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Section # "C"

Semester # 8th

term # final

Subject # Hydraulic Structure.

Qno 7:

Ans:

a) Culvert	Causeway
Culvert is of a tunnel shape carrying a stream of water under a road or railway. It works as a bridge to pass on it. It is normally uses for natural flow of water for controlling it.	A causeway is of course a raised road, it is built on an embankment. It is supported mostly by earth or stone. And it is not a bridge because it supports a roadway between piers.

Qno 1:

b: Ans.

Cross Drainage Work:

Is a structure carrying the discharge from a natural stream across a canal intercepting the stream.

Necessary:

It is required to dispose of the drainage water so that the canal supply water remains uninterrupted.

Types:

Some types of cross drainage are following.

(i) Adequate:-

It carries an irrigation canal over a drain.

(ii) Super passage:-

It carries a drain over an irrigation canal.

(iii) Level Crossing:

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

(iv) Inlet and outlet:

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

Qno2 b
Ans:

a)

Weir:-

Weirs are commonly used to control the flow rates of rivers during periods of high discharge.

Sluice gates are used to increase or decrease the volume of water going out.

Barrage:-

It is used to convert tidal energy into electricity by forcing water through turbines, by activating a generator.

Qno 2:

b: Ans:

Reynold's Number: The product of density times length divided by viscosity coefficient.

This is proportional to the ratio of inertial forces and viscous forces in a fluid flow.

Laminar:- the flow in a pipe is laminar if the reynolds Number is less than 2000.

Turbulant:-

If the reynolds Number is greater than 4000 than it is turbulant.

Neither Laminar nor turbulant flow:

When the Reynolds number is between 2000 and 2800, the flow is neither Laminar nor turbulant.

Lower Critical velocity:

The velocity at which flow changes from Laminar to transition is called Lower critical velocity.

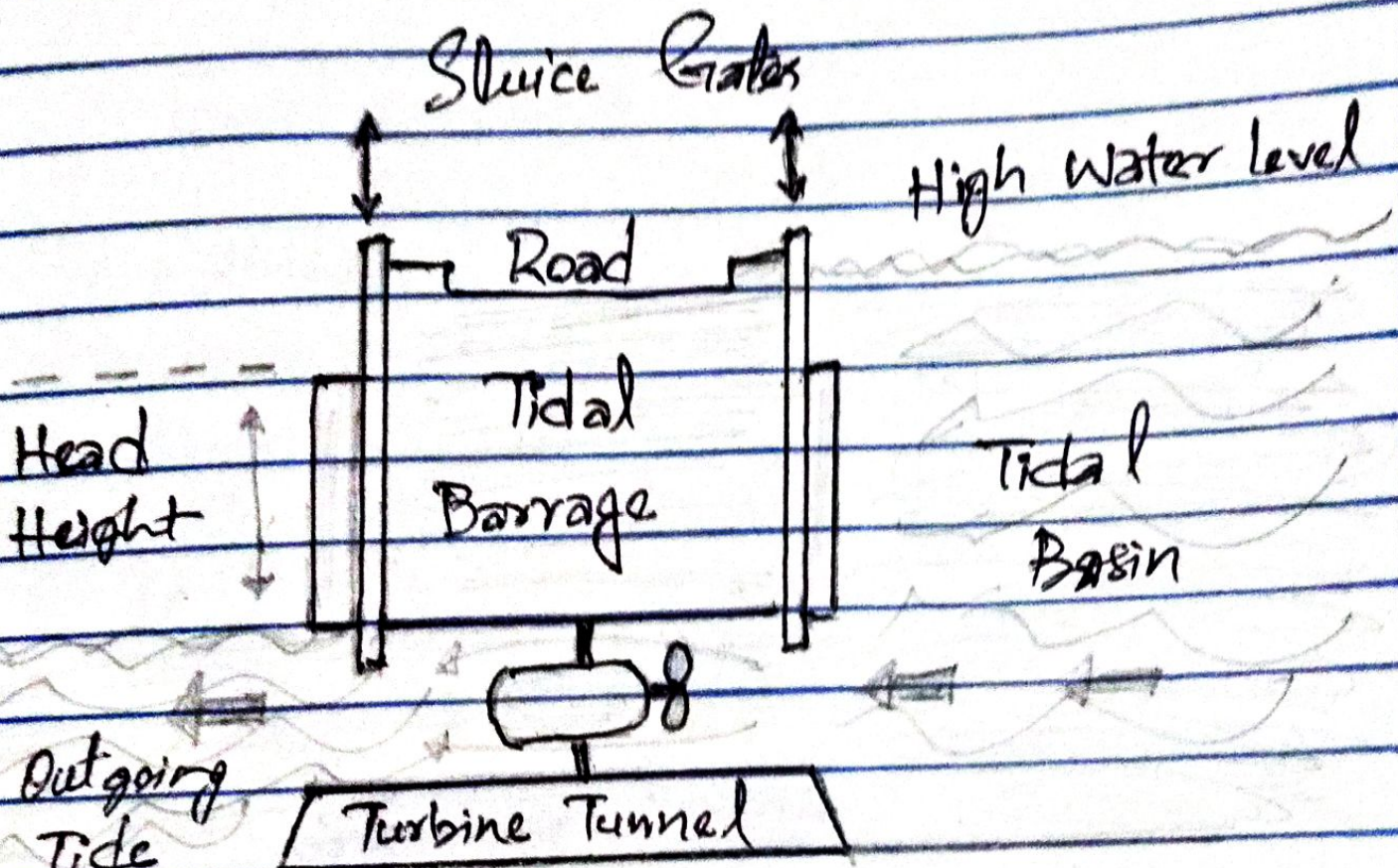
Higher Critical Velocity:

The velocity at which flow changes from transition to turbulant is called Higher Critical velocity.

Qno 3:

(a) Ans:

Barrage:



Qno3: (8)

(b) Ans:

Scour Depth:

Equilibrium:

If the contracted width (L) is less than the regime width (W), the normal scour depth (D_N) is given by

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

(R_s → Regime Scour depth)

Maximum:

The maximum scour depth in a single-span bridge with a straight approach is about 25% more than normal scour given by equation (10.18).

In case of Multispan Structure it is 100% more than normal scour. The maximum scour depth is

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

Q no 4:

Ans:

Given DATA:

L.L = 1.5 kip/ft²

D.L = 300 lb/ft²

θ = 30°

Unit weight of soil = 100 lb/ft²

Dimensions = 15' × 15'

f_y = 60 ksi Steel

Concrete = 1:2:4 = M_{15}

D = 0.92 m thickness.

Solution:

(1) Load:

Total Load on Top = Self weight + LL + DL

Self weight = 3 × 15 = 45 kN/m²

45 kN/m² = 0.939 kip/ft²

W = 1.5 + 0.939 + 0.3

W = 2.739 kip/ft²

(2) Coefficient of Earth pressure:

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

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

$$\boxed{K_a = 0.33}$$

(3) Lateral pressure due to (Dead Load + Live load):

= Total vertical load x K_a

$= (LL + DL) \times K_a$

$= (1.5 + 0.3) \times 0.33$

$= \boxed{0.594 \text{ kip/ft}^2}$

Or

$= \boxed{28.4 \text{ KN/m}^2}$

(4) Lateral pressure due to Soil:

$= K_a \times \gamma_{soil} \times h$

$= 0.33 \times 0.1 \times 18$

$= \boxed{0.594 \text{ kip/ft}^2}$

or

$= \boxed{28.4 \text{ kN/m}^2}$

(5) Lateral pressure at top due to L.L + DL $= 0.594 \text{ kip/ft}^2$

$= \boxed{28.4 \text{ kN/m}^2}$

(6) Lateral pressure at Bottom:

= Lateral pressure due to (LL+DL) + Lateral pressure due to Soil.

$= 0.594 + 0.594$

$= 1.188 \text{ kip/ft}^2$ or

$= \boxed{56.88 \text{ kN/m}^2}$

Diagram: