Question No: 01 (b)

Answer

Cross Drainage Work:

The cross drainage work is a structure constructed when there is a crossing of canal and natural drain, to protect the drain water from mixing into the canal water. It is an expansive work and should be tried to reduced.

Necessity of CD Work:

The necessity of cross drainage work is requirired to disspose of the drainage ~~work~~ water so the can supply cannot disturb and remains uninterrupted. When in the site condition if there is no suitable structure for the canal supply and drainage

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Question No. 01 (a)

Answer:

Culvert:

Culvert is a way or opening for water, rainwater, stream etc beneath the road or railway line. It act as a bridge for traffic to pass on it. They are constructed typically for natural flow of water. It may be in the shape of pipe, box, arch etc.

Causeway:

Causeway is a paved dip which carry floods to pass over it. It may or may not have opening for low water to flow. And it is constructed on the upper point of an embankment. It may be of earth masonary, wood or concrete.

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~~for~~ to divert it in their natural direction, so there is the need of cross drainage work.

Types of Cross Drainage Work:

Irrigation canal passes over the Drainage:

(a) Aqueduct:

The structure in which the irrigation canal is taken over the drainage such as river etc is called aqueduct. The structure is best when the bed of canal is above the highest flood level of drainage.

(b) Siphon Aqueduct:

The structure where the canal is taken over the drainage but the drainage water cannot pass below the canal, it flows under siphonic action. It is best when bed level of canal is below the

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highest flood level.

Drainage passes over the irrigation canal:

(a) Super Passage:

The structure in which the drainage is taken over the irrigation canal is called supper passage. It is best when bed level of drainage is above full supply level of canal. The water is passes below drainage.

(b) Siphon Super passage:

When the canal water passes below the drainage under siphonic action but the drainage is taken over the irrigation canal. It is best when bed level of drainage is below the ~~fsl~~ full supply level of canal.

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Drainage and Canal Intersect each other at same level:

(a) Level Crossing:

When the bed level of canal & the stream are the same and quality of water in canal & stream is not much different, the CD work constructed is called level crossing where water of canal and stream is allowed to mix with the help of regulator; water is disposed through canal and stream in required quantity.

(b) Inlet & outlet:

When the canal meet a small stream or drain at the same level, drain is enter the canal in inlet and at some distance from this inlet point, a part of water is allowed to drain as outlet which eventually meet the orignal stream. Stone pitching is required in inlet & outlet.

Question No: 2 (a)

Answer:

Weir:

A barrier which is constructed across a river to raise the water level on upstream side is called weir. It is of low cost & low control on flow.

Barrage:

When adjustable gates are installed over a weir to maintain the water surface at different levels at different time known as barrage. It is of high cost and relatively high control flow and water levels by operation of gates.

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Question No: 2 (b)

Answer:

Reynolds Number:

The ratio of ~~~~ inertial forces to the viscous forces. It is dimensionless number. Mathematically:

$$Re = \frac{\rho V_m D}{\mu}$$

Laminar:

The flow is laminar if reynold number is less than 2100.

Turbulent:

The flow is turbulent if reynold number is greater than 4000.

Neither laminar or Turbulent:

When the reynold number is between 2000 and 2800, the flow is neither laminar nor turbulent.

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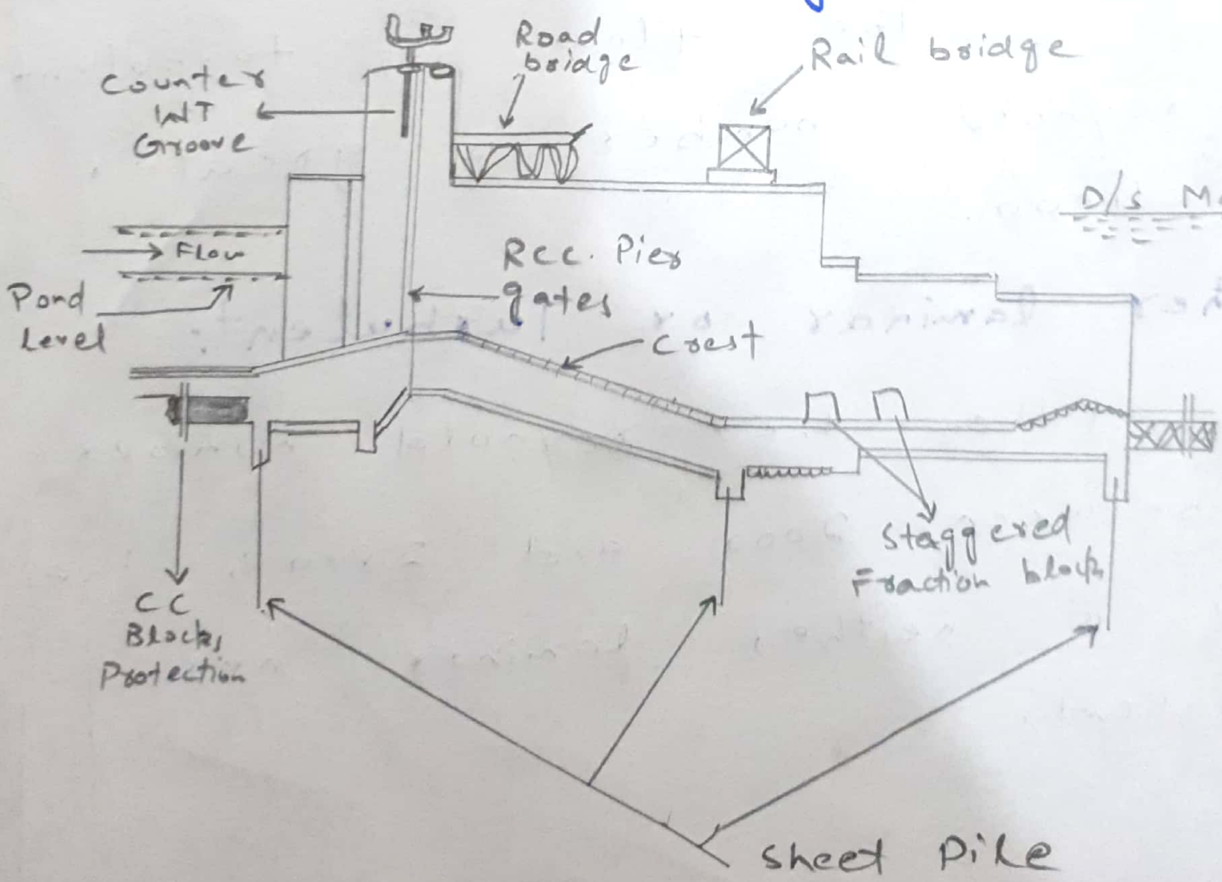
Lower Critical velocity: The velocity at which flow changes from laminar to transition is called lower critical velocity.

Higher Critical Velocity: The velocity at which flow changes from transition to turbulent is called higher critical velocity

Question No: 03 (a)

Answer

Sketch of Barrage:



Question No. 3 (b):

Answer:

Several formulae based on experimental result 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;

~~$y_s/b' = \phi(y_o/b', F_r, d$~~

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

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

Laursen's (1962) experimental result underestimate the scour depths, compared to many indian experiments which suggest the formula (approach flow is normal to the bridge piers).

$$y_s/b' = 4.2(y_o/b')^{0.78} F_r^{0.52}$$

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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.

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

predicts the maximum equilibrium scour depth.

In a relatively deep flow a first-order estimate of (clear) local scour (around pier) may be obtained by:

$$y_s = 2.3 K_\alpha b'$$

Where K_α = angularity cofficient which is function of the pier alignment, i.e angle of attack of approach flow.

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Question No: 4

Answer:

Solution of problem:

→ Self weight of slab

= thickness × unit weight of RCC concrete.

$= 3\ ft \times 156\ lb/ft^3$

$= 468\ lb/ft^2$

→ Total load

L.L + D.L + Self Weight

1500 + 300 + 468

$= 2268\ lb/ft^2$

→ Coefficient of earth pressure

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

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

$= 0.33$

→ Lateral pressure

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→ vertical pressure at top

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

$(1500 + 300)\ 0.33$

$= 594\ lb/ft^2$

→ Pressure of soil

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

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

$0.33 \times 18 \times 100$

$= 594\ lb/ft^2$

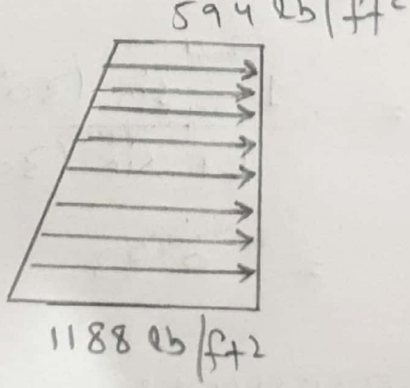
Lateral pressure at top $= 594\ lb/ft^2$

→ Pressure at bottom

= top + pressure of soil

$= 594 + 594$

$= 1188\ lb/ft^2$



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