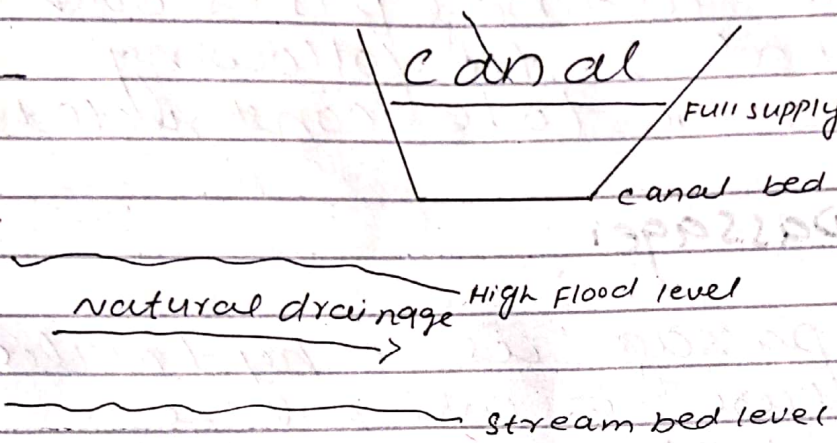
When the irregation canals passes over the drainage so the follow structures are to be constructed

i) Aqueduct:

Aqeduct is a hydraulic structure in which the hydraulic canal is taken over the natural drainage.

* The structure is suitable when bed level of canal is above the highest flood level of drainage.

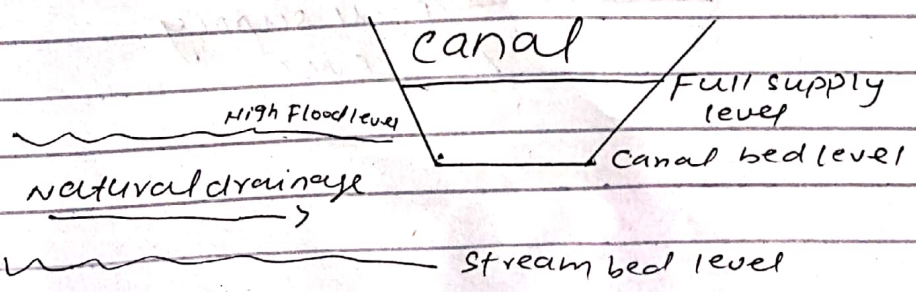
* The drainage water can be easily passes below the canal.



ii) Siphon Aqueduct:

Siphon Aqueduct is a hydraulic structure which are construct to pass the canal over a natural drainage.

* In siphon aqueduct the drainage water cannot pass easily under the canal and flows under ~~seismic~~ siphonic action.
* When the bed level of canal is below the highest flood level so siphon aqueduct is constructed.



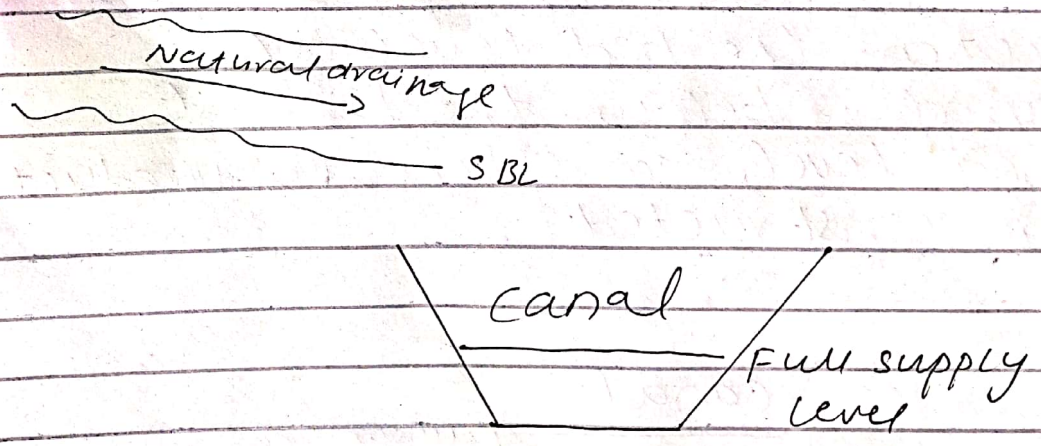
2. Type-II (Drainage passess over the canal)

When the drainage passes over the canal so the following structures are to be constructed.

i) Super passage:

Super passage is a hydraulic structure in which the natural drainage is passes over the canal.

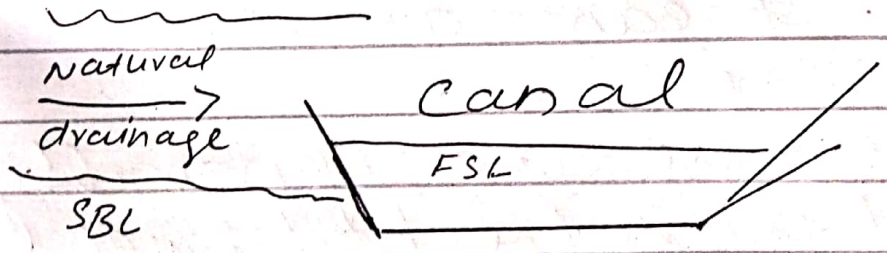
* The canal water can easily flow below the drainage.
* These structures are suitable when the bed level of drainage is above the full supply level of canal.



ii) Siphon super passage:

This is a hydraulic structure in which the drainage is taken over a irrigation canal.

* In this structure the canal water cannot passes clearly below the drainage.
* This structure is suitable when the bed level of drainage is below the full supply level of the canal.



3. Typ-III (Drainage and canal intersect at each level)

In this condition the bed level of canal and drainage is almost same. So the both bodies intersect at each level.
The following structures are constructed.

i) Level Crossing:

Level crossing is a cross drainage work which allows the stream and canal water to mix.

* These structure are generally constructed when the bed level of canal and natural drainage is almost same.
* By using regulators the canal and drainage water is disposed in required quantity.
* Level crossing consist
  i) Crest wall
  ii) Stream regulator
  iii) canal regulator.

ii) Inlet and outlet:

* Inlet is a point where the small stream or a natural drainage enter to the canal.
* when the stream water flows at some distance so these water are then apart to meet with the original stream. so this point is known as outlet.
* stone pitching are used to protect the beds and banks between the inlet and outlet.
* Generally this is inlet and outlet cross drainage work.

Question-2 (part-A)

weir	Barrage
i) The cost of weir are low.	ii) Barrage cost is high.
ii) Weir have hight set crest.	ii) Barrage have low set crest.
iii) weir have low control on flow	iii) Barrage have high control on flow and water level is controlled by operational gates.
iv) In weir there is more chances of silting on the upstream	iv) In barrage silting is controlled by judicial operation of gates.
v) In weir ponding is done against the raised crest or partly against crest and partly by shutters	v) In barsage ponding is done by means of gates

Weir	Barrage
vi) Weir takes less time to construct	vi) Barrage takes more time to construct.
vii) In weir shutters is provided in part length.	vii) In Barrage the gates are provided over the entire length
vii) Gates are greater in height	vii) Shutter are smaller in height i.e 2m
viii) In weir there is no proper procedure for silt diposal.	viii) In barrage the silt is remove by under sluices.
ix) In weir there is excessive ~~floods~~ afflux in high floods	ix) In barrage, the afflux is minimum in high floods.

Question-2 (part-B)

Reynold's number

Reynolds number is the ratio of inertial forces to the viscous forces.

$$Re = \frac{\text{inertial forces}}{\text{viscous forces}}$$

* Reynolds number is used to see that the flow is laminar, turbulant or transition.

Limits:

i) Laminar:
When the reynolds number is less than 2000 then the flow will be laminar.

ii) If the reynold number is greater than 4000 then the flow will be turbulant.

iii) Neither laminar nor turbulant:

When the Re is 2800 so the flow will be neither laminar nor turbulant.

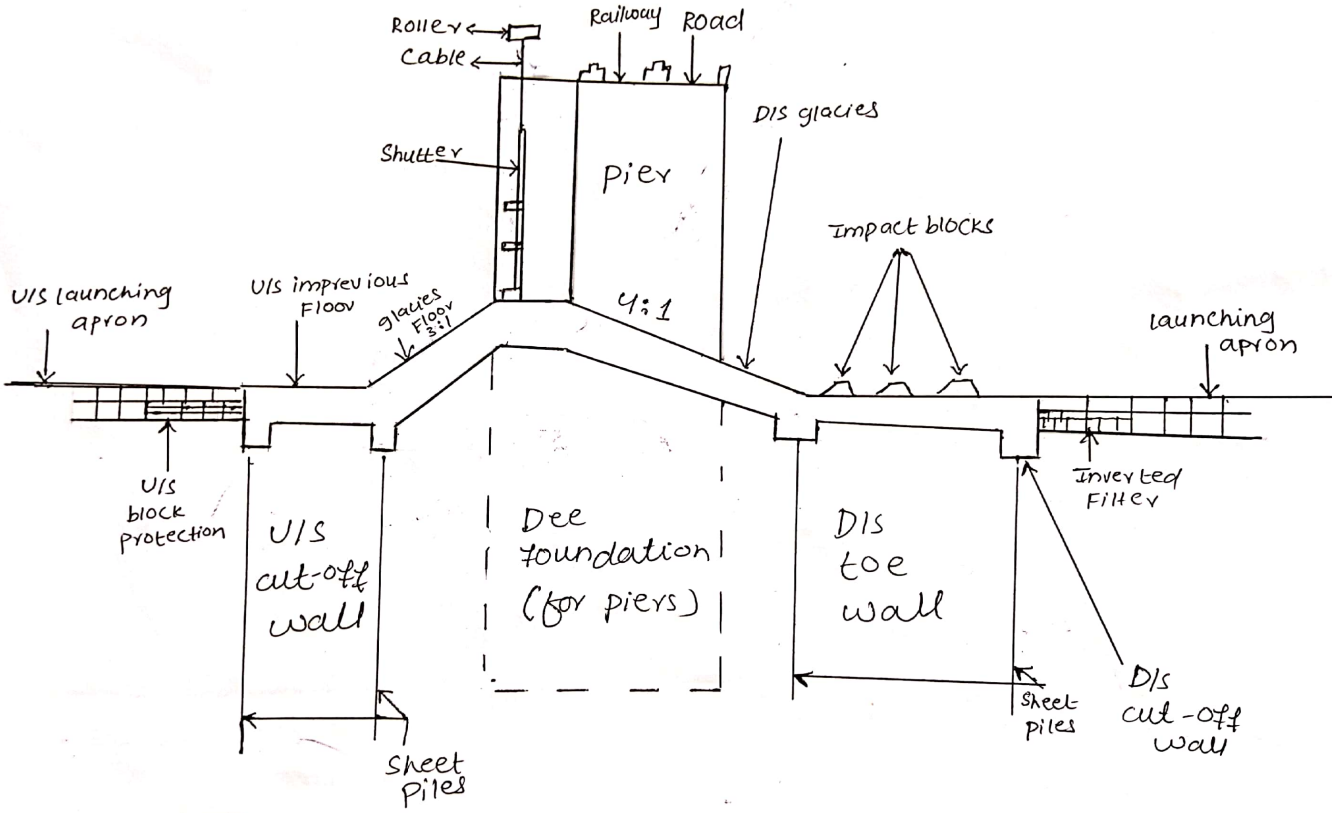
Lower critical velocity:

The velocity at which the flow changes from laminar to transition is called lower critical velocity.

Higher critical velocity:

The velocity at which the transition flow changes to turbulant flow is called higher critical velocity.

Q-3 (Part -A) (Page -13)



Q3 (part -B)

Ans) If the contracted width (i.e bridge length, L) is less then the regime width, W, then the normal scour depth, D_N under the bridge is given by

$$D_N = R_s (W/L)^{0.61}$$

Case:1: when a bridge is single-span bridge (no, piers) with a straight approch then the maximum scour depth is 25% more than the normal scour depth.

Case:2: when a bridge is multispan structure with curved approch reach then the maximum scour depth is 100% more than the normal scour depth.

* Also maximum scour Depth is find by

$$D_{max} = R_s (W/L)^{1.56}$$

Question-4:

Given data:

-> Inside dimension = 15 ft x 15 ft

-> Thickness of slab = 0.92m x 3.28
=> 3.02 ft

-> L.L = 1.5 kip/ft^2 x 1000
= 1500 lb/ft^2

-> D.L = 300 lb/ft^2

-> Unit weight of soil = γ = 100 lb/ft^3

-> θ = 30°

Sol:

1) Load calculation:

Self weight of top slab = 3 x 150
= 450 lb/ft^2

Total load carry on top slab:

= self weight of slab + L.L + D.L

= 450 + 1500 + 300

= 2250 lb/ft^2

2. Co-efficent of Earth pressure:

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

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

$$ka = 0.33$$

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

= Total vertical load (D.L + L.L) x kq
= (300 + 1500) x 0.33
= 594 lb/ft²

4. Lateral pressure due to Soil:

At top:

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

= 594 lb/ft²

At bottom:

lateral pressure due to (D.L + L.L)
+
lateral pressure due to soil
=
= 594 + 594
= 1188 lb/ft²

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