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Section B

Semester : 6th

Irrigation Engineering

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QNo1:: Explain anti water-logging measures.

Anser: Methods of control of water logging:

1) Lining of canals and water courses.
It redeces seepage of water.

2) Reducing intensity of irrigation.
only small portion of land showel receive canal water in one particular season.
Remaining areas can receive water in next season by rotation.

3) By introducing crop rotation.
High water requiring crop should be followed by on requiring less water, and than by one requiring almost no water.
Example:: Rice followed by wheat and than by cotton.

4) optimum use of water::
Certain amount of water gives the best result. less or more water gives the best reduces the yield.

5) improving natural drainage of area.
water should be not allowed to stay in one area. Natural flow is provided bush and jungle cutting.

6) pumping or tubewells or vertical drain
Lift irrigation should be introduced to use Gw. Canal irrigation may be substituted by tube well irrigation.

7) Economical use of water according to need.
only predetermind amount of water is supplied to land.
No percolation losses from water courses.

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QNo1(b) Differentiate b/w Saline and alkaline Soils.

Saline Soil	Alkaline soils.
1) Saline soil contain high content of Soluble Salts.	1) Alkaline so soil are clay soil
2) they have less pH	2) they have high pH
3) It is basic in naline	3) they are more basic
4) It pH is 7 - 8.5	4) pH greater than 8.5
5) Dominating compounds Sodium carbonate salts	5) Dominating compounds in Sodium carbonate.

QNo1(c) How do you reclaim Salt affected lands.

Reclamation of Saline lands.

Alkali Salts (Sodium chloride, Sodium sulphate and Sodium carbonate) are injurous to agriculture.

NaCl - - - - - - - - - - least harmful

Na_2SO_4 - - - - - - - - medium harmful

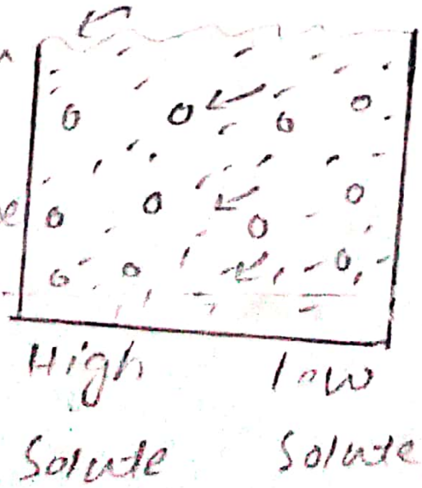
Na_2CO_3 - - - - - - - - - - Most harmful

the above Salts are soluble in water When W.T rises up or roots are in capillary zone, the G.W moves upwards and salts are deposited in root zone and surface of soil.

the phenomene of Salts coming up in Solution and forming a thain crust (5-7.5cm) on the surface after evaporation of water is called Efflorescence.

Land affected by efflorescence is called saline soil. Salts surrounding the roots reduce the osmotic activity of plants.

Semi permeable membrane



QNo2(a) Explain the procedure of desiging of an irrigation canal by kennedy's theory. 5)

KENNEDYS Thoery:. R.G. Kennedy Studied ~~[struck out]~~ Straight reaches of upper Bari Doab canal which are stable for 30 years

• $V_0 = CD^n$ where V_0 is critical velocity (non silting or non scouring)

C is constant depends upon quantity of silt.

Step 1:. Assume the trial value of D and put in eq. 1 and determine.

$$V_0 = 0.546mD^{0.64}$$

Step 2:: In Equ. 1 : $Q = AV$

$$A = Q/V$$

$$A = BD + D^2/2$$

$$P = B + D\sqrt{5}$$

For assumed D determine B

Find $R = A/P$

Step 3:- Substitute the value of R in eqn. 2 (Kutters and Chazy's Eqn.) to obtain V which will be the actual velocity for assumed dimension.

Step 4:- If the velocity worked out from Eqn. 2 agrees with that of obtained with the Eqn. 3 (Kennedy's Eqn.) than the assumed depth is correct. Other wise repeat the procedure with changed value of D.

QNo2(b) Design an irrigation channel by Kennedy to carry a discharge of 30 cumecs with CVR(m) of 2 and N as 0.0225 of 1 in 5000. Assume the depth (D) as 2.3m.

Given Data:-

Discharge (Q) = 30 m^3/sec

CVR(m) = 1

N = 0.0225

Bed Slope = 1 in 5000

Depth (D) = 2.3m

Solution: Finding velocity

By formul

$V_K = 0.546 m D^{0.64}$

$= 0.546 (1)(2.3)^{0.64}$ $= V_K = 0.930$ m

$Q = AV$ $A = Q/V$

$A = 30 / 0.930$

Area = 32.25 m2

Now we have to calculate By using formula $BD + 0.5 D^2$ $A = BD + \frac{D^2}{2}$

By putting values

$A = BD + 0.5 D^2$

$32.25 = B(2.3) + 0.5(2.3)^2$

$32.25 - 2.645 = 2.3(B)$

$29.605 = 2.3(B)$

~~B = 12.87~~

$B = 12.87 \text{ m}$

Now we have to calculate wetted perimeter so By formula

$P = B + \sqrt{5}\,D$

$= 12.87 + \sqrt{5}\,(2.3) \Rightarrow P = 18.01 \text{ m}$

Now we have to calculate hydraulic Radius

$R = A/P$

$= 32.25/18.01 \quad R = 1.79 \text{ m}$

Now calculating mean velocity from chezy equation

$V_c = C(RS)^{1/2}$ where

$C = \dfrac{1/n + \left(23 + \frac{0.00155}{S}\right)}{1 + \left(23 + \frac{0.00155}{S}\right)\frac{n}{\sqrt{R}}}$

$\Rightarrow \frac{1}{0.0225} + \frac{0.00155}{1/5000}$

$\frac{n}{\sqrt{R}} = 1 + \left(23 + \frac{0.00155}{1/5000}\right) \times \frac{(0.0225}{\sqrt{1.79}}$

$C = \dfrac{75.19}{1.517} = 49.56$

$\Rightarrow V_c = 49.56\left(1.79\left(\frac{1}{5000}\right)\right)^{1/2}$

$V_c = 0.93$

$V_c = 0.93 \text{ m}$

QNO 3(a) Differeniate b/w initial regime and final regime in accordance in Laceys theory.

Answers: According to kennedy, a channel is regime (No Silting, No Scouring) but according to Lacey even though channel with no silting or scouring may acutally be not regime.

He differontiated b/w initial regime and Final regime but this theory is applicable to final regime.

INITIAL REGIME: when only bed slope of channel changes but the cross-section remains same then also no silting or scouring take place. But this is rate.

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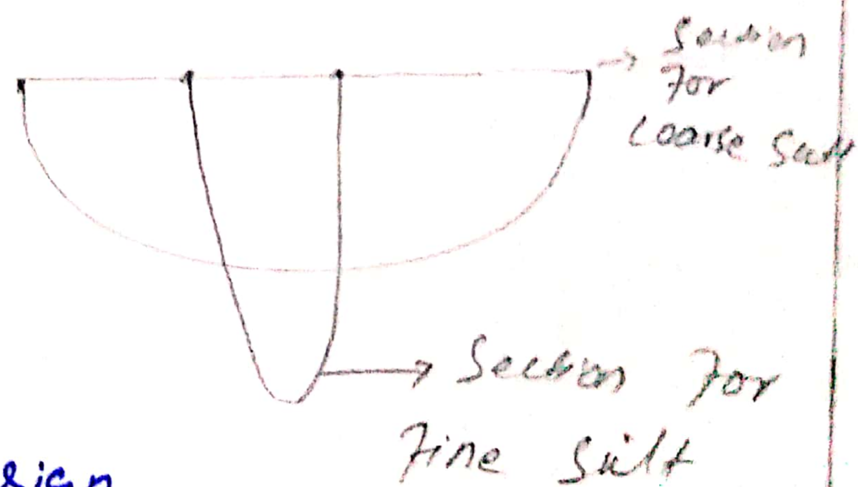
FINAL REGIME:

If all the parameters (perimeter, depth and slope) have equally free to vary and adjust according to discharge and silt grades than the channel is said to have final regime.

In final regime the cross section



Q NO 3(b) Design a regime channel by by Laceys theory for discharge of 30 cumecs and means diameter of 0.56mm.

part B

Given data.

$Q = 30 m^3/sec$

$m = 0.56 mm$

Sol: silt factor $= f = 1.76 \times m^{0.5}$

$f = 1.76 \times (0.56)^{0.5}$

$f = 1.3$

$V_m = \left(\frac{Q f^2}{140}\right)^{1/6} = \left(\frac{30 \times (1.3)^2}{140}\right)^{1/6}$

$V_m = 0.844$

$Q = AV \quad A = Q/V = \frac{30}{0.844}$

$A = 35.54$

$P = 4.75\sqrt{Q}$

$P = 4.75\sqrt{30}$

$P = 26.01$

$R = \frac{5}{2} \times \frac{V^2}{f} = \frac{5}{2} \times \frac{(0.844)^2}{1.3}$

$R = 1.36$

$B = 26.01 - 2.236(1.52)$

$B = 22.611$

$$S = \frac{S^{(5/3)}}{3340 Q^{1/6}}$$

$$S = \frac{(1.3)^{5/3}}{3340(30)^{1/6}}$$

$S = 0.00026$

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QNo4(a) Explain the components of head works with neat digram.

⇒ Components of a diversion head works.

⇒ weir or barrage.
⇒ under sluices.
⇒ Divide wall.
⇒ Fish ladder.
⇒ Canal head regulator
⇒ Silt excluders / silt prevemention devices
⇒ River training works (Marginal bunds and guide banks).

Weir:- Normally the water level of any perennial river is such that it cannot be diverted to the irrigation canal. the bed level of the canal many be higher than the existing water level of the river.

Barrage:- When the water level on the up stream side of the weir is required to be raised to different levels at different time, barrage is constructed. Barrage is an arrangement of adjustable gates weir.

Under Sluices:- Also known as scouring sluices. the under sluices are the openings provided at the base of the weir or barrage. these openings are provided with adjustable gates.

⇒ When the silt deposition becomes appreciable the gates are opened and the deposited silt is loosened boact.

Divide wall:- the divide wall is a long wall constructed at right angles in the weir or barrage, it may be constructed with stone masonry or cement concrete. on the upstream side, the canal head regulator and on the down stream side, it is extended up to the launching apron.

Fish ladder:- the Fish ladder is provided just by the side of the divide wall for the free movement of fishes. rivers are important source of fishes. the tendency of fish is to move from upstream to downstream in winters. and ~~of~~ from downstream to in monsoons.

the movement to upstream.

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Canal head regulator..

A Structure which is constructed at the head of the canal to regulate flow of water is known as canal head regulator. it consists of a number of piers which divide the total width of the canal into a number piers consists of number tiers on which the adjustable gates are placed.

Functions of canal head Regulator.

it regulates the suppiy of water entering the canal it controls the entry of silt in the canal. it prevents the river floods from entering the canal.

Silt regulation works.

the entry of silt in to a canal, which takes off from a head works, can be reduced by constructed certain special works called silt control works.

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Silt Excluders:- silt excluders are those works which are constructed on the works on the bed of the rivers up stream of head regulator. the clear water enters the head regulator and silted water enters the silt excluder. removed from the water before in enters the canal.

Silt Ejectors:- Silt ejectors also called silt extractors are those devices which extract the silt from the canal water after the silted water has travelled a certain distances in the off take canal.

River training works.

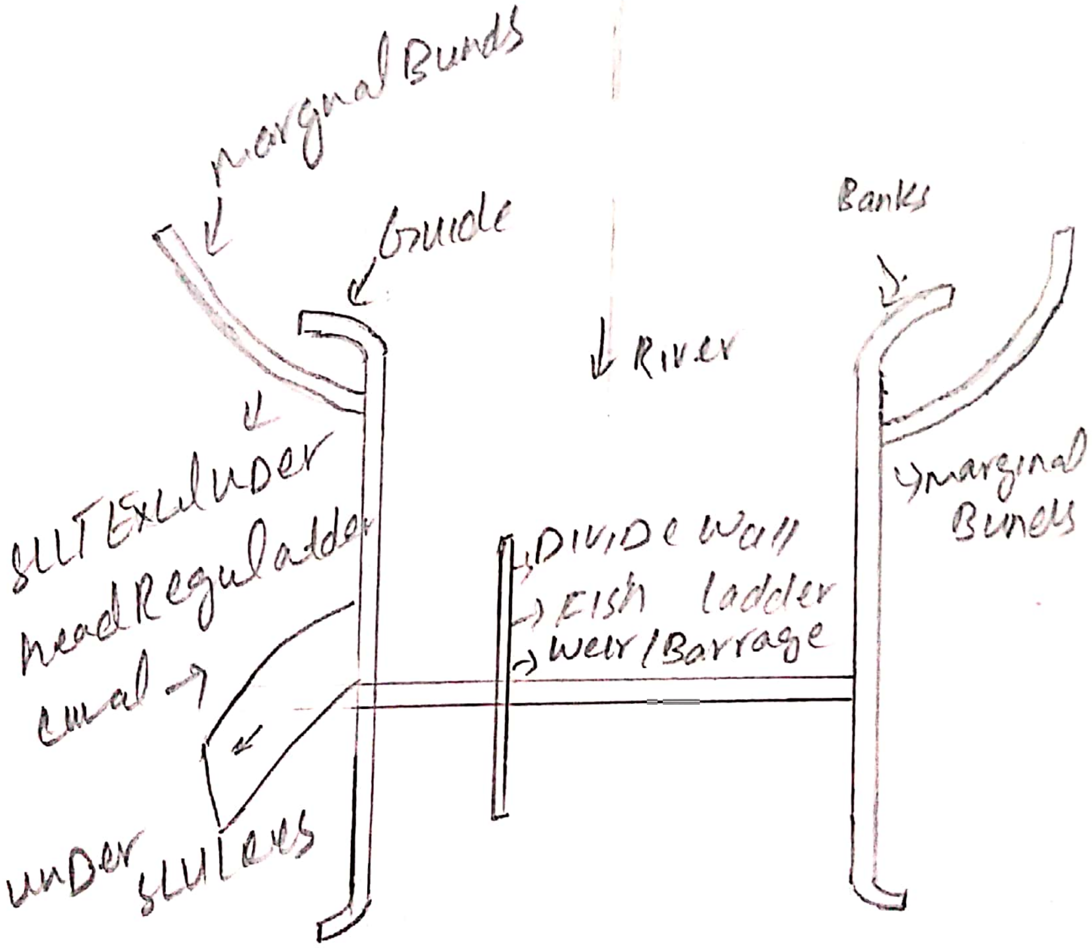
River training works are required near the weir site in order to ensure a smooth and an axial flow of water and thus, to prevent the river from outflanking the works due to a change in its course. (a) Guide banks (b) Marginal bands (c) spurs or groynes.

Guide Bank: When a barrage is constructed across a river which flows through the alluvial soil, the guide banks must be constructed on both the approaches to protect the barrage.

Marginal Bunds: the marginal bunds are earthen embankments which are constructed parallel to the river bank on one condition. the Top side slope on the river side is generally 1:5:1 and that on the country side is 2:1.

19)

diagram :-


marginal Bunds
Guide
Banks
River
SILT EXCLUDER
head Regulatder
canal
DIVIDE Wall
Fish ladder
Weir / Barrage
marginal Bunds
under sluices

QNo4 (b) what are the functions of head regulators.

Answer. CANAL Head Regulator.

A Structure which is constructed at the head of canal to regulate flow of water is known as canal head Regulator.

Funcation.

- To regulate the supplies in to the canal.
- To Indicate the discharge passed in to canal
- To control the silt entry in to the canal.