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7386

Q No # 1

Explain anti water logging measures?

Ans:-

There are several anti water logging measures which are as follows.

1. **Minimizing the strength of irrigation.** The Canal water should be used in less amount and that can be possible if we use it on small area of land, seasonally.

2. **Bordering of Canals and water courses.** By making borders or demarcations the flow wanted to be less.

3. **By introducing crop rotation.** The Crop which requires the most water should be placed firstly then crop which requires less and at the end which requires no water.

Example:-

Rice followed by wheat and then Cotton.

4. **Optimum Use of water.**

The water should be used measurely in a careful manner. Specific amount that is required should be used than more or less water.

5. **Making Natural Drainage better.**

we need to work on natural flow of water by bush and jungle cutting. we should not let water to be stand at one place.

Q 2(B) Differentiate between Saline and Alkaline Soils.

SALINE SOILS	ALKALINE SOILS
1. Saline soils are the soils that have a PH in between 7 and 8.5 and Exchangeable Sodium % below 15%.	Alkaline Soils are the Soils that have a PH greater than 8.5 and an Exchangable Sodium % greater than 51%.
2. PH in Saline Soils is less than 8.5	PH in alkaline Soils is Greater than 8.5
3. Exchangeable Sodium Percentage is less than 15.	Exchangeable Sodium Percentage is Greater than 15
4. Electrical Conductivity is 4 or more mm hos/cm	Electrical Conductivity is usually less than 4 mmhos/cm
5. Most Common ions in Saline Soils are. Mainly Sodium Chloride and Sodium Sulfate Also. Calcium chloride, Calcium sulfate, Calcium bicarbonate. magnesium Sulfate and magnesium bicarbonate in Small amounts.	Most Common ions in Alkaline Soils are mainly. Sodium Carbonate, Potassium Carbonate, Calcium Carbonate and magnesium Carbonate in Small amounts.
5. Organic matter Content is very high in it.	organic matter Content is very low in it.
6. Color of the Soil will be white or light Gray.	Color of the Soil will be black

Q 1 (c)

1. We should ~~also~~ work on the drainage (on the surface and sub-surface land). It should be well established and effective so that if fulfil the needs especially to lower the levels of water table in saline soils.

2. LEACHING..
   1 Land flooded with water
   2 Alkaline salts will be dissolved in water
   3. Percolation to the ground water
   4. Drained by sub surface drains.

3. we will grow crops who has high salt resistant like rice and then normal crops like wheat and cotton for one or more seasons on leached land.

4. Also when Sodium Carbonate is found in soil, we have to add gypsum before leaching as a result Sodium Sulphate is formed which can be ~~leached~~ Leached or filter out easily

$$Na_2CO_3 + CaSO_4 \longrightarrow Na_2SO_4\ CaCO_3$$

5. we can avoid Efflorescence by keeping up the water table sufficiently below the roots.

Q2 (a): Explain the Procedure of designing of an irrigation canal by kenedy's theory.

Ans:- KENNEDY'S THEORY:-

- R.G Kennedy studied straight reaches of upper Baari Doab canal which are stable for 30 years
- $V_o = CD^n$

where V_o is critical Velocity (non-silting or non scouring)

C is Constant depends upon quantity of silt.

KENNEDY PROCEDURE FOR CANAL DESIGN

STEP 1:-

Assume the trial value of D and Put it in Equation 1 and determine

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

STEP 2:-

In Equation 1 $Q = AV$

$$A = Q/V$$

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

$$P = B + D5^{1/2}$$

For Assumed D Determine B

Find $R = A/P$

STEP 3:-

Substitute the value of R in eq. 2 (Kutter's and Chazy Equation) to obtain V which will be the actual velocity for assumed dimensions.

STEP 4:-

If the Velocity worked out from Equation 2 agrees with that of obtained with Equation 3 (Kennedy's Equation.) Then the assumed depth is Correct. Otherwise repeat the Procedure with Changed value of D.

Q_2 (B)

Given Data:-

$Q = 30 m^3/Sec$

$C.U.R = m = 1$

$N = 0.0225$

$S = 1/5000$

Sol:-

First Assume the depth $d = 2.4m$

Trail 1

Step 1:-

$V_o = 0.55 m D^{0.64}$

$V_o = 0.55 \times 1 \times (2.4)^{0.64}$

$\boxed{V_o = 0.963}$

Step 2:-

$Q = AV$

$A = Q/V$

$A = 30/0.963$

$\boxed{A = 31.153 m^2}$

$A = BD + D^2/2$

$31.153 = B \times 2.4 + \frac{(2.4)^2}{2}$

$\boxed{B = 11.78m}$

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

$$P = 11.78 + 2.4\sqrt{5}$$

$$\boxed{P = 17.146\,m}$$

$$R = \frac{A}{P} = \frac{31.153}{17.146}$$

$$\boxed{R = 1.82}$$

Step #3 (Kutter & Chezy Equation)

$$V = C(\sqrt{RS})$$

$$C = \frac{\frac{1}{0.0225} + \left(23 + \frac{0.00155}{0.0002}\right)}{1 + \left(23 + \frac{0.00155}{0.0002}\right)} \times \frac{0.00255}{\sqrt{1.82}}$$

$$C = \frac{75.194}{1.513}$$

$$\boxed{C = 49.703}$$

$$V = C(\sqrt{RS})$$

$$V = 49.703 \times \sqrt{1.82 \times 0.0002}$$

$\boxed{V = 0.948}$ which less than $\boxed{V = 0.963}$

Then Decrease the Depth

$$\boxed{d = 2.3\,m}$$

Trail #2

This 2nd trial are directly Calculated Value

D: 2.3m

Step I

$V_o = 0.55 \times 1 (2.3)^{0.64}$

$V_o = 0.937$ m/sec

Step 2

$A = Q/V$

$= \frac{30}{0.937}$

$A = 32.017 m^2$

$A = BD + D^2/2$

$B = 12.77m$

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

$P = 17.913m$

Step 3

$C = \frac{75.195}{1.518}$

$C = 49.535$

$R = A/P$

$R = 1.787$

$V = C \times \sqrt{RS}$

$V = 49.535 \sqrt{1.787 \times 0.0002}$

$V = 0.93$ m/sec   its Equal to the V_o

Q3A

LACEY'S THEORY

- According to kennedy's a channel is regime (No Silting, No Scouring) but according to Lacey even though channel with no Silting or Scouring may actually be not in regime
- He differentiated between 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 takes Place. But this is rare.
- FINAL REGIME
  - If all the Parameters (Perimeter, depth and slope) have Equally free to very and adjust according to discharge and Silt grades then the Channel is Said to be have final Regime.

Q 3(B)

Given Data:-

Discharge $(Q) = 30 m^3/sec$

Mean dia of silt particle $= (M) = 0.56 mm$

Solution:-

First we have to calculate velocity (mean)

$$V_m = \left[\frac{Q f^2}{140}\right]^{1/6}$$

$$= \left[\frac{30(1.32)^2}{140}\right]^{1/6}$$

$$\boxed{V_m = 0.85 m/sec}$$

∵ f = Lacey's silt factor

$f = 1.75 M^{0.5}$

$= 1.75(0.56)^{0.5}$

$f = 1.32$

→ Now we will Hydraulic Mean depth

$$R = \frac{5}{2}\left(\frac{V^2}{f}\right)$$

$$= \frac{5}{2}\left(\frac{(0.85)^2}{1.32}\right)$$

$$\boxed{\Rightarrow R = 1.36}$$

→ Now finding the value of "P"

By Formula

$$P = 4.75\sqrt{Q}$$

First we have to find Area =

By Discharge formula:

$$Q = AV$$

$$\Rightarrow A = Q/V$$

$$= \frac{30}{0.85} \Rightarrow \boxed{A = 35.29\ m^2}$$

Now

$$P = 4.75\sqrt{Q}$$

$$= 4.75 \times \sqrt{30} \Rightarrow \boxed{P = 26.02}$$

finally we have to Calculate "S"

By Using formula

$$S = \frac{f^{5/3}}{3340\, Q^{1/6}}$$

$$= \frac{(1.32)^{5/3}}{3340 \times (30)^{1/6}}$$

$$\boxed{S = 0.000269}$$

DIMENSIONS CALCULATIONS:-

By formula

$$A = BD + \frac{D^2}{2}$$

$$35.29 = BD + \frac{D^2}{2} \quad \text{—} (1)$$

$$P = B + 2.236D$$

$$B = 26.01 - 2.236D$$

Put in Eq 2 in Eq (1)

$$35.29 = (26.01 - 2.236)D + \frac{D^2}{2}$$

$$35.29 = 26.01D - 2.236D^2 + \frac{D^2}{2}$$

$$35.29 = 26.01D - 2.236D^2 + 0.5D^2$$

$$35.29 = 26.01D - 1.736D^2$$

$$\underset{a}{\underline{-1.736D^2}} + \underset{b}{\underline{26.01D}} - \underset{c}{\underline{35.29}} = 0$$

By Quadratic Equation

$$D = \frac{-(26.01) + \sqrt{(26.01)^2 - 4(-1.736)(-35.29)}}{2(-1.736)}$$

$\boxed{D = 1.51m}$ → Put in Eq. 2

→ $B = 26.01 - 2.236(1.51)$

→ $\boxed{B = 22.63m}$

Q4A

Components of Headwork are as follows.

1. Weir
2. Barrage
3. Under sluices
4. Divide Wall
5. Fish Ladder
6. Canal head Regulator
7. Silt Excluders.
8. River training works (Marginal bunds and Guide Banks)

1. WEIR:-

Perennial rivers are those which has the Continous flow throughout the year. It Cannot be re-directed to the irrigational Canal. The level of Canal Could be higher as compared to river water level Because of its weir Constructed to uplift the water level. It's made from one Side to the other of river. Surplus water Pass over the Crest of weir water. On Crest adjustable shutters are provided to uplift the water level to some required height.

2. BARRAGE:-

Barrage is an altificial barrier across the river. It's arranged in a way that it Consists of adjustable shutters at different tires over the weir. It's Constructed to alter water level when required to different levels at different time.

3. UNDERSLUICES:-

They are the openings Provided at base of weir or Barrage. They are Controlled by adjustable gates. Gates are usually kept Closed. The suspended slit goes on depositing in front of Canal head regulator. They are also known as scöring sluices.

4. DIVIDE WALL

It is to form a still water Pocket in front of the Canal head so that the suspended silt can be settled down which then later be cleaned through the scouring sluices from time to time. It Controls Eddy Current or Cross Current in front of the Canal head. It Provides a straight approach in the front of the Canal head. It resist the over turning effect on the weir or barrage Caused by the Pressure of the Impounding water

5. FISH LADDER

The fish Ladder is Provided Just by the side of the divide wall for the free movement of fishes. Rivers are important sources of fish. The tendency of fish is to move from upstream to down stream in winters and from down stream to upstream in monsoons.

This movement is essential for their survival. Due to construction of weir or barrage, the movements get obstructed and is determinal to the fishes.

CANAL HEAD REGULATOR:-

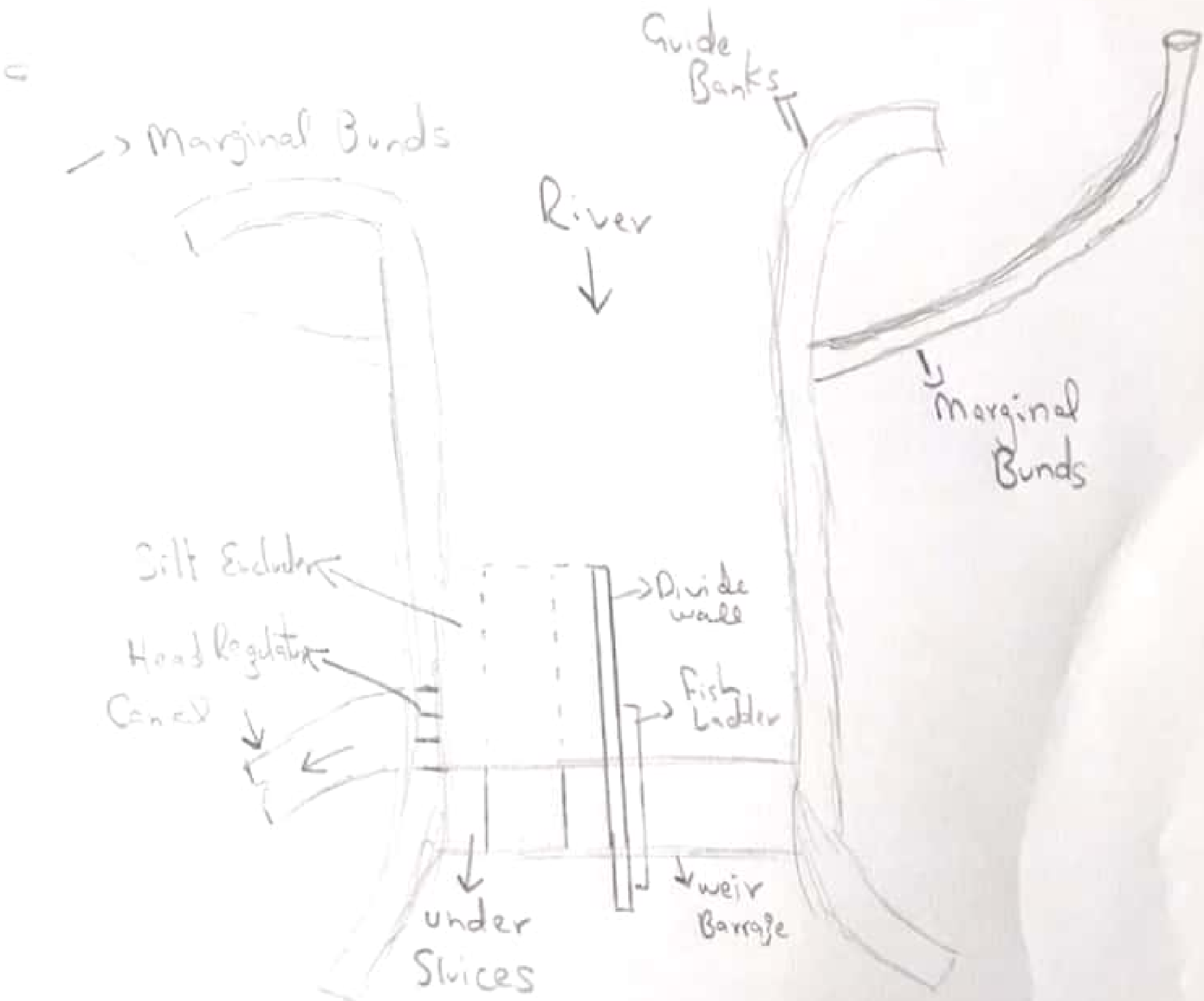
A structure which is contructed at the head of the canal to regulate flow of water is known as canal head regulator. It consists of a number of piers which divide the total width of the canal into a number of spans which are known as bays. The piers consist of number tiers on which the adjustable gates are placed.

SILT EXCLUDERS:-

Silt Excluders are those works which are constructed on the bed of rivers upstream of the head regulator. The cleaner water enters the head Regulator and silted water enters the silt excluder. In this type of works the silt is therefore removed from water before in enters the 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 it's course. The river training works required on a canal head work are (a) (Guide Banks) (b) Marginal bunds.



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Q4B

CANAL HEAD REGULATOR

It's constructed at the head of the Canal to regulate flow of water and is known as Canal Head Regulator.

FUNCTION

There are 3 important functions.

1) It regulates the supply of wate entering the Canal
2) Controls the Entry of Silt in Canal
3) Prevents river flood from entering the Canal.

Silt Regulation works:-
The Entry of Silt into a Canal