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Section	A
Subject	Irregation Engineering.
Semester	6th

AM 101

Methods of Control of water logging.

1) Lining of Cannal & water Courses

It reduce Seepage of water

2) Reducing Intensity of Irregation

Only Small portion of land should recieve Canal water in one particular season. Remaining area Can recieve water in next season by rotation.

3) By Introducing Crop rotation

High water require Crop should be followed by one requiring less water, & then by one require almost no water

Examples: 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 use more water

5) Improving natural drainage of Area.

Water should not be allowed to stay in one area

- Natural flow is provided by bush & jungle cutting.

6) Pumping of Tubewells or Vertical drainage

Lift Irregation should be introduced to use GW. Cannal Irregation may be substituted by tube well Irregation.

7) Economical use of water according to use

8) Adoption of sprinkler method of Irregation

- Only Predetermined amount of water is supplied to land

- No percolation losses from water Courses.

1B Difference b/w Saline & Alkaline Soils.

Saline Soil	Alkaline Soil
1) Saline Soil are the Soils that have a PH in b/w 7 & 8.5 an enchangable Sodium Percentage below 15%.	1) Alkaline Soils are the Soils have a PH greater then 8.5 & an exchangable Sodium Percentage greater then 51%.
2) PH less then 8.5	2) PH greater then 8.5
3) Sodium percentage less then 15%.	3) Sodium percentage greater then 15%.
4) Electric Conductivity is 4 or more mmhos/cm	4) Usually less then 4 mmhos/cm
5) Organic matter content is high in Saline Soil	5) Organic matter content is low in alkaline Soil.
6) Saline Soil are white or light gray in Colour	6) Alkaline Soil are black in Colour.

Salt affected lands can be reclaimed by the following two methods.

1) Avoiding Efflorescences:-

- By mainting the water table Sufficiently below the roots
- Hence all the measures which were Suggested for preventing water logging hold good for preventing Salinity of lands
- An efficient drainage must be provided to lower the water table in Saline Soils

2) Leaching Process:-

In this process

1) Land is flooded with water.
2) Alkaline Salts will be dissolve in water
3) Percolation to the ground water
4) Drainage by Sob Surface drains

- High Salt resistant crop like rice are grown on leached land for one or two

Then ordinary crops like wheat or cotton are grown.

- Then the land is said to have reclaimed.
- When Sodium Carbonate is present in soil gypsum is added before leaching.
- Sodium Sulphate is formed which is leached out easily.

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

$P = 5 + 1 = 6$

Ans 2(A)

. The equation choosen by Kennedy are

1) $Q = AV$

2) $V = C(RS)^{1/2}$ -- Chazy's equation

$$\frac{1}{n} + \left(23 + \frac{0.00155}{S}\right) \qquad 41.65 + \frac{0.00281}{S} + \frac{1.811}{n}$$

$$C = \frac{}{1 + \left(23 + \frac{0.00155}{S}\right)\frac{n}{\sqrt{R}}} \qquad C = \frac{}{1 + \frac{n}{\sqrt{R}}(41.65) + \frac{0.00281}{S}}$$

MKS system FPS system

3) $V_0 = 0.54 m D^{0.64}$ MKS system

Following Data should be known

1) Design Discharge (Q)

2) Slope (S)

3) Rugosity coefficient (n)

4) $C.V.R = m = V/V_0$

$P = 6+1 = (7)$.

Kennedy Procedure for Canal Design

Step#1

Assume the trial value of D & put in equ 1 & determine

$$V_0 = 0.54 m D^{0.64}$$

Step#2

In equ 1 $Q = AV$

$$A = Q/V$$

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

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

For assume D determine B

Find $R = A/P$

Step#3

Substitute the value of R in equ 2 to obtain V which will be actual velocity for assume dimensions

Step#4

If the velocity work out from equ (2) agrees with that of obtain with equ (3) Then the assume depth is correct. otherwise repeat the procedure with changed value of D.

P=10

where

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

$$\Rightarrow \frac{\frac{1}{0.0225} + \left(23 + \frac{0.00155}{1/5000}\right)}{1 + \left(23 + \frac{0.00155}{(1/5000)}\right) \times \left(\frac{0.0255}{\sqrt{1.79}}\right)}$$

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

$C = 49.56$ put this value in eqn (1)

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

$V_c = 0.93$ m/sec

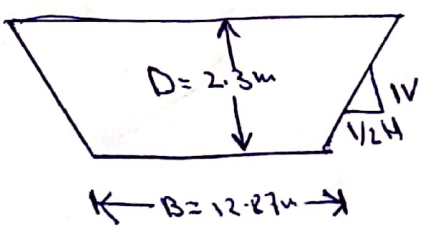
As $V_{kennedy}$ (0.93 m/sec) = V_{chazy} (0.93 m/sec)

So the depth $D = 2.3$ m is OK

& Design is OK

Result

Full Supply depth = D = 2.3 m
Bed width = B = 12.87 m
Sides slopes = 1/2 : 1
Bed Slope = 1/5000



P = 9

Now we have to Calculate B. By using formula

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

by putting values

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

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

$$32.25 - 2.645 = 2.3(B)$$

$$B = 12.87m$$

⇒ Now we have to Calculate Wetted Perimeter

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

$$P = 12.87 + 5\sqrt{2.3}$$

$$P = 18.01m$$

⇒ Now we have to Calculate hydraulic Radius

$$R = A/P$$

$$= 32.25/18.01 \Rightarrow R = 1.79m$$

⇒ Now Calculate mean velocity from cheezy equation

$$V_c = C(RS)^{1/2} \quad — (1)$$

Given Data

Discharge $Q = 30 m^3/sec$

C.V.V (m) = 1

N = 0.0225

Bed slope = 1 in 5000

Depth $d = 2.3m$

Solution:-

Finding Velocity

By formula

$V_K = 0.546 m D^{0.64}$

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

$V_K = 0.930 m/sec$

Now Calculating area of canal

By formula

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

$A = 30/0.930$

$A = 32.25 m^2$

Ans 3A

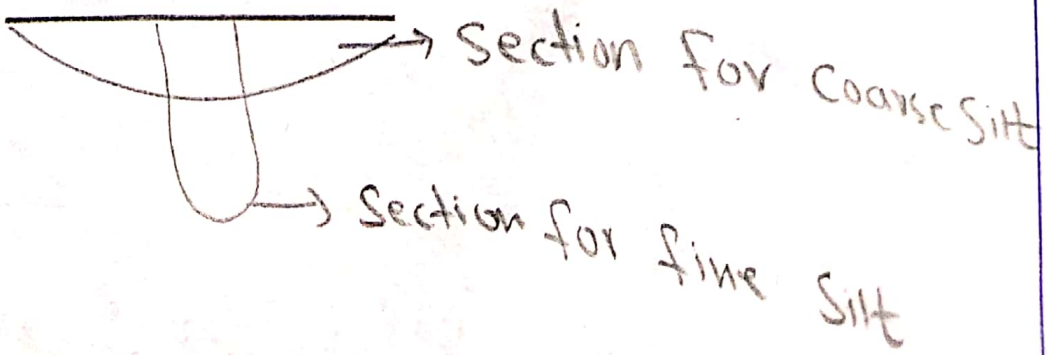
Initial Regime :-

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 perimeters (perimeter, depth & slope) have equally free to vary & adjust according to discharge & silt grades then the channel is said to have final regime.

In final regime the cross section assume semi ellipse shape



Coarser the silt flatter the ellipse.

The channel is said to be regime when the following conditions are satisfied.

1) The channel is flowing in Ultimated, in coherent alluvium of same character

2) Silt grade & silt charge is constant

3) Q is constant.

3B Given Data

$Q = 30\ m^3/sec$

$M = 0.56\ mm$

Solution:-

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

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

$\boxed{f = 1.3}$

~~$V_m = 0.844$~~

$V_m = \left[\frac{Qf}{140}\right]^{1/6} \Rightarrow \left[\frac{30 \times 1.3}{140}\right]^{1/6}$

$\boxed{V_m = 0.844\ m/sec}$

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

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

$P = 4.75\sqrt{Q}$

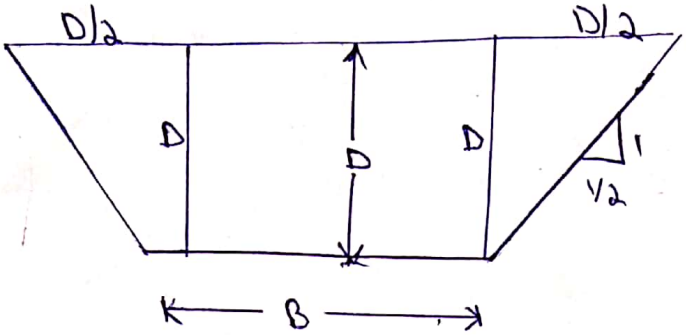
$P = 4.75\sqrt{30}$

$P = 26.01\ m$

$R = \frac{5}{2} \times \frac{V^2}{f} = \frac{5}{2} \times \frac{(0.844)^2}{1.3} \Rightarrow \boxed{R = 1.36\ m}$

P=12

For Trapezoid Section



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

$$35.54 = BD + \frac{D^2}{2} \quad \text{— (1)}$$

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

$$26.01 = B + 2.236D$$

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

put eqn (2) in (1)

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

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

$$35.54 = 26.01D - 1.736D$$

~~35.54 =~~

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

P=13

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

By Quadratic equation

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

$$\boxed{D = 1.52 \text{ m}}$$ Put in eqn (2)

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

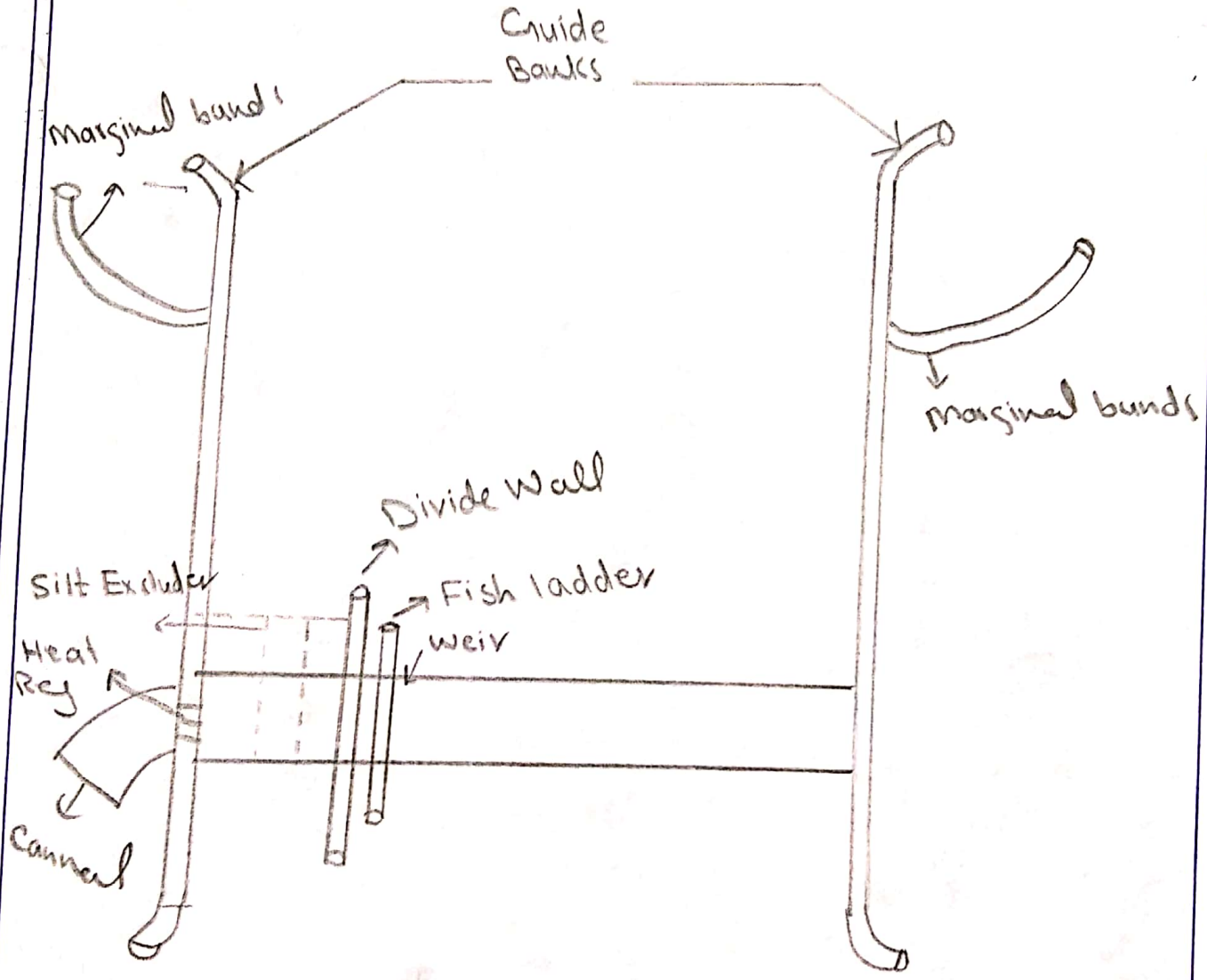
$$\boxed{B = 22.611 \text{ m}}$$

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

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

$$\boxed{S = 0.00026}$$

4 (A)



Ans 4A

Head Works:-

Any hydraulic structure which supplies water to the off taking Cannal is Called a headwork

Headwork may divided into two

i) Storage headwork
ii) Diversion headwork

Components of headwork

⇒ Weir or Barrage

Weir is a structure Constructed across river to raise the water level & divert the water into the Cannal. weir alligned at right angle to the direction flow Shutters are provided at the Crest of the weir so that part of raising upto water is Carried out by shutter.

Divide Wall

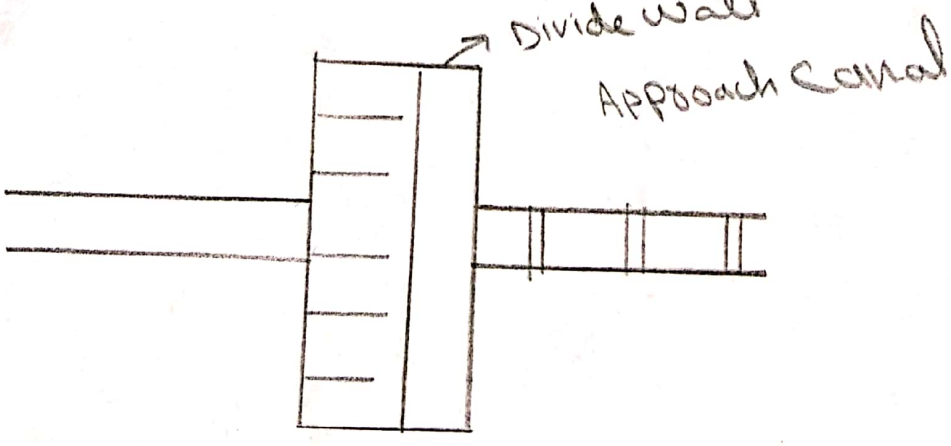
long wall Constructed at right angle in the weir or barrage with stone masonary or Cement Concrete.

⇒ On the upstream side, the wall is extended just to cover the canal head regulator & on the down stream side it is extended up to the launching apron.

Function

From a still water pocket in front of the canal head in which helps in settling of silt.

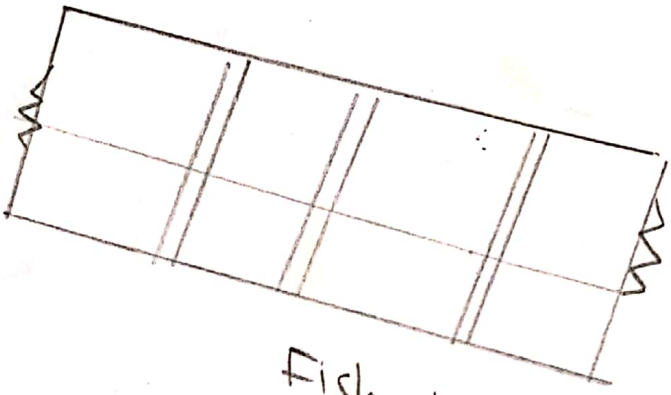
- Controls the eddy current or cross current in front of canal head.
- provide straight approach in front of the canal head



Fish ladder

Consist of an inclined channel with a slope not exceeding 1 in 10

The Compartment of bays of fish ladder should be sufficient large so that the fish do not collide with sides of the bay when ascending.



Fish ladder

Silt exclude:-

- Device to exclude silt from water entering the Canal
- Consist of numbers of rectangular tunnels which are of different length.
- The length of tunnels gradually decrease as the distance of the head regulator.

Canal Head Regulator:-

A structure which is constructed at the head of the canal to regulate

flow of water is called Canal head regulator

The Piers Consist of numbers tiers on which the adjustable gates are placed

Function

- It regulate the supply of water entering the Canal
- It Control the entry of silt in the Canal

(46) ## Function of Head Regulator:-

⇒ It regulate the supply of water entering the Canal

⇒ It Control the entry of Silt from entering the Canal.

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

⇒ To Indicate the discharge from design discharge formula & observed head of water on the crest.