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Q. No. (1)

(a). Answer:

Culvert	Cause way
It is an opening under a road, bridge etc, used to transfer the flow of water. The flow of water could be waste water, fresh water, natural water etc. It may be constructed from pipe, reinforced concrete or other material.	It is a road that is constructed on the water or we can say above the water, marshland etc. It is simply track, road or railway. It can be constructed of earth, masonary, wood, or concrete.

Q. No. (1)

(b) Answer:

Cross drainage work:-

In an irrigation project, when the network of main canals, branch canals, distributaries, etc are provided, then these canals may have to collapse with the natural drainages like rivers, streams, etc to prevent such obstructions suitable construction must be constructed which is known as cross drainage work.

It is necessary because we don't want to mix to irrigation water to the natural drainage like rivers or waste water etc. To prevent our irrigation water we construct such structures.

Types of cross drainage work:-
Type I (Irrigation canal passes over the drainage).
(a) Aqueduct.
(b) Siphon Aqueduct.

(a) Aqueduct:-
In this type of cross drainage work the canal bed level is above the drainage bed level so canal is to be constructed above drainage.

(b) Syphon Aqueduct:-
In a syphon aqueduct, canal water is carrier above the drainage but high flood level of drainage is above the canal ~~the~~ trough.

Type II (Drainage passes over the irrigation canal)
(a) super passage
(b) Siphon super passage.

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(a). Super passage:-
Super passage structure carries drainage above canal as the canal bed level is below drainage bed level.

(b). Syphon Super passage:-
In syphon super passage, drainage is carried over canal, the fully supply level of canal is above than the drainage trough.

Type. III (Drainage and canal intersection each other of the same level.).
(a) level crossing.
(b) Inlet and outlet.

(a) Level crossing:-
When the bed level of canal is equal to the drainage bed level, then level crossing is to be constructed.
It consists of;
1) construction of weir to stop drainage water behind it.
2) Construction of canal regulator accross a canal.
3) construction of head regulator accross a drainage.

(b) Inlet and outlet:-

In a canal inlet structure, the drainage water to be admitted into canal is very less. And in a canal outlet structure, the drainage water to be admitted ~~in~~ ~~t~~ from canal is very high.

Q. No. (02)

(a)

Answer:-

Weir	Barrage
- In a weir the water overflows the weir.	- Barrage is a weir that has adjustable gates installed over top of it, to allow different water surface heights at different times.
- It is also called a low dam.	- Used to prevent flooding, aid irrigation or navigation or to generate electricity by tidal power.
- It is constructed across the width of a river.	
- Used to control ~~of~~ the flow water.	

Q. No. (02)
(b)
Answer:-

Reynold's Number:-
It is to be defined as the ratio of inertial forces to viscous forces.
It is a dimensionless number used to identify the flow either it is laminar turbulent or non-

Reynold's Number for Laminar:-
Laminar flow is "orderly" flow without disturbance.
Limit for laminar flow is when Reynold's number is less than 2100.

$R < 2100$ Laminar flow.

Reynold's number for turbulant:-
Turbulant flow is "Random" and "Chaotic".
Limit for turbulant flow is when Reynold's number is greater than 4000.

$R > 4000$ Turbulant flow

Reynold's Number for neither laminar nor turbulent:-

When the flow is neither laminar nor turbulent than it is called a Transitional flow.

The limit of transitional flow is between (2100 - 4000)

$2100 < R < 4000$

Lower critical velocity:-

The velocity at which the flow enters from laminar to transition period.

Higher critical velocity:-

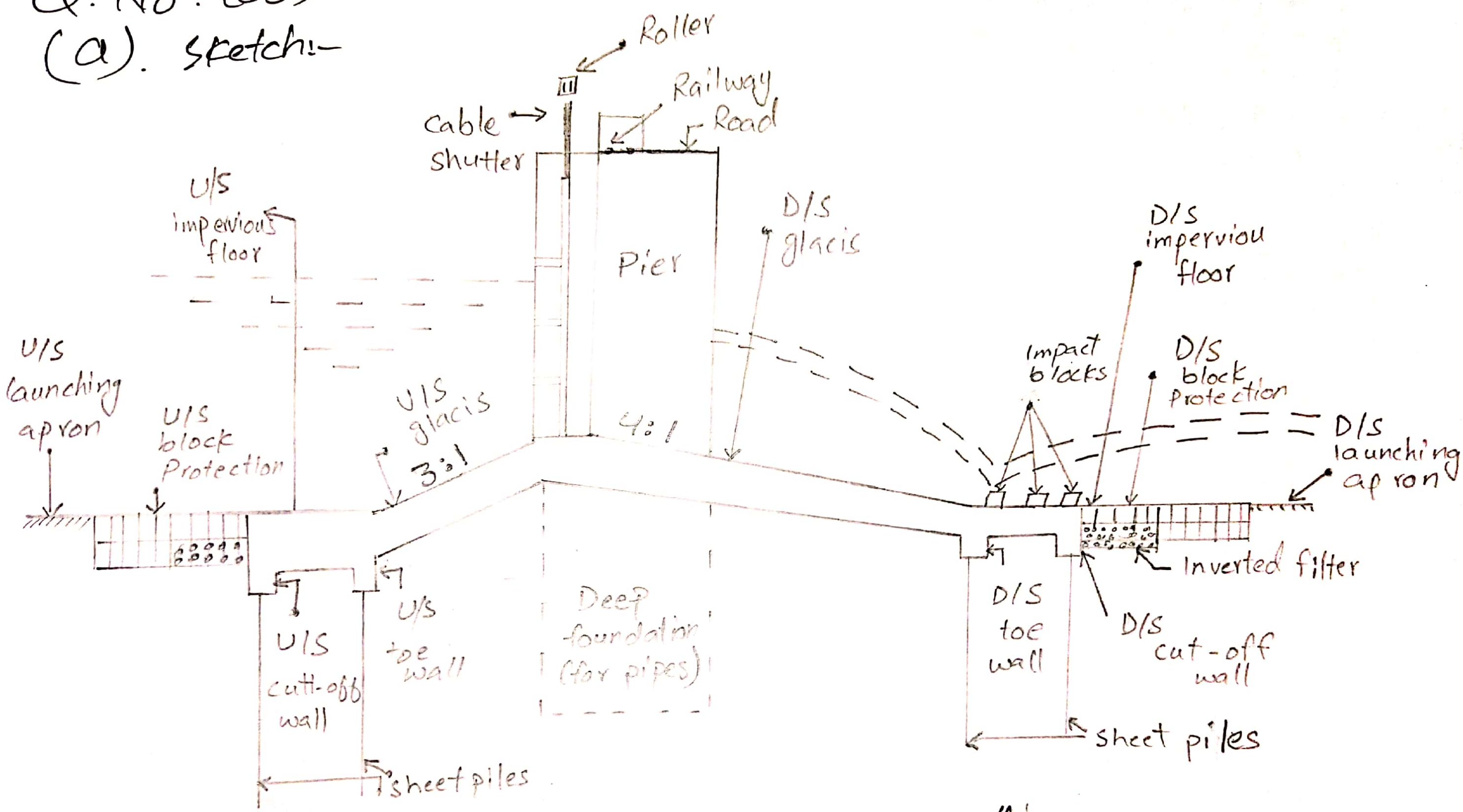
It is the velocity at which turbulent flow starts.

or

The velocity in which flow enters from transition period to turbulent flow.

Q. No. (03)

(a). sketch:-



"Components of Barrage":-

Q. No. (03)
(b)

Answer:-

Several formulae based on experimental results 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:

$$y_s/b' = \phi(y_0/b', Fr, d/b').$$

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

Laursen's (1962) experimental results underestimate the scour depths, compared to many Indian experiment (Inglis, 1949) which suggest the formula (approach flow is normal to the bridge piers).

$$y_s/b' = 4.2\,(y_0/b')^{0.78}\,Fr^{0.52}$$

For Maximum scour depth:-

As the minimum value for K_4 is 0.4. For ~~a~~roundnosed piers aligned with flow, so the maximum pier scour depth is 2.4 times the pier width if Fr_3 is less than or equal to 0.8, or 3.0 times the pier width otherwise.

The above explanation shows the situations or we can say the condition which are applied ~~to the~~ ~~ex~~ it will give us the maximum scour depth.

For equilibrium scour depth:-

The equilibrium scour depth (d_s) is defined as the vertical distance between the deepest point in the scour hole and the stable bed level. In the live-bed scour, the formation of the equilibrium scour depth is rapid, and d_s oscillates with time because of the formation of the bed forms.

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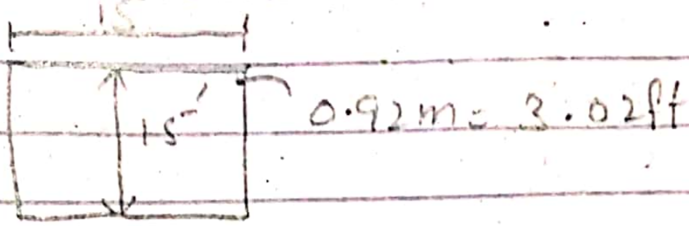
Q. No. (04).

Given data:-

Length = 15 ft
width = 15 ft



Live load, L.L = 1.5 kip/ft^2.
Dead load, D.L = 300 lb/ft^2
" " = 0.3 kip/ft^2.

unit wt of soil, γ = 100 lb/ft^3
" " = 0.1 kip/ft^3

Angle, $\theta = 30°$

Mix design, = 1:2:4

steel fy = 60 ksi

Thickness = 0.92m => 3.02 ft

Design Calvert.

Solution + Design:-
Total load carrying on top slab.

For self wt of slab = $\gamma * h$

" " " = 150 * 3.02

" " " = 453 lb/ft^2

" " " = 0.453 kip/ft^2.

W = Total load = 1.5 + 0.3 + 0.453.

W = 2.253 kip/ft^2

② Coefficient of earth pressure:-

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

$$Ka = \frac{1 - \sin 30}{1 + \sin 30}$$

Ka = 0.333

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

= Total vertical load

= (L.L + D.L) * Ka

= (1.5 + 0.3) * (0.333)

= 0.5994 kip/ft^2.

④ Lateral Pressure due to soil:-

= Ka * γ * h

= 0.333 * 0.1 * 18.02

= 0.6 kip/ft^2.

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(*) Lateral pressure @ top = Lateral Pressure due to (D.L+L.L)
= 0.5994 kip/ft²

(*). @ Bottom = lateral pressure due to (D.L + L.L) + Lateral Pressure due to soil.
= 0.5994 + 0.6
= 1.2 kip/ft².