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Subject Irrigation Engineering

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Q1 Explain anti water - logging measures:

Ans: Following are the anti water logging measures.

1, Lining of canals and water courses.

* Lining of canals Makes the water alingn thingh that Proper channel reducing Major losses to greater extent
* It also reduces seepage of water

2, Introduction to crop rotation:

High water requiring crop should be followed by one requiring less water and then by one requiring almost no water

Ex ; Rice followed by wheat and then by cotton.

3 Reducing intensity of irrigation

Small Portion of land should receive canal water in one Particular season.

The remaining areas of land receive water in next seasons by crop rotation.

④ Optimum use of water:

Paper amount of water gives good results less or More water effects the Yield cultivators should be educated so that there is optimum use of water.

Revenue should be charged on the basis of Quantity of water rether then area of land.

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 Adaption of sprinkler Method of irrigation.

There should be no Percolation losses from water courses.

only determined amount of water is supplied to land.

7 Pumping of tube wells.

lift irrigation should be introduced to use ground water.

* canal irrigation may be substituted by tube well irrigation.

Q1

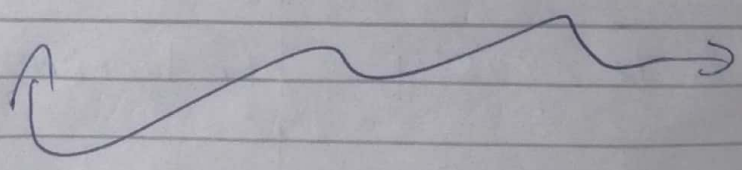
(b) Differentiate between saline and alkaline soils.

| Saline soils | Alkaline soil |
|---|---|
| By Principle of osmosis | . If the salt efforesse |
| Pare water from roots | continues for a longer |
| flow outwards. In a Plant | Period a base exchang |
| die due to lack of water | reaction with clay |
| Such soil is unProductive | take Place thus so durig |
| and is called saline soil | the clay making. it impermeable, |
| * Saline soil appearence | illaverated and highly |
| is a black crusty | Productive, such soil are |
| core over the surface | called alkaline soil |
| of earth. | It is white in appearence as white patches appear over earths surface. |

Q1 How do You reclaim salt affected (C) lands ?

Ans: Following are the major aspect to reclaim salt affected lands:

- The practice of crop reversal is necessary to reduce the establishment of salt or efforescence An efficient drainage (surface and sub surface) Must be provided to lower the water table in saline soils.
- High salt resistant crops like rice are grown on leached land for 1 or 2 seasons.
- Land should be flooded with water so that alkaline salts will be dissolved in water.



Q2 Explain the Procedure of desiging (a) of an irrigation canal by Kennedy theory

Ans: Following are the steps required for designing an irrigation canal using Kennedy's theory.

Step 1:

Assume the trial value of D and Part it is equation ($Q = AV$) and determine $V_0 = 0.546 m D^{0.64}$

Step 2:

As eq (1) is $Q = AV$

Thus $A = Q/V$

$A = BD + D^2/2$

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

For assumed D determine B, Find $R = A/P$

Step 3

Substitute the value of R in Kutters and chazy's equation to obtain v which will be the actual

velocity for assumed dimensions

step 4:

If the velocity worked out from Kutter and Chezy's equation agrees that of obtained with the Kennedy's equation then the assumed depth is correct otherwise repeat the Procedure with changed value of D.

Q 2
(b)
Sol:

$$A = \frac{Q}{V} = \frac{30}{V} \quad - (1)$$

Thus using formula to compute "V"

$$V_0 = 0.546 M D^{0.64}$$

$$V_0 = 0.546 (1) (23)^{0.64}$$

$$\boxed{V_0 = 0.935 \text{ M/S}}$$

Put this value in eq (1)

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

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

$$32.01 = B(23)^2 + \frac{2.3^2}{2}$$

$$\boxed{B = 12.77 M}$$

Put the value in below eq

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

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

$P = 17.9\,m$

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

Substituting the value of R in Kutter and chazy eq $V = C(R \cdot S)^{\frac{1}{2}}$ — (2)

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

$$= \frac{1}{n} + \left(23 + \frac{0.00155}{0.002}\right)$$

$$1 + \left(23 + \frac{0.00155}{S}\right) n/R = 1 + \left(23 + \frac{0.00155}{0.0002}\right) \frac{1}{\sqrt{1.78}}$$

$C = 49.526$

Put the value in eq (2).

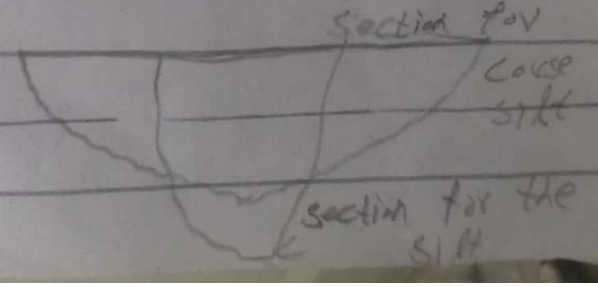
$V = 49.526 (1.78 \times 0.0002)^{\frac{1}{2}}$

$V = 0.93\,m/sec$

Q3

(A) Differentiate between intial regime and final regime in accordance to Lacey's theory

| Antial regime | Final regime |
| --- | --- |
| • when only bed slope of channel change but the cross section remains same then there will be no silting and scouring. • cross section of wetted perimeter remains unaffected | • If all the parameters (Perimeter depth and slope) have equally free to vary and adjust according to discharge and silt grades the channel is said to have Final regime • In Final regime the cross sec assume semi-ellipses shape |



Q3 Part (B)

Given data

$Q = 30\ m^3/sec$

$M = 0.56\ mm$

Sol Silt Factor $f = 1.76 \times M^{0.5}$

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

$f = 1.3$

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

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

$V_m = 0.844$

$Q = AV$

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

$A = 35.54$

$P = 4.75\sqrt{Q}$

$P = 4.75\sqrt{30}$

$P = 26.01$

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

$R = 1.36$

$A = BD + D^2/2$

$35.54 = BD + \frac{D^2}{2}$ — (1)

$P = B + D/5$

$26.01 = B + 2.236D$

$B = 26.01 - 2.236D$ — (2)

Put eq (2) in eq (1)

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

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

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

$35.54 = 26.01D - 1.736D^2$

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

$a = -1.736 \quad b = 26.01 \quad c = -35.54$

by Quadtic eq

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

$$D = 1.52$$

Put in eq (1)

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

$$B = 22.611$$

$$S = \frac{f\ (513)}{3340\ 9\ 1/6}$$

$$S = \frac{(1.3)\ 513}{3340\ (30)}\ 1/6$$

$$S = 0.000026$$

Q4 (A) Explain the component of hard work.

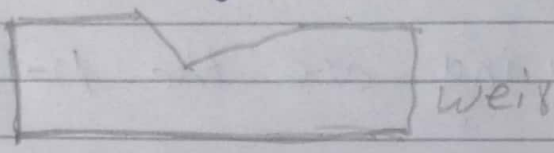
Ans: Following are the main components of hard works.

⇒ weir or Barrage
⇒ under sluice
⇒ Divid wall
⇒ fish ladder
⇒ canal head regulator
⇒ site excludes / site Prevention devices
⇒ River training works.

⇒ weir and Barrage:

Normally the water level of any perinial river is such that it cannot be divcted to the irrigational canal. 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 wated level to

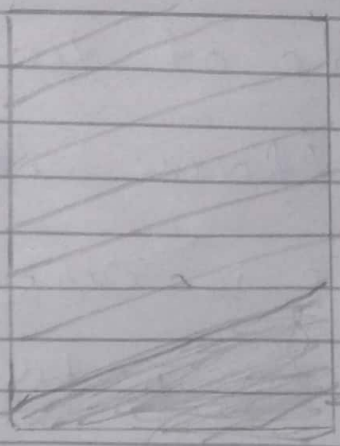
some required height.




② under sluices:

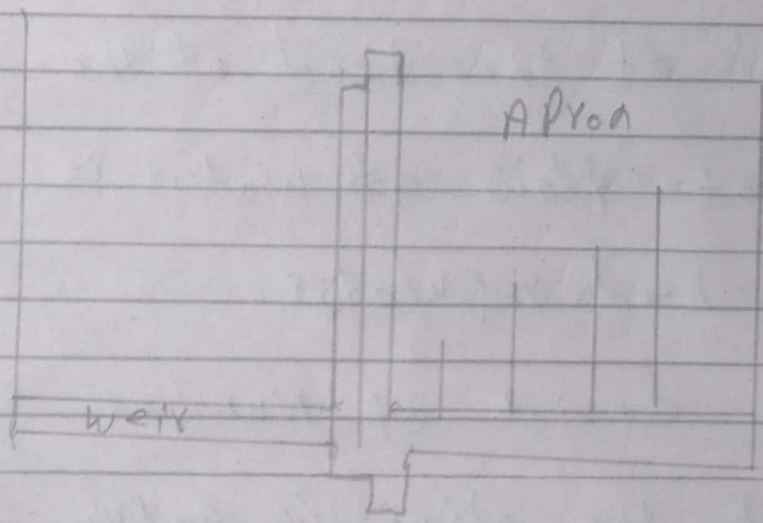
It is also know as scouring sluices. The under sluices are the opening provided at the base of the weir or barrage. These opening are provided with adjustable gates.

when the silt deposition becomes appreciable the gates are opened and the deposited silt is loosened with an agitator moating on a boat. The gates are then closed. but at the period of flood the gates are kept opened:



## 3) Divide wall :-

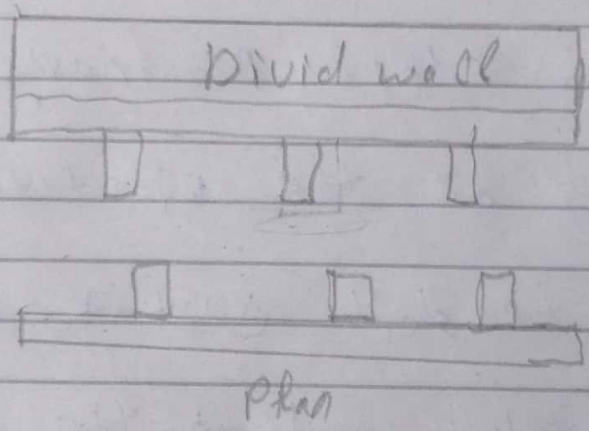
The divide wall is a dog wall constructed at right angles the weir or barrage it may be constructed with stone masonary or cement concrete on the upstream side the wall is extended just to cover the canal head regulator and on the downstream side it is extended up to the lacking apron




## 4) Fish Ladders :-

It is provided just by side of divide wall. for the free movement of fishes Rivers are important source of fishes. The tendency of fish

is to move from up-stream to down stream in winters and from down stream to upstream in monsoons.




Plan

⑤ canal head regulator :-

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

The Piers consist of Number ties on which the adjustble gates are placed.

Q 4

(b) What are the Functions of the head regulator

Ans The major Functions is to regulates the supply of water entering the canal & it controlls the entry of silt in the canal.

=> & it Prevent the river floods from entering the canal.

=> & it regulates / indicate the discharge passed into the canal from design discharge formula.