SUBMITED TO

ENGR ADEED

SUBMITED BY

HAMAD

STUDENT I'D

7747

SECTION

B

SUBJECT:

HYDRAULIC STRUCTURS

Scanned with CamScanner

Day: M T W T F S Date: / /

QUESTION # 1 (A)

CULVERT	CAUSEWAY
→ Culvert is define as tunnel structure constructed under roadway or railways to provide cross drainage or to take electrical or other cable from one side to other.	→ A causeway is of course a raised road it as built as embankment.
	→ It is supported mostly by earth or stone
	→ And it is not a bridge bcz it support a roadway b/w piers.
→ It is totally enclosed by soil or ground Pipe culvert, box culvert and arch culvert are the common type used under roadways and railways.	→ It can be constructed of earth, masonry, wood or concrete for track road or railway.
→ Used for natural flow of water for controlling it.	

Scanned with CamScanner

Day: M T W T F S Date: / /

QUESTION # 01 (B)

CROSS DRAINAGE WORKS:

→ Cross drainage is stucture which is constructed when there is crossing of channal and natural drain.

To prevent the drain water from mixing into channel water.

→ By mixing two or more stream into one and only one cross drainage work is be constructed.

NECESSITY OF CROSS DRAINAGE WORK

The water-shed channel donot cross the natural drainages but in actual orientation of the channel network this condition. may not be available and obstacles like natural drainages. may be present across the

Scanned with CamScanner

Day: M T W T F S Date: / /

channal. So, the cross drainage works must be provide for running the irrigation system.

→ When the water cross, the water of the channel and the drainage get intermixed for the smooth running of the water (channel) to design discharge the cross drainage works.

→ The cross drainage work requiered to dispose of the drainage water so that the channel supply water remain undisturbed.

TYPES OF CROSS DRAINAGE WORK

follow are the types as under.

TYPE - I

Irrigation channal passes over drainage.

Scanned with CamScanner

Day: M T W T F S Date: / /

1 **AQUEDUCT:**

DEFINITION

The hydrullic structure in which the irrigation channel is taken over the drainage is called aqueducts.

→ This structure is suitable for when the bed level is greater or above the highest flood level of drainage. In this case, the drainage water passes clearly below the channel.

2 **SIPHON AQUEDUCT:**

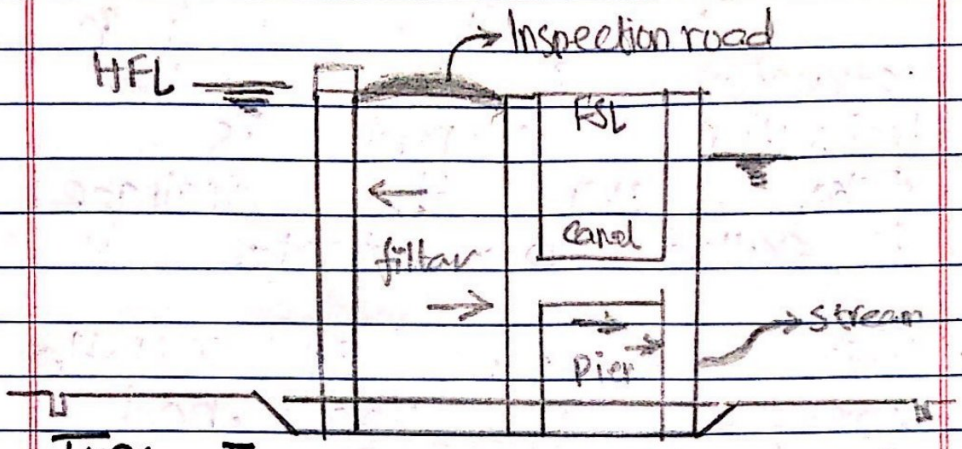
In a hydrullic structure where the channal is taken over the drainage but the drainage cannot passes clearly below the channel It flow under Siphon action so it is called aqueduct.

→ Siphon aqueduct is suitable when the bed below

Scanned with CamScanner

Day: M T W T F S Date: / /

the highest flood level.



TYPE - II
DRAINAGE PASSES OVER the IRRIGATION CHANNEL

SUPPER PASSAGE :-

The structure in which the drainage is taken over the irrigation channel is known as supper passage.

→ It is suitable when the bed level of drainage is above the full supply level of the channel.

→ The water of the channel passes clearly below the drainage.

Day: M T W T F S Date: / /

SIPHON SUPER PASSAGE :

The hydraulic structure which the drainage is taken over the irrigation etc canal., but the canal water passes below the canal (Drainage). under siphonic Action is called siphon super passage.

It is suitable when the bed level of drainage is below the full supply level of the canal.

TYPE - III

DRAINAGE AND CANAL INTEREST EACH OTHER AT THE SAME LEVEL

LEVEL CROSSING :

When the bed level of the canal and the stream are approx the same and quality of water in canal and stream is not much different the cross drainage

Scanned with CamScanner

Day: M T W T F S Date: / /

work constructed are known as level crossing.

→ Water of ~~channel~~ canal and stream allowed to mix with the help of regulator both in canal and stream.

→ water is disposed through level and stream is required quantity

→ Level crossing consist of
crest wall
Stream regulator
Canal regulator.

INLET & OUTLET :

When irrigation cannal meets a small stream or drain at same level, drain is allowed to enter the ~~en~~ cannal an inlet.

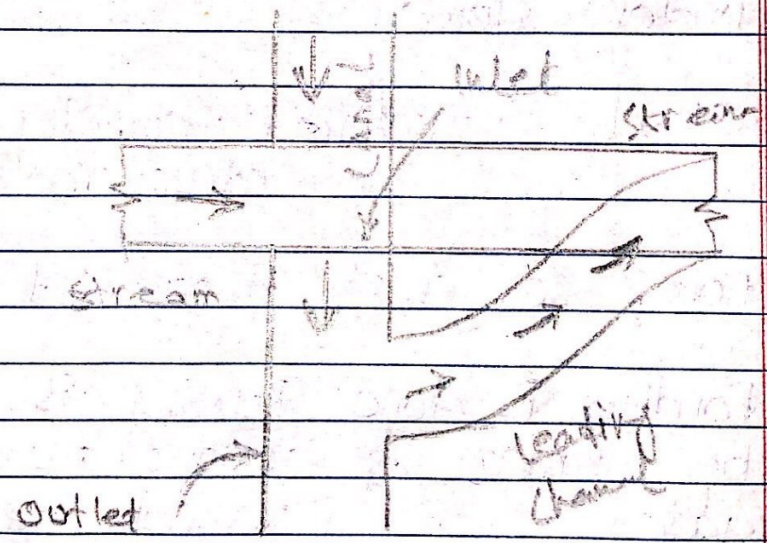
→ At same distances from this inlet point, apart of of water is allowed.

Scanned with CamScanner

to drainage as out let.

→ Eventually meets the original stream, stone pitching is required at the inlet and out let

→ The bed and blanks b/w inlet and out let are also protected by stone pitching. This type of CDW is know as inlet and out let.



Scanned with CamScanner

Day: M T W T F S Date: / /

QUESTION # 2 (a)

DIFFERENCE B/W WIER & BARRAGE

BARRAGE	WEIR
High flood can be passed with minimum afflexs	Excussive afflexs is high flood.
Longer construction period	Shorter construction period.
Silt removel is done through under sluices	No mean for silt disposel.
Closely structure	Relatively cheeper structure
Low set crest	High set crest
Ponding is done by means of gates	Ponding is done by means against the raised crest
Gate over entire length	Shutter are part length
Gate are at greater height	Shutter are of lower height.

Babar Paper Product

Checked By:.....Parents:.....Excellent Good Need Improvement

Scanned with CamScanner

Day: M T W T F S Date: / /

QUECTION #2 (B)

REYNOLD NUMBER

Reynold number can be define as; "The ratio of an inertial forces to viscous forces."

→ Reynold number is also use to product if a flow condition will be laminar or turbulant or transition.

FORMULA:

$$Re = \frac{\text{Interial force}}{\text{viscous Forces}}$$

LAMINAR FLOW:

→ The flow in which the Reynold number is less then 2000

→ $Re < 2000$

TURBUCENT FLOW:

The flow in which the Reynold number is greater than 4000

Scanned with CamScanner

$Re > 4000$

TRANSITION FLOW :

→ The flow at which the Reynold nbr is greater than 2000 and less than 4000

→ $Re > 2000$ & < 4000

LOWER CRITICAL VELOCITY

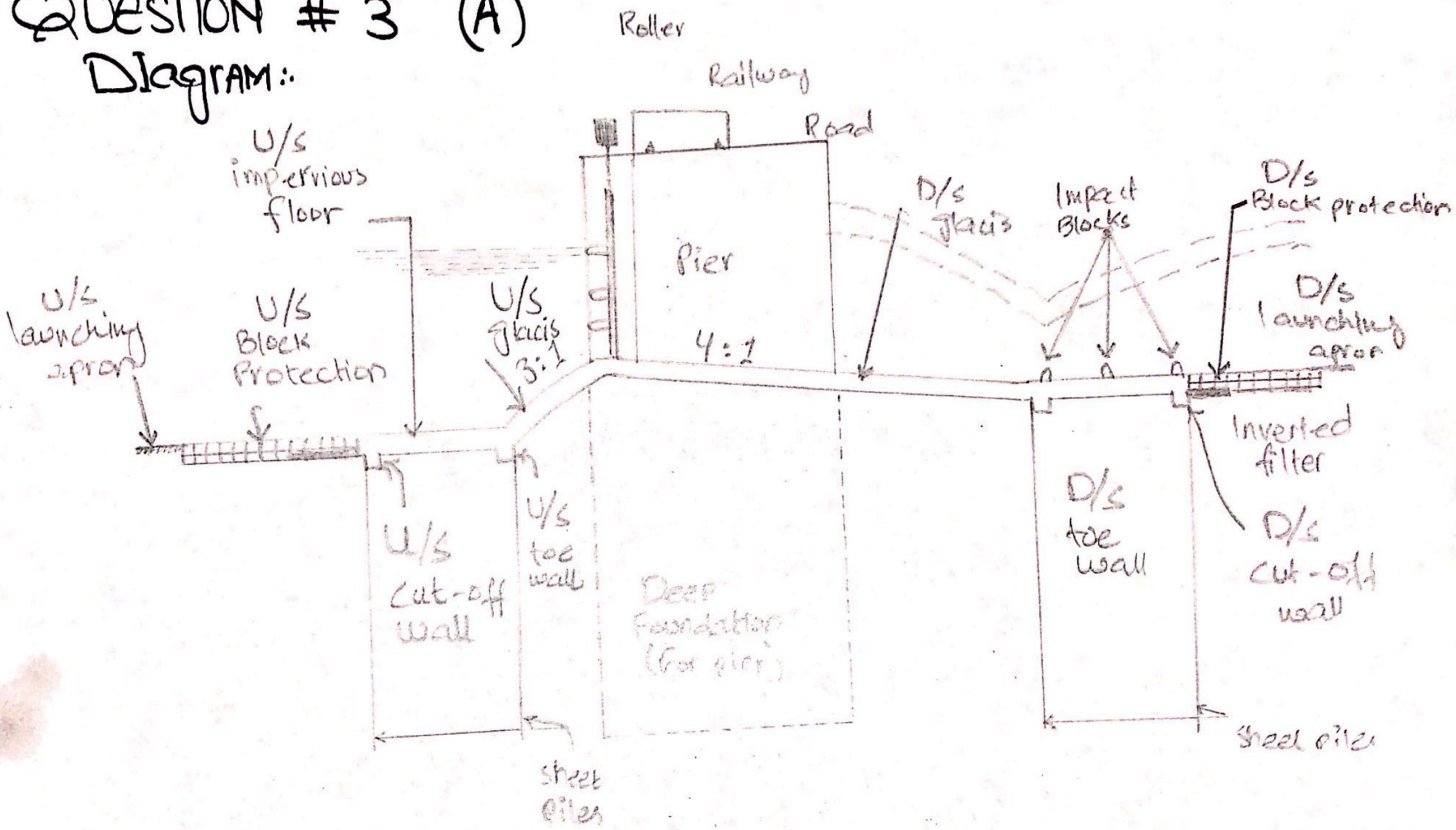
The flow which changes from laminar to transition state.

Higher CRITICAL VELOCITY

The flow which changer from transition to turbulant flow called higher critical velocity.

QUESTION # 3 (A)

Diagram:-



Day: M T W T F S Date: / /

QUESTION # 3 (B)

ANSWER :

Several formula based on Experiment result have been proposed to product the maximum or equilibrium scour depth (Y_s below the ground bed level) around bridge piers, In gemal, These the assume 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 floor froud number.

Laursen's (1962) Experimental result underestimate the scour depth, compared to many Indian Experiment which suggest the formula.

$$Y_s/b' = 4.2 (y_0/b')^{0.78} Fr^{0.35}$$

Day: M T W T F S

Date: / /

The scour should be taken as twice the regime x scour depth.

→ In case of live bed (a stream with bedload transport) the formula.

$$y_s / y_0 = (B/b')^{6/7} - 1$$

Predicts. The Maximum Equalibrium scour depth.

In relatively deep flow a first order estimate of local scour may obtained by.

$$y_s = 2.3 k_a b'$$

Where k_a = ~~angulatair~~ angularity co-efficient which is a function of the pier alignment.
i-e angle of attack of approch flow.

Scanned with CamScanner

Day: M T W T F S Date: / /

→ The best Estimate will be achieved with the appropriate co-efficient for flow depth, alignment etc.

→ The Live bed may contribute to an appreciable reduced local scour depth if the sediment bed is distinctly layer and cover layer of thickness less than the local scour depth the overall scouring phenomena is outlet different.

→ The stepped scour depth in the lowering layer, it is given by

$$H = \eta (Y_2 - Y_1)$$

→ $Y_2 - Y_1$ are the uniform flow depth over a flat bed of grain roughness corresponding to the upstream surface particles (d_1) and the underlying

Babar Paper Product
Checker By:.....Parents:.....Excellent ☐ Good ☐ Need Improvement

Scanned with CamScanner

Day: M T W T F S Date: / /

Surface final particals (d_s) respectively.

Coefficient of run riffle forming sediment $\eta = 2.6$ for design porpose

→ The total scour depth may lead to a gross underestimate if the lower layer is of vary fine material.

Scanned with CamScanner

Day: M T W T F S Date: / /

QUESTION # 4

Given data:

Inside dimension = 15' x 15'

Live load = L.L. = 1.5 K/ft²

Dead load = D.L. = 300 lb/ft²

Unit weight of Soil = 100 lb/ft³

Angle of repose = 30°

Use concrete of 1:2:4 ratio

f_y = 60 ksi

Thickness = 0.92m = 3ft

Required:

Design culvert = ?

Solution:

Load calculation

Total load carry on top slab

= self wt of slab + L.L + D.L

Self wt of slab = 3 x 150

= 450 lb/ft²

Babar Paper Product

Checked By:.....Parents:.....Excellent ☐ Good ☐ Need Improvement

Scanned with CamScanner

Day: M T W T F S Date: / /

$$W = 450 + 1500 + 300 = 2250 \text{ lb/ft}^2$$

Co-efficient of Earth pressure :

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

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

$$ka = 0.33$$

Lateral Pressure Due to (D.L + L.L)

Total vertical load (L.L + D.L) x ka

$$(1500 * 300) \times 0.33$$

$$= 594 \text{ lb/ft}^2$$

Lateral pressure due to soil

$$= ka \times \gamma_h$$
$$= 0.33 \times 100 \times 18$$
$$= 594 \text{ lb/ft}^2$$

Lateral Pressure :

Day: M T W T F S Date: / /

Top

Lateral pressure due to (D.L + L.L)
= 594 lb/ft²

Bottom

Lateral pressure due to (D.L + L.L) + Lateral pressure due to Soil

= 594 + 594

= 1188 lb/ft²