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Section	A
Exam	Final Term
Subject	Hydraulic Structure
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Submitted to	Engr. Adeed

Q1 (a) Culvert:-

Culvert is to convey the water from the embankment by pipe or enclosed channel. Culvert span is less than 20 feet. A culvert is typically designed to convey water under a roadway.

Causeway:-

A causeway is likely bridge but it is not a bridge there support are roadway between the piers. Its mostly supporting by earth & stone. The causeway is on a raised road. It is traditionally paved with pebbles. But in reality the road plus the embankment will usually be called the causway.

(b) Cross drainage works:-

From the point of view of irrigation project. The different number of canals, branches & distribution channels are provided for irrigation purposes. These different form of canals at a point cross the natural rivers, streams etc.

For the protection of the natural drainages a suitable structures must be constructed to avoided these problems. This is work as a helping structures for the irrigation projects & the structure is called Cross-drainage works.

Necessary:-

When there is a crossing of canal & natural drain, to prevent the drain water from mixing in to canal water.

Types of Cross-drainage works:

i) Aqueduct:-

It is one of the type of Cross-drainage work. It carry the irrigation canal over the natural drainage like river, stream etc. This structure work when canal is satiuted on high level of drainage.

Siphon Aqueduct:-

The siphon aqueduct is a structure where the canal is over the drainage when the water cannot goes clearly below the canal. Due to this they will flow like siphonic action. This types of hydraulic structure is work when the bed level of canal is below the highest flood level.

Super passage:-

It carries drain over an irrigation canal.

Level Crossings:-

This structure makes it possible to dispose off drain water safely at same level as that of a canal.

Inlet & outlet:-

When possible drain water is taken in the canal to be discharged afterwords in to a drain at suitable location.

Q2 (a) Difference btw Weir & barrage:-

Both are terms used in irrigation engineering in conjunction with storage & regulation of water.

Both terms are used in conjunction with water dams. Weir stores the water by creating obstruction. If the water flow regulated through mechanically operated gates, this is called a barrage.

If water flows over the obstruction, it is called a weir whereas if water flows through an opening this is a barrage.

(b) Reynold's Number:-

The product of density times length divided by viscosity coefficient.

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

Laminor:-

The flow in a pipe is laminor if the reynolds number is less than 400.

Turbulant:-

If the reynolds number is greater than 400 it is Turbulant.

Neither Laminar nor Turbulant flow:-

When the reynold number is between 2000 & 2200, the flow is neither laminar nor turbulant.

Lower Critical velocity:-

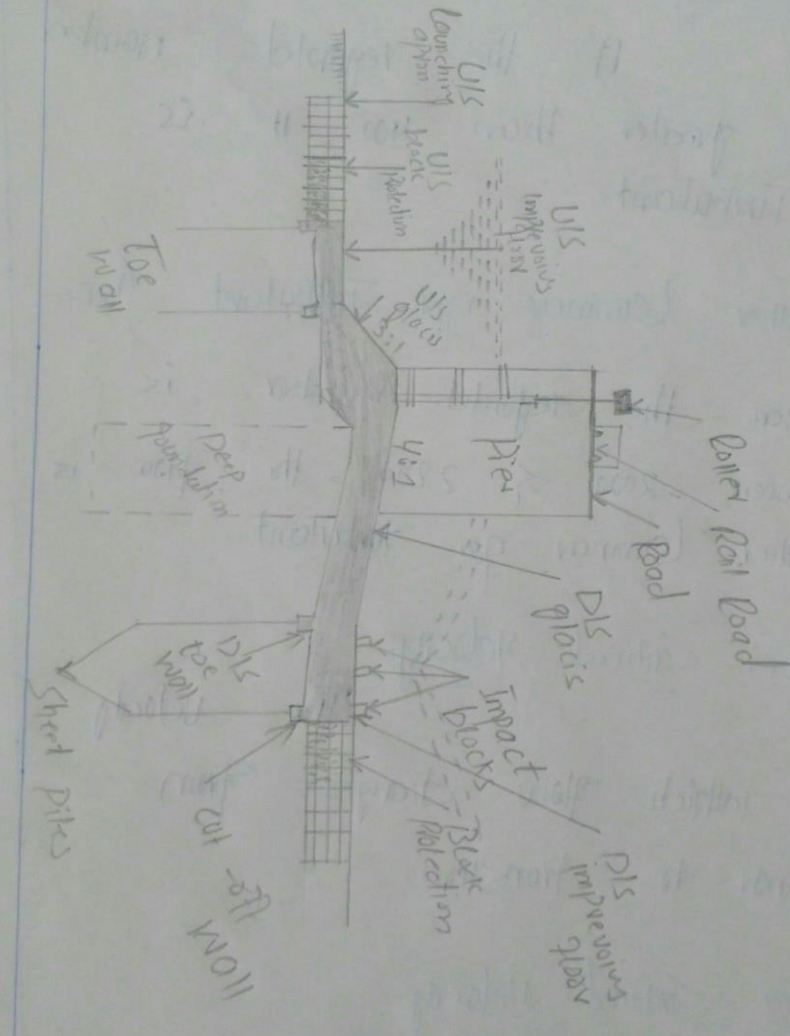
The velocity at which flow changes from laminor to transition.

Higher Critical Velocity:-

The velocity at which flow changes from transition to turbulant.

Q3 Neat Sketch:-

(a)



Q3 (b) Scour depth under the bridge:-

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

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

Where R_s is the regime Scour depth.

The maximum Scour depth in a Single-span bridge (no piers) with a Straight approach is about 25% more than the normall Scour given by equation whereas the case of multispan Structure with a curved approach reach it is 100% more than the normal scour

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

$$y_c/b' = \phi(y_0/b', F_r, d/b')$$

where 'b' is the pier width, y_0 is upstream flow depth, d is the sediment size & F_r is the flow Froude number.

Laursen's (1962) experimental results underestimate the scour depths.

$$y_c/b' = 4.2(y_0/b')^{0.78} F_r^{0.02}$$

In the case of live beds the formula

$$y_c/y_0 = (B/b') - 1$$

predicts the maximum equilibrium scour depth

$$y_c = 2.315\, b'$$

Q4:: Given data:

$L.L = 1500\ lb/ft^2$

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

Section = 15' x 15'

thickness = 0.92 = 3ft

Unit wt of Soil = 120 lb/ft²

$\theta = 30°$

$f_y = 60\ ksi$

Sol::

Self wt of slab x unit wt of RCC concrete

3 x 156 = 468 lb/ft²

Total load

(L.L + D.L + Self wt)

(1500 + 300 + 468)

= 2.268 lb/ft²

Coefficient of earth pressure

$$\frac{1-\sin\theta}{1+\sin\theta} = 0.33$$

Lateral pressure

i) Vertical pressure

$(L.L + D.L)\,K_a$

= (1500 + 300) 0.33 = 594 lb/ft²

ii) pressure of soil

$K_a \times h \times$ unit wt of soil

$= 0.33 \times (15+3) \times 100$

$= 594$ lb/ft^2

iii) pressure at top $= 594$ lb/ft^2

pressure at bottom

$= 594 + 594$

$= 1188$ lb/ft^2