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Section " "A"

Subject " Irrigation Engineering

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Q No1 Part "A"

Explain anti-water-logging measures?

Ans:

Some of the measure used to control water logging are following.

(1) **Rotation of crop**

It mean that we should plant crops in such a way that it prevent the land from water logging

→ crop which used large amount of water should be followed by those plant which used less water or no water.

(2) **Control of cannel Seapage:-**

cannel seepage is major source of water losses, and waterlogging in irrigated areas and it can be control by.

→ Logging of with Imprevious material like clay, concret to control seapage

→ convert cannel system to piped system.

(3) **Reduced Intensity of Irregation:**

The most Important aspect to avoid water logging is to provide the water to the small portion of land where necessary

→ Applying only the required amount of water so all water are used by plant

(4) Optimum use of water:-
Certain amount of water give the best result. less or more water reduce the yield. cultivators should be educated so that not used to more water.

(5) Improving natural drainage of Area:-
water should not be allowed to stay in one area.
natural flow is provided by bush and Jungle cutting.

6) Pumping or tubewells or vertical Drainage:
- cannal Irrigation may be substituted by tube well irrigation.

7) Economical use of water according to need.

(8) Adoption of Sprinkler method of Irregation

Only predetermined amount of water is supplied to land.

-> No precalation bases from water courses.

Q1 Part B

Differentiat b/w Saline soil & Alkaline soil

Saline Soil	Alkaline Soil
→ Saline soil are the soil that have a pH in b/w 7 and 8.5 and an exchangeable Sodium percentage below 15%	Alkaline soil that have a pH greater than 8.5 and an exchangeable sodium percentage greater than 15%
→ Less than 8.5	greater than 8.5
→ 4 or more mmhos/cm	usually less than 4 mmhos/cm
→ Mainly Soodium chloride and Soodium sulfate. Also calcium chloride calcium sulfate, calcium bicarbonate magnesium sulfate and magnesium bicarbonate is small amount	Mainly sodium carbonate potassium carbonate calcium carbonate and ~~mang~~ magnesium carbonate is small amount
→ Organic matter content high	organic matter content low
→ colour is white or light gray	colour is black

Part (C)

(c) How do you reclaim salt affected land?

Reclamation of salt affected lands

How avoid efflorescence :-

→ By maintaining the water table sufficiently below the roots

→ Hence all the measures which were suggested for preventing water logging hold good for preventing salinity of land

→ An efficient drainage (surface and subsurface) must be provided to lower the water table in saline soils

Leaching:-

In the process:

→ Land is flooded with water

→ Alkaline salt will be dissolved in water

→ Percolation to the ground water

→ Drained by sub surface drains

• High salt resistant crops like rice are grow on leached land for 1 or 2 seasons.

Q2 Part "A"

(a) Explain the procedure of ~~designing~~ designing of an irrigation cannal by Kennedy's theory.

Kennedy's procedure for cannal design:-

Step No # 1:

~~from~~ the trial value of D and put in eq. 1 and determine

$$V_o = 0.546\, m D^{0.64}$$

Step No # 2:

in Eq 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 No # 3:

Substitute the value of R in eqn (Kutters and Chazys Eqn) to obtain V which will be the actual Velocity for assumed dimensions.

Step No # 4

if the velocity worked out from Eqn 2 agrees with that of obtained with the equation 3 (Kennedey's Eqn)

Then the assumed depth as correct. other wise repeate the procedure with changed value of D.

Q No 2 Part B.

Given data:-

$Q = 30\ m^3/sec$

$CVR = m = 1$

$N = 0.225$

$S = 1/5000$

Solution

First assume the depth $d = 2.4m$

Trail 1

Step No 01

$V_0 = 0.55 m D^{0.64} \Rightarrow 0.55 \times 1 (2.4)^{0.64}$

$V_0 = 0.963$

Step No# 02

$Q = AV$

$A = Q/V$

$\Rightarrow A = 30/0.963 = A = 32.25\ m^2$

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

$31.15 = B \times 2.4 + (2.4)^2/2 \Rightarrow B = 11.78\ m$

$\Rightarrow P = B + D\sqrt{5} \Rightarrow 11.78 + 2.4\sqrt{5}$

$P = 18.09\ m$

$\Rightarrow$ Now we have to calculate ~~wetted perimeter~~ Hydraulic Radius.

$R = A/P$

$32.25/18.01 \Rightarrow R = 1.79\ m$

⇒ Now calculating mean velocity from chezy equation

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

where

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

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

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

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

$$\boxed{V_c = 0.93\ m}$$

Q No # 03 Part A

Ans **Initial regime**

- when only bed slope of channel change but the cross section remain Same then also no silting or Scouring take place. But this is rare

Final Regime:-

- if all the parameters (perimeter, depth and slope) have eqully free to vary and adjust according to discharge and silt grades then then the channel is said to have final regime.

Q No # 03 Part # B

Given data:- $Q = 30\ m^3/sec$

$M = 0.56\ mm$

Sol: S.H Factor $= f = 1.76 \times M^{0.5}$

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

$f = 1.3$

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

$V_m = 0.844$

$Q = AV \Rightarrow A = Q/V = 30/0.844 \quad A = 35.54$

(9)

$P = 4.75\sqrt{Q} \Rightarrow P = 4.75\sqrt{30} \Rightarrow \boxed{P = 26.01}$

$R = \frac{S}{2} \times \frac{4^2}{4} = \frac{S}{2} \times \left(\frac{0.844}{1.3}\right)^2 \Rightarrow \boxed{R = 1.36}$

$A = BD + \frac{D^2}{2} = 35.54 = BD + \frac{D^2}{2} \rightarrow (1)$

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

$26.01 = B + 2.236D$

$B = 26.01 - 2.236D \rightarrow (2)$ put eq(2) in eq(1)

$35.54 = (26.01 - 2.236D)D + \frac{D^2}{2}$

$35.54 = 26.01D - 2.236D^2 + 0.5D^2$

$35.54 = 26.01D - 1.736D^2$

$\underset{a}{-1.736D^2} + \underset{b}{26.01D} - \underset{c}{35.54} = 0$

$a = -1.736$, $b = 26.01$, $c = -35.54$ by quadratic eq

$D = \frac{-(26.01) + \sqrt{(26.01)^2 - 4(-1.736)(-35.54)}}{2(-1.736)}$

$\boxed{D = 1.52}$ put in eq (2)

$B = 26.01 - 2.236(1.52)$

$\boxed{B = 22.61}$

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

$\boxed{S = 0.00026}$

Q No # 04 Part 'A'

Explain the component of headwork with neat diagram.

Head work:-

Any hydraulic structure which supplies water to the off taking cannal is called a head work.

Components of a diversion head work:-

(1) **Weir:-**

Normally the water level of any perennial river is such that it can't be diverted to irrigation cannel.

→ The bed level of the cannel may be higher than the existing water level of the ~~cannal~~ River.

2) **Barrage:-**

When the water level from the upstream side of the weir is required to be raised to different time barrage is constructed.

3) **Under sluices:~**

→ Also know as scouring sluices

→ The under sluices are the opening provided at the base of the weir or or barrage

4) Divide wall :-
The divide wall is the long wall constructed at right angle of the weir or barrage it may be constructed with stone masonry are cement concrete.

5) Fish. ladder :-
The fish ladder is provided just by the side of the divide wall for free movement of fishes.

(6) Cannal head regulator :-
A structure which is constructed at head of the cannal to regulate flow of water is know as head regulator.

(7) Still regulator work :
The entry of still into a cannal which take off from a head work can be reduced by constructing certain special work called still regulator work

(8) River traning work :
River traningwork are required near the weir site in order to ensure a smooth and an

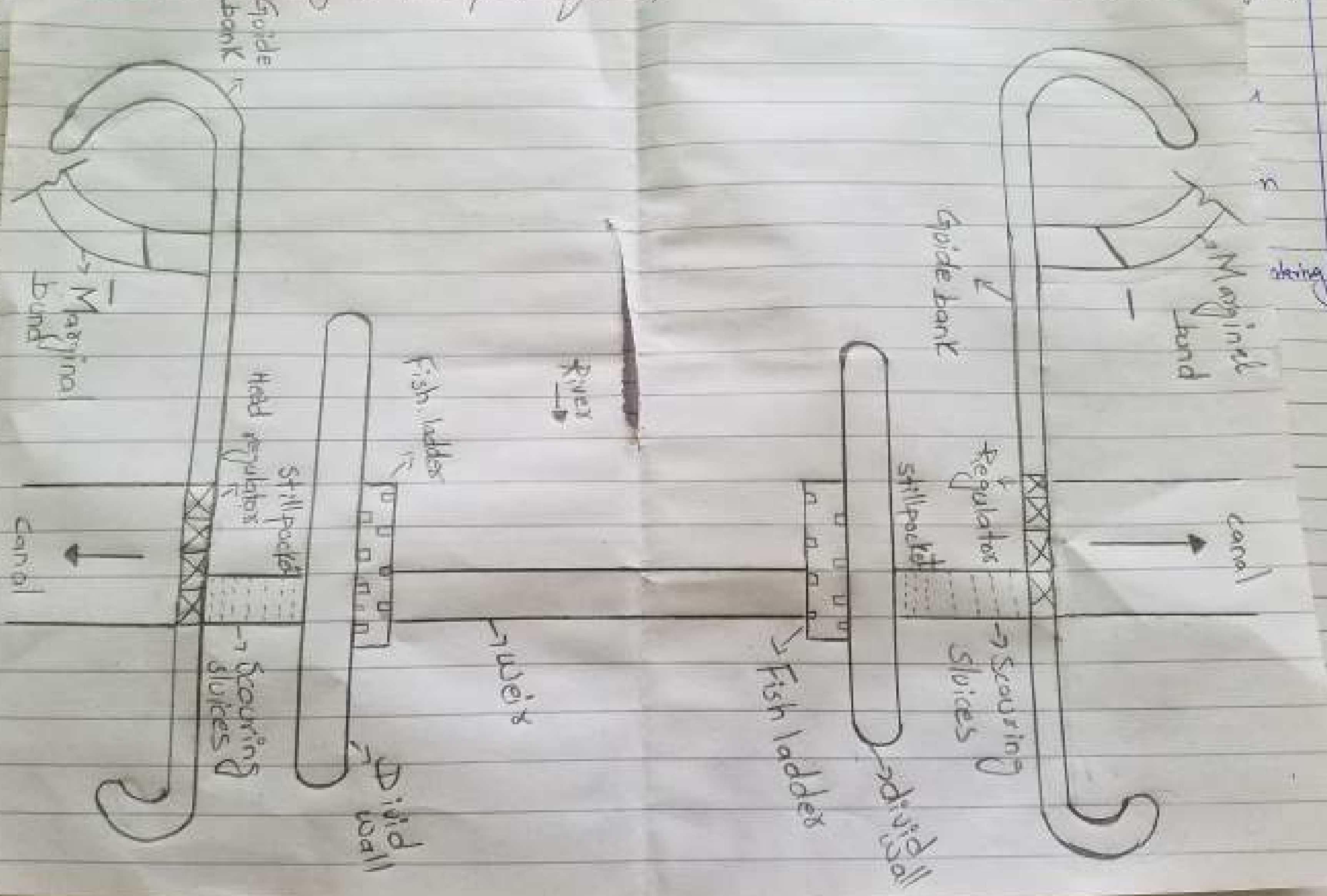
(9) Guide bank.

when a barrage is constructed across a river which flow through the alluvial soil the guide bank must be constructed on both approach

(10) Marginal Bund:

The marginal bund are earthen embankment which are constructed parallel to the river bank.

Fig 15.1 Layout of headworks



Part 'B'

What are the funtion of head regulators?

Function of Head regulators:-

→ it regulates the supply of water entering the cannel

→ it control the entry of silt in the cannel

→ it prevent the river - floods from entering the cannel.