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Subject Irrigation Engineering

Module 12th

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Q1:- Explain anti water logging measures?

Ans:- Anti water logging are as below.

(1):- Lining of canals and water courses:- it reduces seepage of water.

(2):- Reducing intensity of irrigation:-

- Only small portion of land should receive canal water in one particular reason.
- Remaining areas can receive water in next season by rotation.

(3):- Introduction to crop rotation:- High water requiring less water and then by one requiring almost no water.

Example:- Rice followed by wheat and then by cotton.

(4):- optimum use of water:- Proper amount of water gives good result. Less or more water effect the yield cultivators should be educated so that there is optimise use of water.

- Revenue should be changed on the basis of quantity of water rather than the area of land.

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

(6) pumping :- Lift irrigation should be introduced to use Ground water.
- Canal irrigation may be substitution by tube well irrigation.

(7) Adoption of sprinkler method of irrigation:-
- only predetermined amount of water is supplied to land.
- No percolation losses from water courses.

(b): Differentiate b/w saline and alkaline soils?

Saline soil	Alkaline soil
High soil content in soil solution	High sodium > 15% CEC. ESP = Exchangeable Sodium Percentage

Saline soil

- "White Alkali" soil - Salt accumulation at soil surface.
- EC > 4 mmhos/cm = 40meq/L
- Salts raise the osmotic potential of the soil solution reduces available soil water
- Plants have to use more energy to get the water they need.

Alkaline soil

- High pH > 8.5 pH of Na_2CO_3 in water is 9.5
- "Black alkali" soil:- it dissolved OM and salt accumulation at the soil surface.
- Main problem is the effect of sodium on flocculation and aggregation of soil particles.
- Plant cannot grow in sodic soils.

Q:- How do yo redaim salt affected lands?

Ans:- The major aspect to redaim salt affected lands are as below.

① The pratice of crop reversal is necessary to reduced the estiblishment of salt.

② An efficient drainage be provide to lower the water table saline soils.

(b) High salt resistant crops like rice are grown on leached load for 1 or 2 seasons

(c) Load should be flooded with water so that alkaline salts will be dissolved in water.

Q2:- (a):- Explain the procedure of designing of an irrigation canal by Kennedy's theory.

Ans:- Step 1:- Assume the trail value of D and put it in equation $\{Q = AV\}$ and determine

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

Step 2:- As equation (1) is $Q = AV$

Thus $A = Q/V$

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

$$P = B + D\sqrt{2}$$

For assumed D determine B,

Find $R = A/P$

Step 3:- Substitute the value of R in kutter's and chazy's equation to obtain V which will be the actual velocity for assumed d.

Step 4:- if the velocity worked out from Kutter's and Chazy's equations agrees that obtained with the Kennedy's equation d. Then the assumed depth is correct. otherwise repeat the procedure with change the value of D.

(6):- Design an irrigation channel by Kennedy's theory to carry a discharge of 30 cumecs with CVR (m) of 1 and N as 0.0225 and bed slope of 1 in 5000 Assume the depth (D) as 2.3 m

As $A = Q/V = 30/V \rightarrow (1)$

Thus using the formula to compute "V"

$V_0 = 0.546 m D^{0.64}$

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

$\boxed{V_0 = 0.935 \text{ m/s}}$

Put this value in eq (1)

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

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

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

$\boxed{B = 12.77 \text{ m}}$

Put the value

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

$P = 12.77 + 2.3\sqrt{5}$

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

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

Substituting the value of "R" in kutters and chezy equations

$V = C(RS)^{1/2} \rightarrow (2)$

(7)

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

$$C = \frac{\frac{1}{1} + \left(23 + \frac{0.00155}{0.002}\right)}{1 + \left(23 + \frac{0.00155}{0.002}\right)\frac{1}{\sqrt{1.76}}}$$

$$\boxed{C = 49.526}$$

Put the value in (2)

$$V = 49.526(1.76 \times 0.002)^{1/2}$$

$$\boxed{V = 0.93 m/sec}$$

Q3. (a) Differentiate b/w initial regime and final regime in accordance to Lacey's theory?

Ans:- Initial Regime

(1) When only bed slope of channel changes but the cross sections remains same then there will be no silting and scouring.

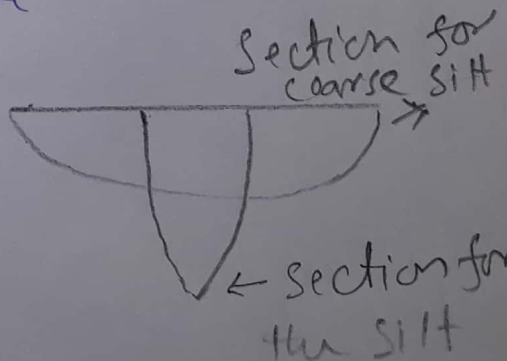
(2) cross section or wetted perimeter remain unaffected

(3) it is a quick process and occurs within short span of time.

Final regime

(1) if all the parameter have equally free to vary and adjust according to discharge and silt grades then the channel is said to have final regime

(2) The cross section assumes semi-ellipse shape.



Q3:- (b)

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

$M = 0.56mm$

Sol:- Silt factor $= f = 1.76 \times M^{0.5}$

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

$f = 1.3$

$$V_m = \left\{ \frac{Qf^2}{140} \right\}^{1/6} \quad f = 1.3$$

$$V_m = \left\{ \frac{30 \times (1.3)^2}{140} \right\}^{1/6} \Rightarrow \boxed{V_m = 0.844}$$

$Q = AV$

$A = Q/V = 30/0.844$

$$\boxed{A = 35.54\ m^2}$$

$P = 4.75\sqrt{Q}$

$P = 4.75\sqrt{30}$

$$\boxed{P = 26.01}$$

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

$$\boxed{R = 1.36}$$

$A = BD + D^2/2$

$35.54 = BD + D^2/2 \rightarrow (1)$

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

$26.01 = B + 2.236D \rightarrow (2)$

$B = 26.01 - 2.236D \leftarrow (2)$

Put eq (2) in (1)

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

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

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

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

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

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

By quadratic eq:

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

$D = 1.52$

put in eq (2)

(11)

$$B = 26.01 - 2.236\,(1.56)$$

$$\boxed{B = 22.611}$$

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

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

$$\boxed{S = 0.00026}$$

Q:- (9):- Explain the component of head works with need diagram.

Ans:- The main components of head works are as following.

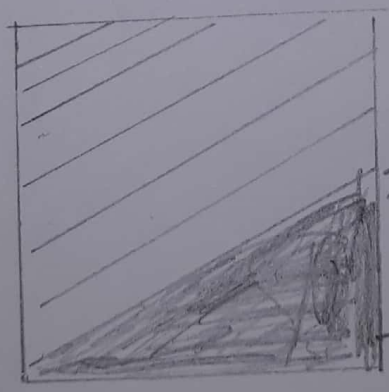
1. Weir or Barrage
2. Under Sluice
3. Divid wall
4. Fish ladder
5. Canal head regulator
6. Site excludes
7. River training works.

(1) Weir and Barrage :- Normally the water level of any perinial river is such that it cannot be divated to the irrigation channel. the bed level of the canal may be high then the existing water level on the top stream side of the weir is required to different level different time, barrage is constructed, are provided on the crest to ~~of~~ rise the water level to same required height

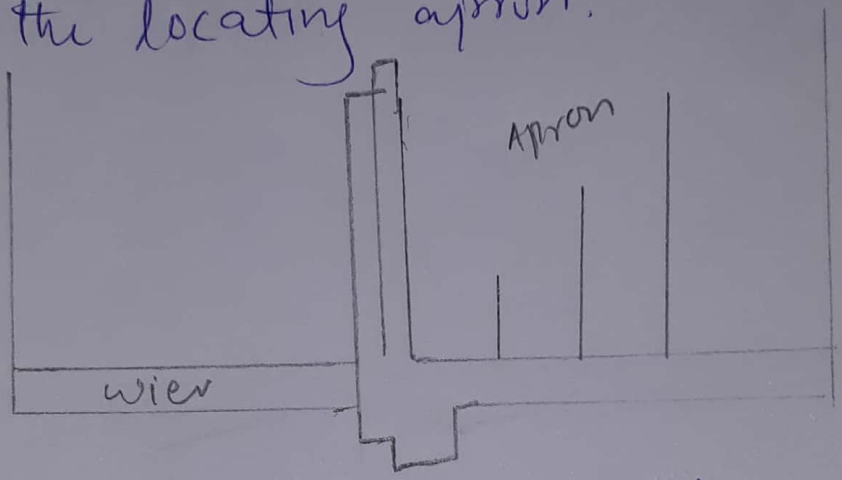
wier.

(2) under sluices :- It is also known as Scouring sluices. The under sluices are the openings provided at the base of the wier or barrage. These openings are provided with adjustable gates

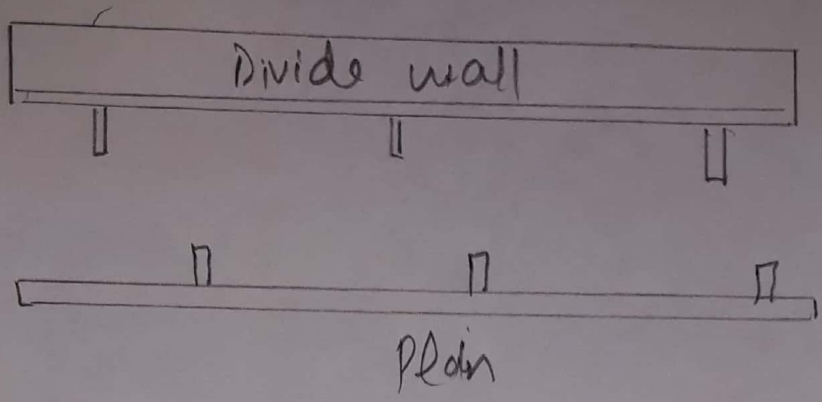
- When the silt deposition becomes appreciable the gates are opened and the deposited silt is loosened with an agitator mounting on a boat. The gates are then closed. But at the period of flood the gates are kept opened.



(3) Divide wall :- The divide wall is a long wall constructed at right angles in the weir or barrage it may be constructed with stone masnory or cement concrete on the upstream side. It is extended up to the locating apron.



(4) Fish ladder :- it is provided just by sides of the divide wall for the free movemut of fisher rivers are important source of fishes the tendency of fish is move from upstream to downstream in winter and from downstream to upstream in moonsoons: In this fish ladder the fabl walls are constructed in zig-zag manner so that that velocity with in the ladder.



(5):- Canal Head regulator :- A structure which is constructed at the head of canal to regulate flow of water is known as canal head regulator the piers consists of number tiers on which the adjustable gates are placed.

(6):-

Ans:- The Major function is to regulate the supply of water entering the canal it controlls the entry of silt in the canal.
it pavements the rivers floods from entring the canal.

End