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Qno1 (a) : Explain anti water-logging measures.

Ans: Land is said to be water logged when its productivity is affected by high water table.
high water table causes saturation of root zone.

Methods of Control of water Logging

(1) Lining of Canals & Water Courses:
It reduces the seepage of water.

(2) Reduce the intensity of of irrigation:
One part of land should recieve water at one season, and the next one in next season.

(3) By introducing Crop rotation:

- The Crop Should be followed by one requiring Less and then almost no water require, Such as; rice followed by wheat and wheat by Cotton.

(4) Optimus use of water:

Certain amount gives best results, Less or more affect the yield. Cultivators Should be educated that, not to use more water.

(5) improving natural drainage of Area:

→ Water Should not be allowed to Stay in one place, natural flow is provid by bush and jungle.

(6) Pumping or tubewell or Vesticle Drainage:

Lift irrigation Should be introduce to use GW.

(7) Econominal use of water.

(8) Adoption of Sprinkler method of irrigation.

→ Only predetermined amount of water is Supplied to land.

→ No Precolation losses from water Courses.

Q no1: (b) : Differentiate b/w Saline and alkaline Soil.

Answer. Saline and Sodic Soil limits the ability of plant's root to absorb water, and the also destroy the Soil Structure by breaking down and dispersing Soil Particles.

Definition:

Saline and Alkaline Soils, both have the high P.H Level with problem typically occuring at a PH of 7.8.

Saline Soil	Alkaline Soil.
(1) Saline Soil have a high ~~Sodium~~ Salt Content.	(1) Alkaline Soil have high Sodium Content.
(2) in Saline Soil, Salts are Soloubble salt in the Soil which are, Chloride of Sodium Calcium and magnesium	(2) in Alkaline Soil, the Level of Sodium in Soil dominates the other Soloubble Salt.

Saline Soil

(3) In Symptoms, the plant leaves have yellow Strips on the upper leaves Caused by zinc and deficiency.

(4) They also may Contain Powdery Substance on the Soil as salt are dispersed to Soil Surface.

Alkaline Soil

(3) The Symptoms could be Like as of Saline Soil, but alkaline Soil Condition also reduce the viability of seedling and Can affect germination.

(4) The Sodium Can also Create a black brown Crust that is Caused by dispersion of organic matter.

Qno1 (C): How do you reclaim the Salt affected lands.

Answer: If you See a Land is wetter than other after rain, it is the Salt affected Land. the first Step is to identify the Land. The following techiques Can help reclaim Salt affected Soil.

→ Salt Can be leached out of the root zone through good quality irrigation water or by heavy Rain fall.

→ Create good Surface and internal drainage. the use of tile drains and open ditches in the fields Can increase the drainage and remove Some of the Salts.

→ Break the Compacted layers, that occur near of at the Soil Surface.

→ add organic matter, such as rotted hay of feedlot manure, at 10-15 tons/ton to improve Soil Porosity.

→ further more, the ~~&~~ Gypsum should be added to remove the ~~Soil~~ Salt.

→ Sandy Soil is easy to reclaim that the Clay Soil, ~~#~~ by rain if the rain is the only Source of reclaimation.

Q no 2: (a): Explain the Procedure of designing of an irrigation Canal by Kennedy's theory.

Answer: **Kennedys theory**:

R. G. Kennedy Studied Straight reaches of upper bari 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 depend upon quantity of Silt.

- Sediment is kept in Suspension Solely by the verticle Component of eddies.

- Weight of Sediment Vertically acts downward.
- Verticle Component of eddies acts upward.
- Result; The Sediment is in Suspension.
- $V_o = 0.84 D^{0.64}$ FPS System.
- $V_o = 0.546 D^{0.64}$ MKS System, D is depth.
- $V_o = 0.546\ m\ D^{0.64}$ Where $m = V/V_o$ = Critical Velocity Ratio (C.V.R), depends upon Silt grade.
- V = Critical Velocity for all Size of Sediment, V_o is V_{cr} for upper bari Doab Canal only.

Kennedy Procedure for Canals design.

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

$$V_o = 0.546\, mD^{0.64}.$$

Step-2: In eq.1; $Q = AV$.

$$A = Q/v$$

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

$$P = B + D\,5^{-1/2}$$

for assumed D determine B.

find $R = A/P$.

Step-3: Put the value of R in eq 2 (Kutter and Chazys Eqn) to obtain V, which will be the atual for assumed dimension.

Step - 4: If the velocity worked out from eqn. 2, agrees with that of obtained with eq 3 (Kennedeys Eqn). Then the assumed depth is Correct. other wise reapet the Procedure with Change Value of D.

Q no (3) (a): Differentiate b/w initial regime and final regime in Accordance to Laceys theory.

Ans: According to Kennedy, a Channle is regime (No Silting, No Scouring) but According to Lacey even though Channle with no Silting of Scouring may actually be not in regime.

→ He differentiated b/w initial and final regime but this theory is applicable to final regime.

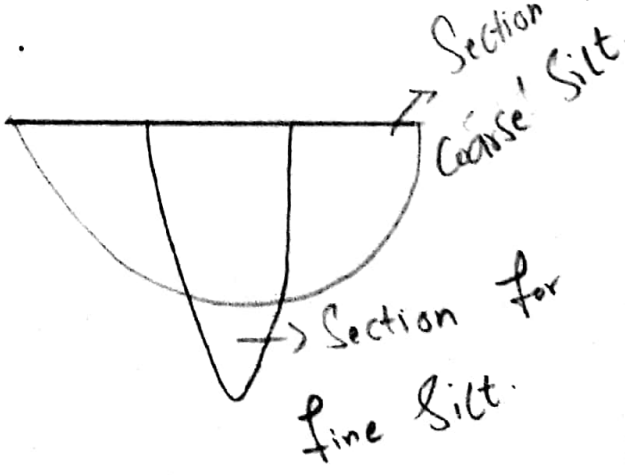
INITIAL REGIME:

When only bed Slope of Channle Changes but the Cross Section remains Same, then also no Silting or Scouring take place. But this is rare.

FINAL REGIME:

→ If All the Parameters (perimeter, depth and Slop) have equally free to vary and adjust according to discharge and Silt grades then the Channel is Said to have final regime.

→ In final regime the Cross Section assumes Semi-ellipse Shape.



Qno2 (b) Design an irrigation channle by Kennedy's theory to Carry a discharge of 30 Cmecs with C.V.R (m) of 1 and N as 0.0225 and bed Slope of 1 in 5000.

Assume The depth (D) as 2.3m.

Given Data:

$D = 2.3m$

$Q = 30$ Cumecs

$C.V.R = m = 1$

$N = 0.0225$

$S = 1/5000 = 0.0002$.

As we Know $Q = AV$

$A = Q/V = \frac{30}{V} \rightarrow (1)$

(Ans)

Thus, using formula to Compute "V".

$V_0 = 0.546\,(1)(2.3)^{0.64}$.

$\boxed{V_0 = 0.935 \text{ m/s}}$ → put this Volume in eq (1)

$$A = \frac{30}{0.935} = 32.01 \text{ m}^2$$

Now, $A = B\Delta^2 + \frac{\Delta^2}{2}$.

$$32.01 = B(2.3)^2 + \frac{(2.3)^2}{2}.$$

$\boxed{B = 12.77 \text{ m}}$ put the value in below eq

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

$$\Rightarrow 12.77 + 2.3(\sqrt{5}).$$

$$P = 17.9 \text{m}.$$

Now $R = A/P = \frac{32.01}{17.9} = 1.78.$

∴ Substituting the value of "R" in Kuller's and Chazy's equation.

$$V = C(RS)^2 \rightarrow (a)$$

$$\Rightarrow C = \frac{\frac{1}{n} + \left(23 + \frac{0.00155}{S}\right)}{1 + \left(23 + \frac{0.00155}{S}\right)\sqrt{f/8}}$$

$$\Rightarrow C = \frac{\frac{1}{1} + \left(23 + \frac{0.00155}{0.0002}\right)}{1 + \left(23 + \frac{0.00155}{0.0002}\right)\left(\sqrt{1.76}\right)}$$

Put the value in eq (a)

$$V = 49.528 \left(1.76 \times 0.0002\right)^{1/2}.$$

$$\boxed{V = 0.93 \text{ m/s}}$$

This is equation to V_0 thus no more trail required.

Q no 3 (b): Design a regime Channle by laceys theory for Q = 30 cumec and mean dia of Silt Particles of 0.56mm.

Solution:

Given Data

$Q = 30 \ m^3/Sec$

$m = 0.56mm$

Silt factor $= f = 1.76 \times m^{0.5}$

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

$f = 1.3$

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

$V_m = 0.844$

$Q = AV$

$A = Q/V = 30/0.844 = \boxed{35.54}$

$P = 4.75\sqrt{Q}$

$P = 4.75\sqrt{30}$

$P = 26.01$

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

$\boxed{R = 1.36}$

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

(Eq 1)

$35.54 = BD + \frac{D^2}{2}$ — (1)

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

$26.01 = B + 2.236D$

$B = 26.01 - 2.236D$ — (2)

Put eq (2) in eq (1).

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

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

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

$35.54 = 26.01D - 1.736D^2$.

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

$a = -1.736$, $b = 26.01$, $c = -35.54$.

by quadratic equation.

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

$D = 1.52$

Put in Eq (2)

$$B = 26.01 - 2.236\,(1.52)$$

$$\boxed{B = 22.611}$$

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

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

$$\boxed{S = 0.00026}$$

(Q.1)

Q no 4 (a) : Explain the Components of headworks with neat diagram.

Answer: Following are the Component of headworks.

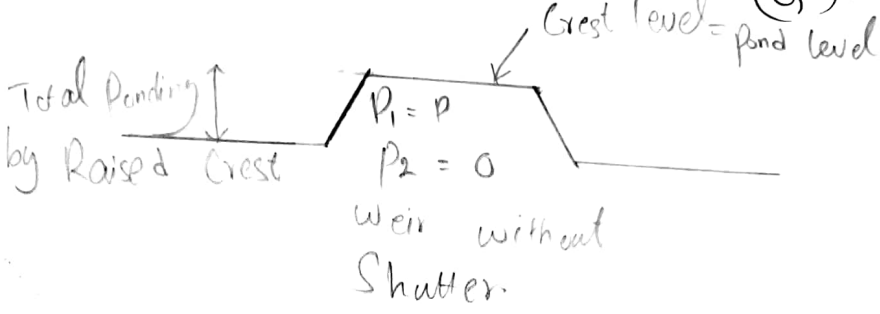
- → Weir
- → Under Sluices
- → Divided walls
- → Fish ladder
- → Canal head regulator

(1) Weir : → Normally the water level of any perenial river is such that it can't be diverted into irrigation Canals.

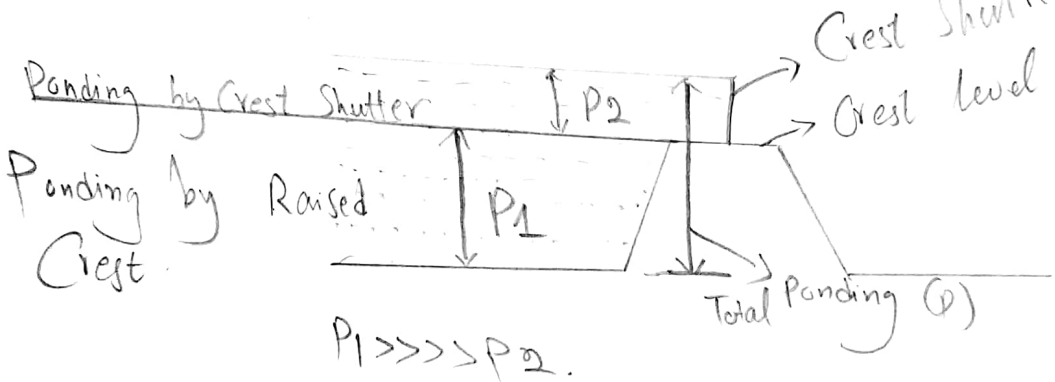
→ In such case, weir is ~~Constructed~~ Constructed accross the River to raise the water level.

→ Adjustable Shutters are provided to rais water level.

(G,2).



Weir without Shutter.



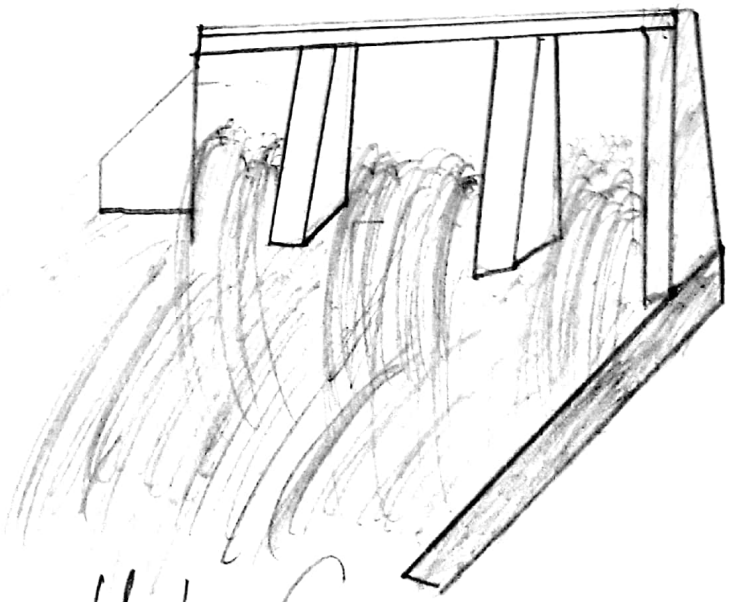
$P_1 >>>> P_2$.

Weir with Shutter

Under Sluices:

- Also known as Scouring Sluices.
- The Under Sluices are the opening provided at the base of weir or barrage.
- These opening are provided with adjustable gates.
- The Suspended Silt goes on depositing in front of the Canal & head regulator.

- When the Silt depositing becomes appreciable, The gates are opened and the depositing sft is loosened with an agitator mountaing on a boat.
- The muddy water flows toward the downstream through the Scouring Sluces.
- The gates are then Closed but at the Period of flood and gate are kept opened.



Under Sluce

Divided wall:

The divided wall is a long wall Constructed at Right angle in the weir or barage, it may be Constructed with Stone masonry of Cement Concrete..

→ On the upstream Side, the wall is extended just to Cover the Canal head regulator and on the downstream side, it is extended up to the launching Apron.

function of divide wall.

→ 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 the eddy Current or Cross Current in front of the Canal head.

→ It resist the the overturning effect on the weir or barrage Caused by water Pressure.

Barrage: When the water level on upstream side of the weir is required to be raised to different level at different time, barage is constructed.

→ Barrage is an arrangement of adjustable gates or shutter at different tries over the weir.

Fish ladder. The fish ladder is provided just by the ~~walls~~ side of divided walls for the free movement of fishes.

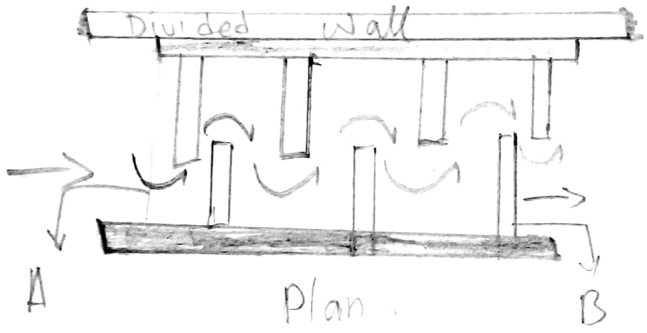
→ Rivers are important source of fishes.

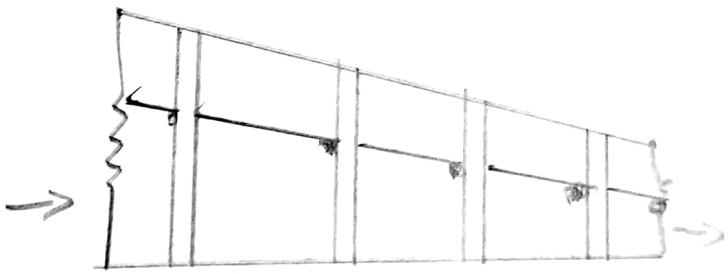
→ The tendency of fish is to move from upstream to downstream in witers and from down stream to upstream in moonsoon.

→ This movement is essential for their survival.

→ Due to weir or barrage, the movement gets obstructed, and it is detrimental to fishes.

→ The walls are constructed in zigzag in fish ladder, so that the velocity of flow doesn't exceed ~~3/s~~ 3 m/sec.





Fish ladder

Canal Head Regulator:

→ A Structure which is Constructed at the head of the Canal to regulate flow of water, is called Canal head.

→ It has gates, which are operated - from the top by ~~using~~ Suitable mechanical device.

→ A platform is Provided for operatings.

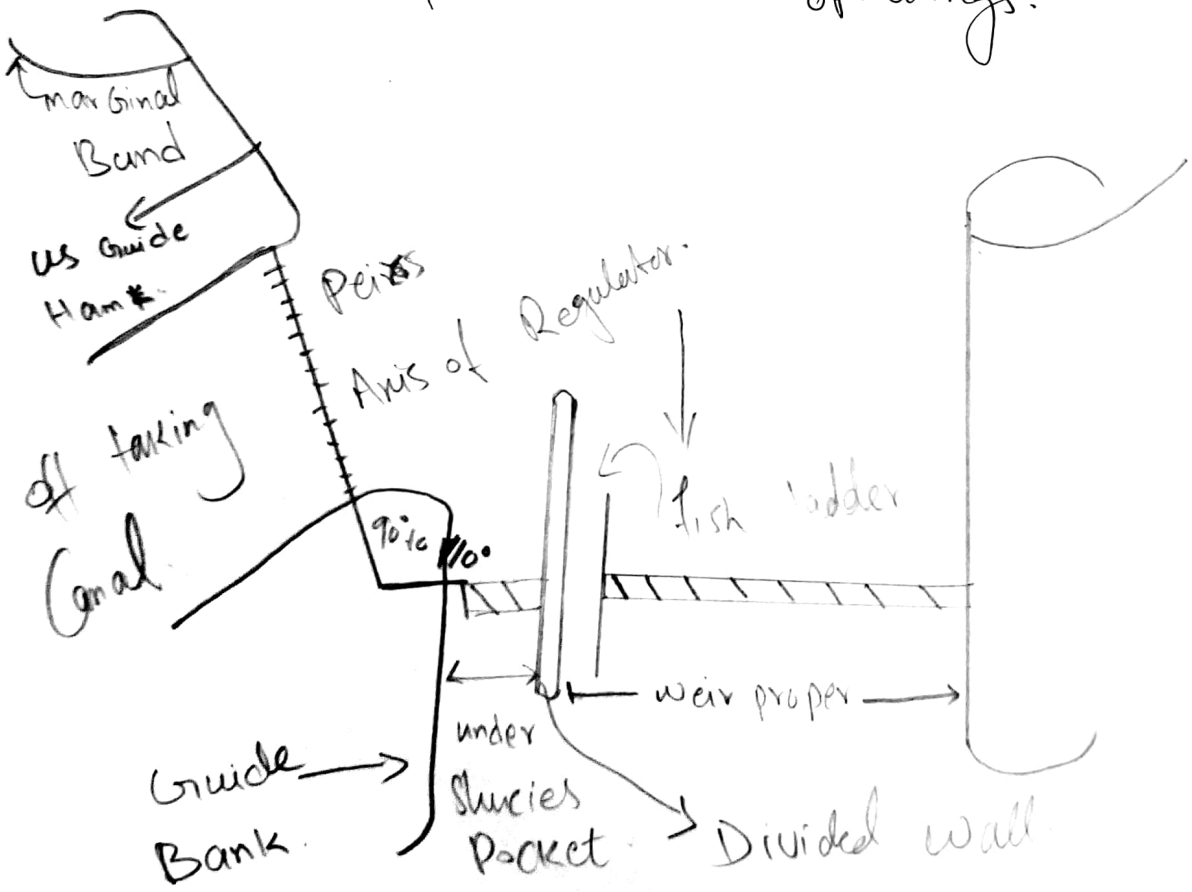


fig: Alignment of a Canal head regulator.

Silt regulation works:

The entry of Silt into a Canal, which takes off from a head work can be reduced by Constructed Silt Control works. It has two types.

1. Silt regulation works
2. Silt Excluders.

River training work.

River training work are required near the weir site in order to ensure a smooth and an axial flow of water, and to prevent River from outflow. It has two types.

1. Guide Bank
2. Marginal Bund.

Q no 4.(b) What are the functions of head Regulators.

Ans: Head Regulators is constructed at the off taking are called head regulators.

→ when it is constructed at head of main Canal it is known as Canal head regulators.

Function:

→ To Control the entry of water either from the reservoir or from the main Canal.

→ To Control the entry of silt into off taking or main Canal.

→ To serve as a meter for measuring discharge of water.