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Paper hydraulic structure

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final term

culvert :- culvert is a tunnel carrying a stream under a road or railway a culvert may act as a bridge for traffic to pass on it. They are typically found in natural flow of water these are permanent drainage structure constructed to carry road way or railway track over small stream or canal

There are types of culvert

1) arch culvert
2) slab culvert
3) Box culvert
4) pipe culvert

Causeway :- A bridge having its floor flush or little above the bed of stream which allow flood water to pass always over its floor. when heavy discharge in stream only for small duration not more than 72hr natural width of stream carrying little or no water through out the year

there are type of causeway

1) flush cause way
2) low level cause way
3) high level cause way

Cross Drainage Work :-

A structure constructed when there is a crossing of canal and natrual drain To Prevent drain water from mixing in a canal. but these type of structure is costly and mostly it is avoided in two way by changing the alignment of canal water way.

The cross drainage is required to dispose of drainage water so that canal supply remain uninterrupted - at the crossing Point the water of canal and drainage get intermixed So for smooth flow of canal with design discharge and cross drainge that in the design the water of canal and drainge can not be divert. and should main tain natural direction flow

Types of cross-drainage work :-

Aqueduct :- In this the bed level is above the drainage bed level so canal is to be constructed above drainge

drainage is carried over canal similar

The canal water level is referred as fully supply level and drainge water level is reffered as high flood level. High flood level is below the canal

Syphon Aqueduct :-

in syphon, canal water is carrier above the drainage but the high flood level of drainge is above canal The drainage water flow under syphonic action and there is no precence of atmospheric Pressure in the natural drain

Super Passage :-

super passage structure carrie drainage above canal as canal bed level is below drainge bed level the full supply level of canal is below the drainge through in this structure the water in the canal flow under gravity and Posses the atmospheric pressure. this is simply reverse of aqueduct structure

Canal syphon :-

in a canal syphon, drainage is carried over canal similar to super Passage

but the full supply level of canal is above than the drainage through so canal water flow under syphonic action and there is no presence of atmospheric Pressure is canal

Level Crossing :-

when the bed level of canal is canal to the draing bed level. then level crodding is to be constructed

- Construction of weir to stop drange water begin it
- construction of canal regulator across a canal
- construction of head regulato across drainge

Q2

Ans

Weir :-

Weir are commonly used to control the flow rate of river during period of high discharge

- it is low cost
- Low control on flow of water
- No Provision for transport communication across river
- chance of silting on the upstream is more

Barrage :-

It is used to convert tidal energy into electricity by forcing water through turbine

- high cost
- high control on flow of water level by operation of gates
- usually a road can be added conviniently
- silting may be controll by Judical operatio of gates

Q2
Uns B

Reynold's number :-

It is the ratio of inertial forces to that of viscous forces

relation

$$Re = \rho VD/\mu$$

It is dimensionless quantity use to determine the type of flow pattern as laminar or turblent while flowing through Pipe

Laminar :-

The flow in a pipe is Laminar if reynold number is less than 2100

Turbulant :-

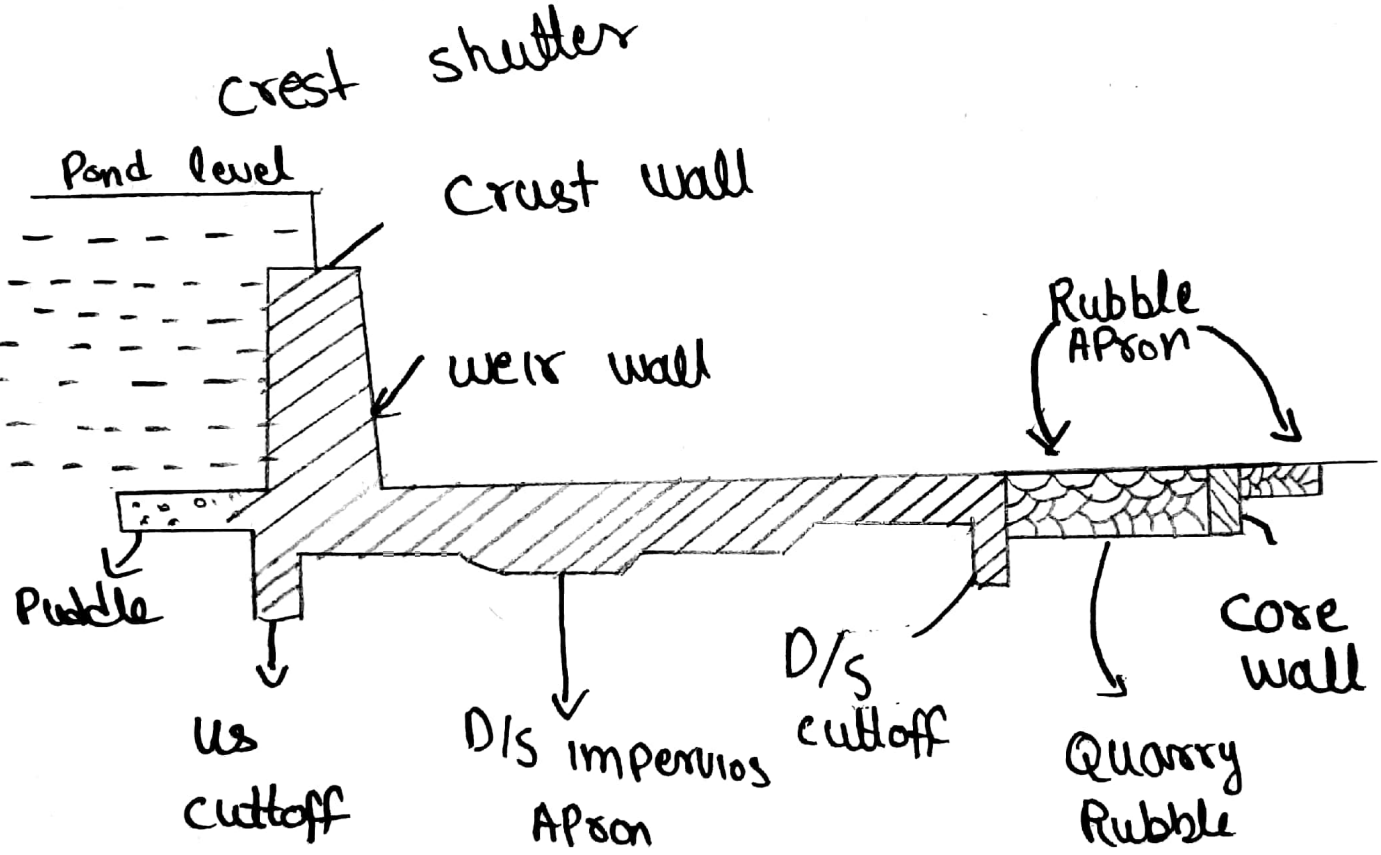
If the reynold number is greater than 4000 than flow is turbulant

Neither Laminar nor turbulent :-

when the reynold's number is between 2000 and 2800 the flow is neither Laminar nor turbulant

higher critical velocity:- when liquid flow in a pipe the viscoes ~~flow~~ force oppose to the flow of liquid the Press is P_2 applied b/w end of tube the flow continue but velocity exceed the Liminar Limiting velocity & flow become turblent The velocty at which laminar change into turbulent

Q3
Ans
A



Q3 b

Ans

If the contracted (ie bridge length) is less than the regime width W the normal source depth DN, under bridg is

$$Dy = R_2 (W/L)^{0.86}$$

where R is regime source depth

The max source depth in single span bridge with straigth approch about 25 % more than normal scour given in equatio whese the case of multi plane structure with curved approch reach 100% more than normal source if Construction is predominant the max scour depth is maximum case 1 & case 2 or value given by

$$Dmax = RS (W/L)^{1.56}$$

Given data

LL = 1500 lb/ft

D.L = 300 Lb/ft

section 15'x15'

Thickness 3ft

unit of soil 100lb/ft^3

$\phi = 30°$

unit wt of concrete 156 lb/ft^3 $f_y = 60$ ksi

Sol

self wt of slab

thickness x unit wt of Rcc concrete

$= 3 \times 15.6$ lb/ft^2 $= 468$ lb/ft^2

total load L.L + D.L + S.wt

$1500 + 300 + 468 = 2268$ lb/ft^2

Coefficient 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

$(L.L + D.L)K = (1500 + 300)0.33 = 594$ lb/ft

Pressure Ka x unit wt. of soil

$0.33 \times (15' + 3') \times 100 = 594$ lb/ft

Lator pressure at top = 594 lb/ft

Pressure at bott top + pressure soil

$= 594 + 594 = 1188$ lb/ft