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Section = "B"

Subject = Irrigatio Eng

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(a) Explain anti water losing measurments ?

Ans Method of controle water losing :-

1) lining of canals and water courses :-
It reduces seepage of water.

2) Reducing intensity of irrigation :
only small portion of land should recive canal water in one particular season.
Remaing areas can recive water in next season by rotation.

3) By introducing Crop rotation :-
High water requiring Crop should be followed by one requiring less water and Then by one requiring almost no water. e.g Rice followed by wheat & Then by cotton.

4) Optimum use of water :-
Certain amount of water gives the best

Result. less or more water reduce the Yield. cultivators should be educated so that not to be use more water.

5) Imporing 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 tubwells or virtical Drainage :->
lift irrigation should be introduced to use G.w. canal irrigation may be substitituted by tub well irrigation.

b) Differentiate b/w Saline and alkaline soil.

	Saline	alkaline
(1)	Saline soils have a ph less than 8.5 & exchangeable Sodium percentage less than 15	alkaline soil have ph Greater than 8.5 and an exchangeable sodium.

(2)	The electrical conductivity of saline soil is high	→ low electrical conductive of alkaline s
(3)	The organic matter content in saline soils is comparitively high.	→ The organic mater content in alkaline soil is low.
(4)	It is basic in nature	They are more basic.
(5)	Dominating compound is sodium carbonate salts	→ Dominating compound in sodium carbonate.

(C) How do you reclaim salt effected lands?

Ans → Reclamation of salt effected land :-

Alkali salts (sodium chloride, sodium sulphate and sodium carbonate) are injurious to agriculture.

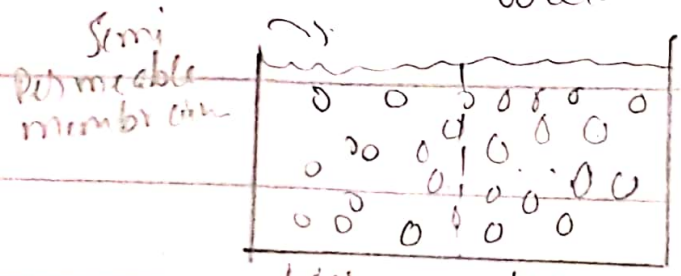
NaCl .... least harmful

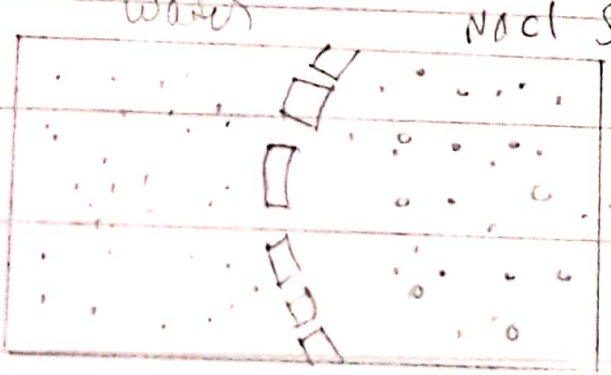
Na_2SO_4 .... medium harmful.

Na_2CO_3 .... most harmful.

The above salts are soluble in water. When WT rises up or roots are in capillary zone. The GW moves upwards and salt deposited

The phenomena of salts coming up in soluble in water. solution and forming a thin crust (~ 7.5 cm) on the surface after evaporation of water is called efforescence.





Osmosis.

Q2 Explain the procedure of designing of an irrigation canal by Kennedy's theory.

Ans KENNEDY'S THEORY:

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

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 trail value of D and put in eqn 1. and determine.

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

Step: 2

$$A = Q/V$$

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

$$P = B + DS^{-1/2}.$$

For assume D determine B. Find $R = A/P$.

Step 3 :->

Substitute the value of R in eqn. 2 .(Kutters and Chazys Eqn) To obtain ,V, which will be the actule velocity for assumed dimensions.

Step 4 :-> if the velocity worked out from Eqn. 2 agrees with what of obtained with the eqn. 3. (Kennedet's eqn). Then the assumed depth is correct. other wise repeat the procedure with changed value of D.

B Design an irrigation channel by Kennedy Theory to carry a discharge of 30 cumecs with an N as 0.0225 and bed slope of 1 in 5000, Assume the depth of (D) as 2.3m.

Given data :->

D = 2.3m , Q = 30 cumec.

C.V.R = m = 1

N = 0.0225

S = 1/5000 = 0.0002.

As we know $Q = AV$.

$$A = Q/V = \frac{30}{V} \rightarrow x$$

Thus using formula to compute "V"

$$N_0 = 0.546\,(1)\,(2.3)^{0.64}$$

$$\boxed{V_0 = 0.935\ m/s} \rightarrow \text{put this in } x$$

$$A = \frac{30}{0.935} = 32.01\ m^3$$

Now, $A = BD^2 + \frac{D^2}{2}$ putting values.

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

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

$$= 12.77 + 2.3(\sqrt{5})$$

$$\boxed{P = 17.9m}$$

Now $R = \frac{A}{P} = \frac{32.01}{17.9} = 1.76$

$$\Rightarrow V = C(RS)^{\frac{1}{2}} \rightarrow a$$

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

$$C = \frac{\frac{1}{1} + 23 + \frac{0.00155}{0.0002}}{1 + \left(23 + \frac{0.00155}{5}\right)^{1}\sqrt{1.75}}$$

$$\Rightarrow V = 49.526(1.76 \times 0.0002)^{1/2}$$

$$\Rightarrow \boxed{V = 0.93\ m/s}$$ this is equation to V_0

(d) Differentiate blw initial regime and final Regime in According to laceys Theory.

⇒ LACE'S THEORY :->

- According to Kennedy, 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 differentiate blw initial regime and final regime but this Theory is applicable to finial regime.

→ Initial rigeme :->

When only bed slope of channel changes but the cross ~~correction~~ section remains same Then also no silting or scouring take place But this is rare.

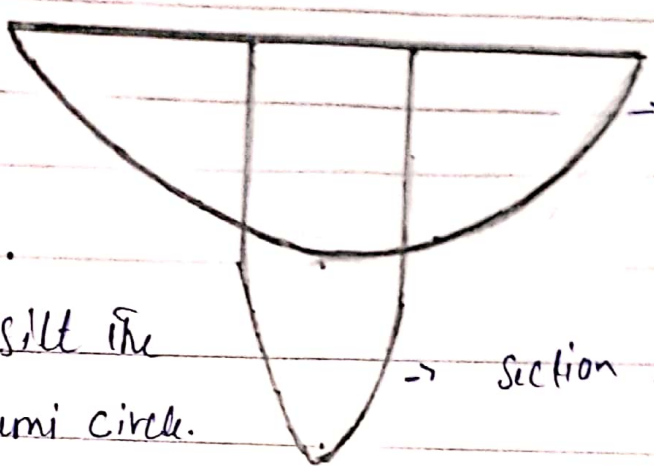
→ Final rigeme :->

If the Parameters (depth, 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 ~~ellips~~ ellips shape.

Coarser the silt flatter the ellipse.

Finer the silt the section is semi circle.



→ section for coarse silt

→ section for fine silt.

B

Design a regime channel by Lacey's theory for discharge of 30 cumes and mean diameter of silt particle of 0.56m.

Given Data

$Q = 30\ m^3/sec$

$M = 0.56\ mm$

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

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

$$\boxed{f = 1.3}$$

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

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

$$\boxed{V_m = 0.844}$$

$Q = AV$

$A = \frac{Q}{V} = \frac{30}{0.844}$

$A = 35.54$

$P = 4.75\sqrt{Q}$

$P = 4.75\sqrt{30}$

$P = 26.01$

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

$R = 1.36$

$B = 26.01 - 2.236(1.52)$

$B = 22.611$

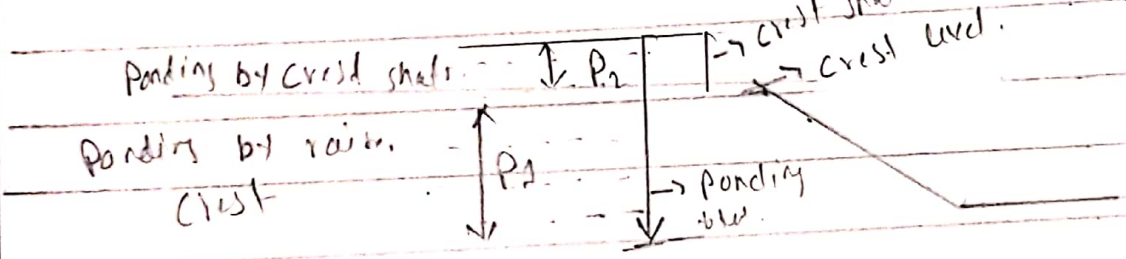
$S = \frac{f^{(5/3)}}{3340\, Q^{1/6}}$

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

$S = 0.00026$

Q4 (a) Component of head work :→

⇒ 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 may be higher than the existing water level of the river. In such cases weir is constructed accross the river to raise the water level.



$P_1 > P_2$

- Barage :→

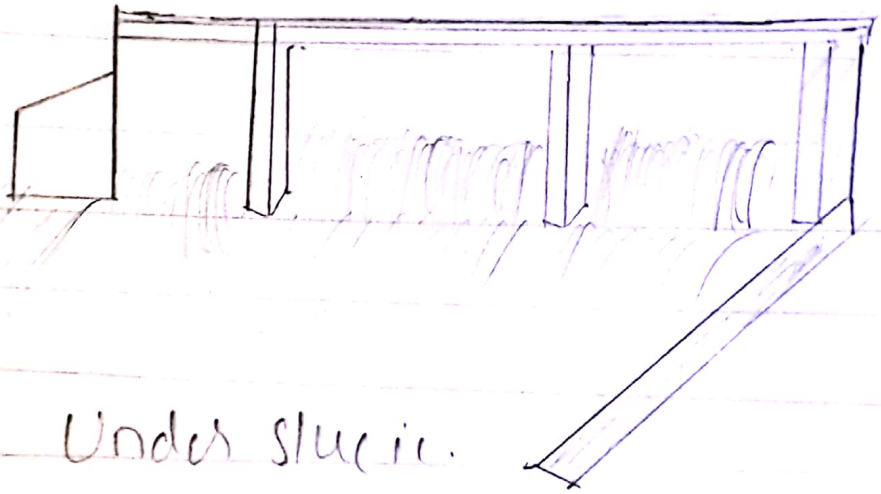
Normally the water level of any perenial river is such that it cannot be diverted to the irrigation canal.

- 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.

• Under Sluices :→

Also known as scouring sluices. The under sluices are the opening provided at the base of the weir or barrage. These opening are provided with adjustable gates.



Under sluice.

→ Divide wall?

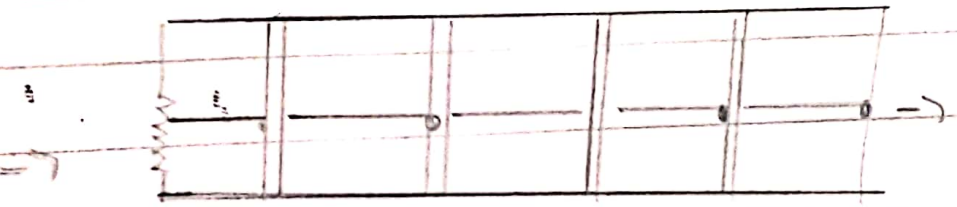
The divide wall is a long wall constructed at right angles in the weir or barrage. It may be constructed with stone masonry or cement concrete. On the upstream canal side, the wall is expended just, to cover the canal head regulator and on the downstream side it is extended up to the launching apron.

- Fish ladder :->

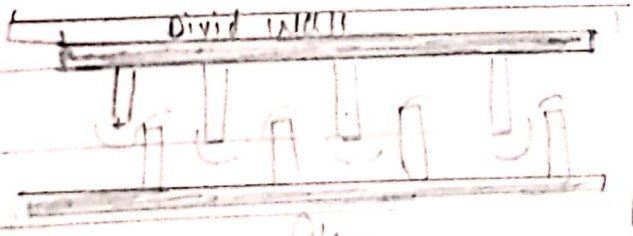
The fish ladder is provided just by the side of divide wall for the free movement of fishies. rivers are important source of fishies.

- The tendancy of fish is to move from upstream to down stream in winters & from down stream to upstream in monsoons.

Fish ladder



Section on AB.

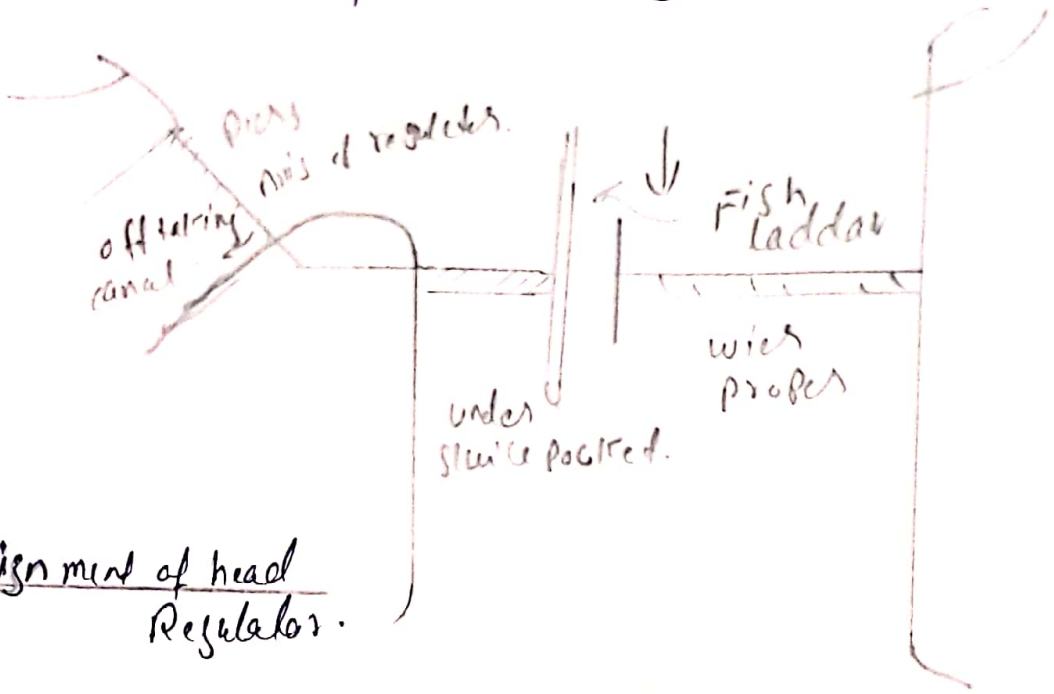


- Canal head regulator :->

A structure which is constructed at the head of canal to regulate flow of water, is known as head regulator.

⇒ Functions of canal Head Regulator :-

It Regulates the supply of water entering the canal. It controls the entry of silt in the canal. It prevents the river floods from entering the canal.



Alignment of head Regulator.

→ Silt regulation works :

The entry of silt into canal which takes off from a head works can be Reduced by constructed certain special work, called silt control work.

- Silt Ejector: also called silt extractor are those device which extract the silt from canal water after the silted water has travelled certain distance in off canal.

b) What are the function of head regulator?

Ans

CANAL HEAD REGULATOR:->

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

FUNCTION:->

- To regulate the supplies into the canal
- To indicate the discharge passed into canal.
- To control the silt entry into the canal.