NAME :- MALIK Muhammad Afnan

ID :- 7839

Section :- "B"

Semester :- "Six"

Department :- Civil Engineering

Subject :- Irrigation Engineering.

Q No 1

a)

Ans:- **Water-Logging Measure:-**

- Quality of water into Soil below is reduced.
- Inflow into underground reservoir is reduced and outflow should be increased.

Method of Control of Water logging:-

1 **Lining of Canal of water Courses:-** It reduce Seepage of water.

2) **Reducing intensity of irrigation:-** • only Small Portion of land Should receive Canal water in one

Particular Season.

- Remaining area Can receive water in next Season by rotation.

Economical Use of water according to Need:-

- only Predetermined amount of water is Supplied to land.
- No percolation losses from water Course.

Improving Natural drainage of Area:-

- water Should not be allowed to stay in one area.
- Natural flow is provided by bush and jungle Cutting

Pumping or Tubwells or Vertical Drainage:-

-Lift irrigation Should be introuced to use GW. Canal irrigation may be Substituted by tube well irrigation.

Optimum Use of Water:-

-Certain amount of water give the best result. Less or more water reduce the yield. Cultivators should be educated So that not to use more water.

QNo 1

(b)

Ans:- Difference between Saline And Alkaline

1 Saline:-

• By Principle of osmosis the pure water from root flow outwards in a plant die due to lack of water
• Such Soil is unproductive and is Called Saline.

Soil Salinity is the Salt Content in the Soil. The process of increasing the Salt Content is Know as Salinization Salt occur naturally within soil occur and water Salination Can be Caused by natural Processes Such as mineral weathering or by the gradual withdrawal of an ocean.

2) Alkaline Soils:-

• if the Salt efforescence Continues of a longer period, a base exchange reaction with Clay takes place, thus exchange reaction with clay take place thus Sodiumizing the Clay, making unproductive.

• Such Soil are Called alkaline Soils.

Soils Structure and a low infiltration Capacity often they have a hard Calcareous layer at 0.5 to 1 meter depth.

QNo1

c)

Ans.- **Reclamation of Salt affected lands:-**

- By maintaining the water table Sufficiently below the roots
- Hence all the measure which are suggested for preventing water logging hold good for preventing Salinity of land.
- An efficient drainage (Surface and Subsurface) must be provided to lower the water table in Saline soils.

Leaching:-

In this Process:

1) Land is flooded with water
2) Alkaline Salts will be

dissolved in water.

3) Percolation to the ground water.

4) Drained by Sub Surface drains.

- High Salt resistant Crops like rice are grown on leached land for 1 or 2 Season
- Then ordinary Crops like wheat or Cotton are grown.

X

Q No 2

a)

Ans:- **Assumption of Kennedy:-**

→ Vertical component of eddies support the silt particles.

→ The silting power of a channel depends upon its velocity, which controls the eddies.

→ The silt transporting power depends upon its depth

→ The silt transporting power of a channel is independent of bed width.

KENNedy Theory:-

• R.G Kennedy studied straight reached of upper Bari Doab Canal which are stable for 30 years

• $V_o = CD^n$

where V_0 is Critical velocity (non-Silting or non-Scouring)
C is Constant depends upon quantity of Silt.
- Sediment is kept in Suspension solely by the vertical Component of eddies.
- Weight of Sediment vertically acts downwards.
- vertical Component of eddies acts upwards.
- Result: the Sediment is in Suspension.

Kennedy Procedure for Canal Design:-

Step 1:-
Assume the trail value of D and putt in Eq (1)

$V_o = 0.546 m D^{0.64}$

Step 2:-

In Eq 1: $Q = AV$

$A = Q/V$

$A = BD + D^2/2$

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

Step 3:-

Substitute the value of R in Eqn 2 (Kutters and Chazys Eqn) to obtain V which will be the actual velocity for assumed dimensions.

Step 4:-

if the velocity worked out from Eqn 2 agrees with that of obtained with Eqn 2 (Kennedeys. other wise repeat the procedure with changed value of D.

QNo2 b)

Ans:-

Given data:-

$Q = 30 m^3/sec$

$C.V.R = m = 1$

$N = 0.0225$

$S = 1/5000$

Trail 1:-

Step 1:-

$V_0 = 0.55 m D^{0.64}$

$V_0 = 0.55 \times 1 (2.4)^{0.64}$

$V_0 = 0.963$

Step 2:-

$Q = AV$

$A = Q/V$

$A = 30/0.963$

$A = 31.153 m^2$

$A = BD + D^2/2$

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

$B = 11.78m$

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

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

$P = 17.146m$

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

$R = 1.82$

Step 8:- (Kutter and Chezy Eq)

$V = C(\sqrt{Rs}$

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

$C = \frac{75.194}{1.513} = C = 49.703$

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

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

$V = 0.948$

which less then $v = 0.963$

Then decrease the depth

$d = 2.3m$

Trail 2:-

This Second trial are directly Calculated value

$D = 2.3\,m$

Step 1:- $V_0 = 0.55 \times 1 \times (2.3)^{0.64}$

$V_0 = 0.937\,m/sec$

Step 2:- $A = Q/V = \frac{30}{0.937}$

$A = 32.017\,m^2$

$A = BD + D^2/2$

$B = 12.77\,m$

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

$P = 17.913\,m$

Step 3:- $C = \frac{75.195}{1.518}$

$C = 49.535$

$R = A/P$

$R = 1.787$

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

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

$V = 0.93\ m/sec$

which equal to the V_0.

X ~~~~~~ = ~~~~~~ X ~~~~~~ = ~~~~~~ X

Q No 3
(a)
Ans.-

Initial Regime :-

• when only bed Slope of Channel 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, depth and slope) have equally free to vary and adjust according to discharge and silt grades then the Channel is said to have final regime.

The Channel is Said to be regime when the following Condition are Satisfied.

1 The Channel is flowing in unlimited in-Coherent alluvium of Same Character (grade).

2 Silt grade and Silt Charge is Constant.

3) Q is Constant.

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 but not in regime.

• He differentiated between initial regime and final regime but this theory is applicable to final regime.

QNo3 b) Ans:-

Given data:-

$Q = 30 m^3/sec$

$m = 0.56 mm$

Sol:.

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

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

$f = 1.3$

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

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

$P = 4.75\sqrt{Q}$.

$P = 4.75\sqrt{30} \Rightarrow \boxed{P = 26.01}$

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

$\boxed{R = 1.36}$

$A = BD + D^2/2$

$35.54 = BD + \frac{D^2}{2} \rightarrow (1)$

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

$26.01 = B + 2.236D$

$B = 26.01 - 2.236 - (2)$

Putting in Eq ② in ①.

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

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

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

$35.54 = 26.01D - 1.736D^2$

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

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

By Quadratic Equation

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

$\boxed{D = 1.52}$ - Put in Eq ②

$B = 26.01 - 2.236(1.52)$

$\boxed{B = 22.611}$

$$S = \frac{P^{(5/2)}}{3340\,Q^{1/6}} = \frac{(1.3)^{(5/2)}}{3340(30)^{1/6}}$$

$$\boxed{S = 0.00026}$$

x ~~~ = ~~~ x ~~~ = ~~~ x

Q No 4
(a)
Ans:-

Components of Head works:-

• Any hydraulic structure which supplies water to the off-taking canal is called a head work. Headwork may be divided into two.

1 **Storage Head work:-**

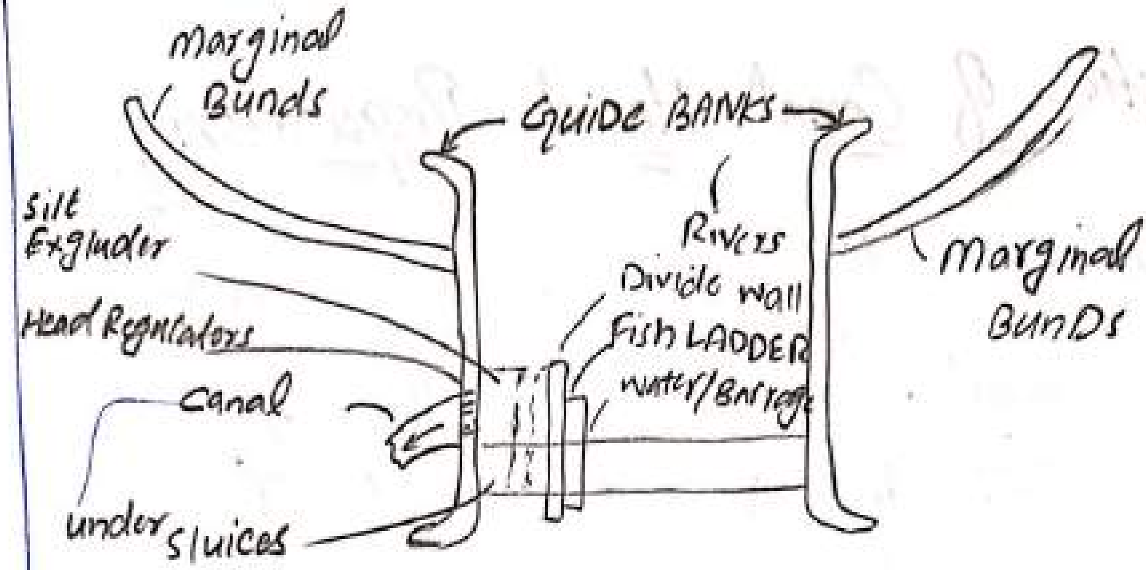
• Dam is constructed across a river valley to from storage reservoir, know as storage head work. water is supplied to the canal from this reservior through canal regulator. These serves for multipurpose function like hydro-electric power generation, flood control, fishry.

2) Diversion Head Works:-

. Weir or barrage is Constructed across a perennial river to raise water level and to divert the water to Cannal, is know as diversion head work.
. Flow of water in the Cannal is Controlled by Canal head regulator.

It raise the water level on its upstream side. It regulates the supply of water into Cannal. It Controls the entry of silt into Cannal. It Creates a small pond (not reservoir) on its upstream and Provide some pondage.

Diagram:-


Marginal Bunds
GUIDE BANKS
Rivers
Marginal BUNDS
Silt Exgluder
Head Regulators
Divide wall
Fish LADDER
Canal
water/Barrage
under sluices

Q No 4 (b)

Ans. **Function of Canal Head Regulator:-** It regulators the supply of water entering the Canal. It Controls the entry the Silt in the Canal. It Prevents the river-floods from entering the Canal.

Silt excluder:-

=> Device to exclude silt from water entering the cannal.

=> Consist of a number of rectangular tunnels

=> The tunnels are of different length

=> The length of the tunnel gradually decrease is the distance of the head regulator.

Canal Head regulator:-

=> A Structure which is Constructed at the head of the Cannal to regulate flow of water is know as Cannal head regulator.

=> The Piers Consist of number tiers on which the adjustable gates are Placed.

Function:- => It regulates the Supply of water entering the Cannal

=> It Controls the entry of silt in the Cannal.

Diagram:-