Final Term Paper

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Section — "A"

Semester — 6th

Subject — Irrigation Engineering

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Q:: 1 Part "a"

Anti water logging measures:-

(i) ⇒ Quantity of water into soil below is reduced.

⇒ Inflow into underground reservior is reduced & out flow should be increased.

① Lining of Canals & water courses:-

It reduces seepage of water.

② Reducing intensity of irrigation:-

⇒ Only small portion of land should recieve canal water in one particular season.

⇒ Remaining areas can recieve 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.

(4) Optimum use of water:-

Certain amount of water gives the best result. Less or more water reduced the yield. Revenue should be charged on the basis of quantity of water rather then the area of Land.

(5) Improving natural drainge of area:-

⇒ Water should not be allowed to stay in one area.

⇒ Natural flow is provided by bush and Jungle cutting.

(6) Pumping or tube well or vertical Drainage:-

Lift irrigation should be introduced to use GW.

Canal irrigation may be substituted by tube well irrigation.

(7) Economical use of water according to need.

(8) Adoption of Sprinkler method of irrigation.

⇒ only predetermined amount of water is supplied to land.

⇒ No percolation losses from water courses.

Q:1| Part "b"

Saline Soil	Alkaline Soil.
⇒ Saline Soils are the Soil That have a PH in b/w 7 & 8.5 and an exchangeable Sodium percentage 15%	⇒ Alkaline Soil are the Soil that have a PH greater then 8.5 and an exchangeable Sodium percentage greater then 15%.
⇒ PH value is less then 8.5	⇒ PH value is greater then 8.5
⇒ Electrical Conductivity is 4 or more mm hos/cm	⇒ Electrical Conductivity usually less then 4mmhos/cm
⇒ Saline Soil are white or light gray in Colour.	⇒ Alkaline Soil is Black in Colure.
⇒ Organic matter content is high.	⇒ Organic matter Content is low.

Q:11 Part 'C'

Reclaimation of Salt affected Land.

How to avoid efforescence?

⇒ By maintaining the water table sufficiently below the roots.

⇒ Hence alle the measure which were suggested for preventing water logging hold good for Preventing Salinity of Lands.

Leaching:-

In leaching process

1) Land is flooded with water.

2) Alkaline Salt 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 seasen.

→ Then ordinary crops like wheat or cotton are grown.

→ Then the land is said to have reclaimed.

→ Sodium Sulphate is formed which is leached out easily.

$$Na_2CO_3 + CaSO_4 \longrightarrow Na_2SO_4 + CaCO_3.$$

Surface Drainage :-

⇒ Removal of excess of water using open ditches, feild drains, land grading etc.

⇒ open drains ~~carry run off to~~ which remove excess of irrigation and storm water are ~~dug~~ broad and shallow are called Shallow Surface drain.

Land Grading :-

⇒ It is a continous land slop toward feild drains.

⇒ It is necessary for Surface Irrigation.

Q: No 2: Part "a"

KENNEDY'S Theory:-

⇒ RG Kennedy studied straight reaches of upper Bari Doab Canal which are ~~suitable~~ stable for 30 years.

$$\Rightarrow V_0 = CD^n$$

where V_0 is critical velocity and C is constant depends upon quantity of silt

Kennedy Procedure for Canal Design:

Step # 01:-

Assume the trial value of D and put in Equation and Determine.

$$Eqn \Rightarrow V_0 = 0.54\, m\, D^{0.64}$$

~~Step~~ **Step # 2:-**

In Eqn 1: $Q = AV$

$$A = Q/V$$

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

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

For assumed D determine B

Find $R = A/P$

Step # 03:

Substitute the value of R in eqn 2 (Kuttar & Chezzys Eqn) to obtain V which will be the actual velocity for assumed dimensions.

Chezys Equation = $V = C(RS)^{1/2}$

Step # 4:-

If the velocity worked out from Eqn. 2 agrees with that of obtained with Eqn 3 (Kennedy Equ:). Then the assumed depth is correct. Other wise repeat the procedure with charged value of D.

Q:2 part 'B':-

Given data:-

Discharge (Q) = 30 m^3/sec

C_{V_r} (m) = 1

N = 0.0225

Bed slop = 1 in 5000

Depth (d) = 2.3 m.

Solution:-

Finding velocity,

we know that

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

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

$V_K = 0.930m$

Now area of Canal

$Q = AV \Rightarrow A = Q/V$

$A = 30/930$

Area = 32.25 m^2

①

Now Calculate B

$$A = BD + \frac{D^2}{2} \Rightarrow BD + 0.5D^2$$

Put values

$$A = BD + 0.5D^2$$

$$32.25 = B(2.3) + 0.5(2.3)^2$$

$$32.25 - 2.645 = 2.3B$$

$$\boxed{B = 12.87\ m}$$

Now wetted Perimetter.

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

$$= 12.87 + \sqrt{5}(2.3) = \boxed{P = 18.01\ m}$$

Now Hydraulic Radius:

$$R = A/P = 32.25/18.01$$

$$\boxed{R = 1.79\ m}$$

Now mean velocity from chezy eqn

$$V_c = C(RS)^{1/2}$$

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where

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

$$C = \frac{\frac{1}{0.0225} + \left(23 + \frac{0.00155}{(1/5000)}\right)}{1 + \left(23 + \frac{0.00155}{1/5000}\right) \times \left(\frac{0.0225}{\sqrt{1.79}}\right)}$$

$$C = \frac{75.19}{1.517} = 49.56$$

$$\Rightarrow V_c = 49.56\left(1.79\left(1/5000\right)\right)^{1/2}$$

$$\boxed{V_c = 0.93 m}$$

Q:3 Part "a"

Lacey'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 acually be not in regime.

⇒ He differentiated between initial regime & final regime.

⇒ Initial Regime :-

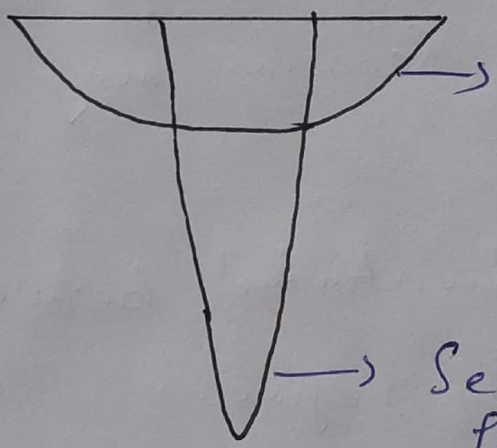
when only bed slop of channel charge but the Cross section remain Same then also no Silting or Scouring take place. But this is rare.

⇒ Final Regime :-

- If all the parameter (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.



Q 31 Part B :-

Given data :-

$Q = 30\ m^3/sec$

$n = 0.56\ mm$

Solution :-

SIH Factor $= f = 1.76 \times n^{0.5}$

$f = 1.3$

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

$$\boxed{V_m = 0.844}$$

$Q = AV \Rightarrow A = Q/V$

$$A = \frac{30}{0.85} \Rightarrow \boxed{A = 35.29\ m^2}$$

Now

$$P = 4.75\sqrt{Q}$$

$$= 4.71\sqrt{30} \Rightarrow \boxed{P = 26.01}$$

Now we have to find "S"

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

$$S = \frac{(1.32)^{5/3}}{3340 \times (30)^{1/6}}$$

$$\boxed{S = 0.000269}$$

Calculations:-

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

$$35.29 = BD + \frac{D^2}{2} \quad \text{——} (1)$$

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

$$26.01 = B + 2.236D$$

$$B = 26.01 - 2.236D \quad \text{——} (2)$$

Put (2) in (1)

$$35.29 = (26.01 - 2.236D)\, D + \frac{D^2}{2}$$

$$35.29 = 26.01D - 2.236D^2 + \frac{D^2}{2}$$

$$35.29 = 26.01D - 2.236D^2 + 0.5D^2$$

8)

$$35.29 = 26.01D - 1.736D^2$$

$$\underbrace{-1.736D^2}_{a} + \underbrace{26.01D}_{b} - \underbrace{35.29}_{c} = 0$$

By Quadratic formula

$$a = -1.736 \;,\; b = 26.01 \;,\; c = -35.29$$

$$D = \frac{-(26.01) + \sqrt{(26.01)^2 - 4(-1.736)(-35.29)}}{2(-1.736)}$$

$$\boxed{D = 1.51\,m}$$

Put in Eqn (2)

$$B = 26.01 - 2.236(1.51)$$

So

$$\boxed{B = 29.63\,m}$$

Q:- 4 Part 'A'

Head work :-

Any hydraulic structure which supplies water to the off-taking canal is called a head work.

Head work may be divided into two categories.

(1) Storage head work :-

Dam is constructed across a river valley to form storage reservoir known as storage head work.

2) Diversion Head work :-

Weir or barrage is constructed accross a Perennial river to raise water level and divert the water ~~level~~ to canal.

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Component of Head work :-

⇒ Weir or barrage

Normally the water level of any Parannial 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 In such case weir is constructed.

when the water level on the up Stream Side of the weir is required to be raised to different level at diffrent time then 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.

⇒ Divide wall :-

The divide wall is a long wall constructed at the right angles in the weir or barrage, It may be constructed with Stone masonary or Cement Concrete.

⇒ Fish ladder :-

The Fish ladder is provided just by the side of the divide wall for the free movement of fishes. because rivers are important Sources of Fishes.

⇒ Canal Head regulator :-

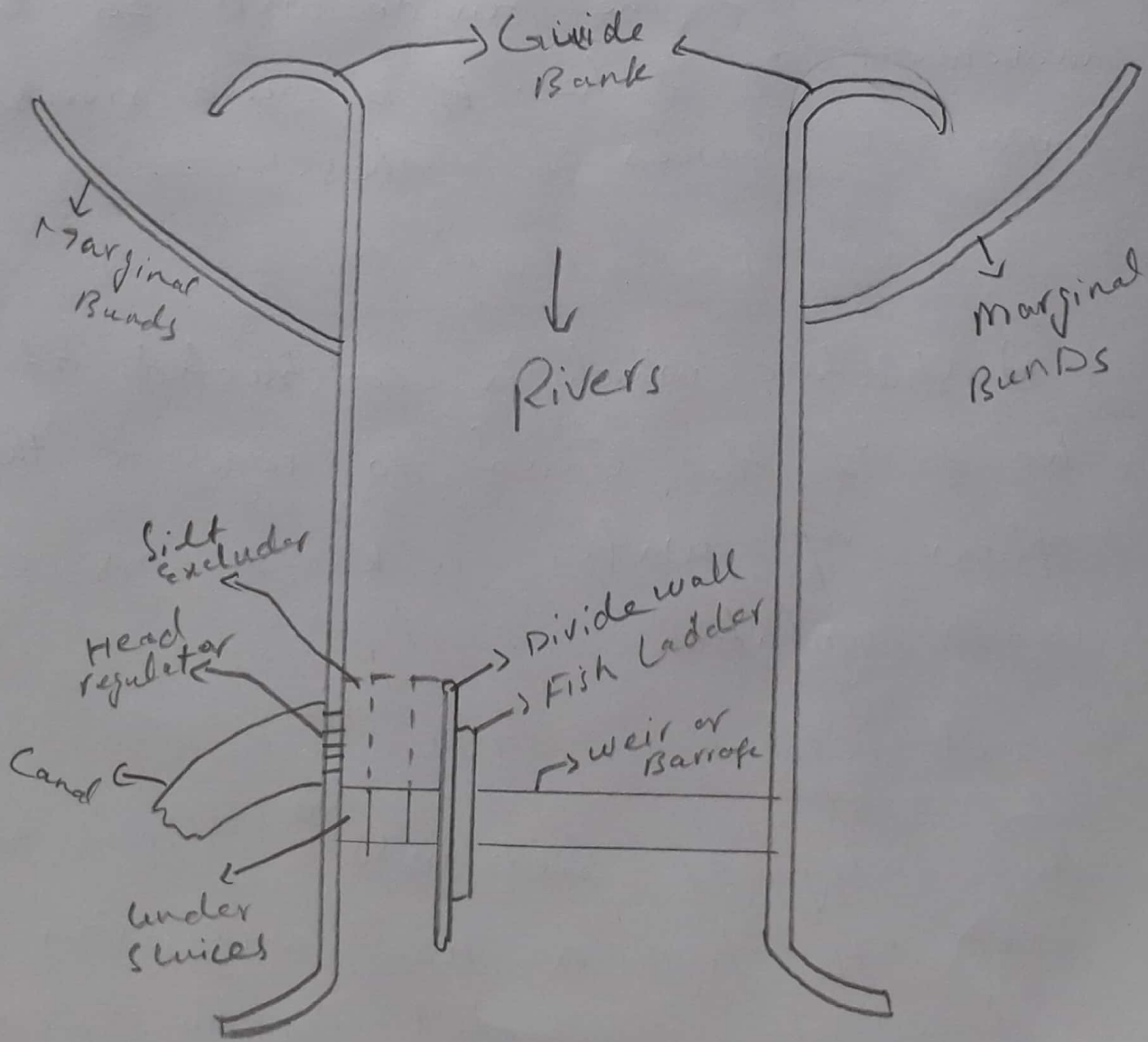
A structure which is constructed at the head of the Canal to regulate the flow of water is known as Canal Head regulator.

⇒ Silt regulation works :-

The entry of Silt into a Canal, which take off from a head works, Can be reduced by Constructed Certain Special works, called Silt control works.

⇒ River training works :-

River training works are required near the weir site in order to ensure a smooth and an axial flow of water and thus to prevent the river from out flanking the work due to a change in its course.



Q: 4 Part B :.

Function of Canal Head regulater:.

⇒ Function of Canal Head regulater are to regulate the Supplies into the Canal.

⇒ Indicate the discharge passed into Canal from design discharge formula. and observed Head of water on the Crest.

⇒ It Control the entry of Silt in the Canal.

⇒ It Prevent the river-floods from entering the Canal.

⇒ It Should be closed otherwise high Silt Quantity will leave to Canal.

End