FINAL EXAMINATION

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ID : 7812

SECTION : A

SUBJECT : IRRIGATION ENGINEERING

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QNO: 01

Part : a

Anti Water - Logging measures

Following are the anti water measures.

1 - Linning of Canals & Water Course :

Linning of Canal with imperious material e.g: Concrete, polythene etc so it to Control excessive Seepage from unlined Canal

2 - Reducing intensity of irrigation :

A Small portion of Land Should be received Cannal water in one proper Season Remaining area Can be recieved water in the next Season by Rotation.

3 - Optimum use of water :

Cultivator / Farmer Should be educated So that to use Less water

4. Improving Natural drainage of area :

Water Should not allow to Stay in one area.

P-T-O →

5- Pumping or Tubewells or Vertical Drainage:

Water Logging Can be Controlle by Lift irrigation Cannal irrigation Substitued by tube-well irrigation.

6- Adoption of Sprinkler Method of irrigation:

Water Logging Can also be Controlled by Adoption of Sprinkler Method of irrigation

Q1 Part : b : Differentiate b/w Saline and alkaline Soils:

The main difference between Saline alkaline Soils is That Saline Soils have a PH Less than 8.5 and an exchangeable Sodium percentage Less Than 15, while alkaline Soils have a pH greater Than 8.5 and an exchangable Sodium percentage higher Than 15

Meanwhile neutral Soil have PH7.

→ Colour of The Saline is white or Light gray while The Colour alkaline Soil is mostly black Colour. Organic Contents in Saline Soil is high while alkaline is Low.

P-T-O →

Q:1

Part : C Reclaim Salt affected Lands

→ There are different Salts which are Soluble in water like Sodium Chloriade (NaCl) Sodium Sulphate (Na_2SO_4) and Na_2CO_3.

→ When water table rises up or roots are in Capillary zone The ground water, moves upward and Salts are deposited in root Zone and Surface of Soil and it Can be look a Thin Crust on The Surface after evaporation of Water and it affects The Soil badly.

→ The Land is Said to have reclaimed when Sodium Carbonate is present in The Soil, gypsum is added before leaching

→ Sodium Sulphate is Formed which is leached out easily

P-T-O →

Q.No: 02 :

Part: a :

Following are some steps procedure for designing.

Step: 01 : $Q = AV \longrightarrow (1)$

Assumption the trial value of D and put in eq (1)

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

Step: 02 From equation (1)

$$A = Q/V$$

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

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

For assumed D determine B

Find $R = A/P$

Step: 03 Substitute the value of R in eq 2 (kutters and Chazys Eqn) to obtain v which will be the actual velocity for assumed dimension

P-T-O→

Step : 04 : If the velocity worked out from Eqn. 2 agrees with That of Obtained with The Eqn. 3 (Kennedys Eqn) Then The assumed depth is Correct. otherwise Repeat the procedure with Changed value of D.

Q : 02

Part : b

Given that :

Discharge = 30 cumecs

$m = 1$

Slope = $S = 1/5000$

Assume : Depth = $D = 2.3m$

Kutter's Rugosity Coefficient = $N = 0.0225$

Critical velocity Ratio $m = 1$

Assume : Side Slope = $Z = 1/2$

Solution : $V_K = 0.55mD^{0.64}$ V_K = velocity

$V_K = 0.55 \times 1 \times (2.3)^{0.64}$ => $V_K = 0.94m$

Area = A $Q/V_K = \frac{30}{0.94}$ => $A = 31.91m^2$

P-T-O →

Calculate B,

$A = BD + 0.5D^2$

For $2 = \frac{1}{2} = 0.5$

$31.91 = (B + (2.3)) + 0.5(2.3)^2$

$31.91 = 2.3B + 2.64$

$2.3B = 31.91 - 2.64$

$B = \frac{29.27}{2.3} \Rightarrow \boxed{B = 12.72m}$

Wetted Perimeter & Hydraulic mean depth

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

$P = 12.72 + \sqrt{5}(2.3)$

$\boxed{P = 17.86m}$

$R = A/P = \frac{31.91}{17.86} = 1.78m$

$\boxed{R = 1.78m}$

V_c = Rugosity Coefficient

$$V_c = \frac{23 + 1/N + \frac{0.00155}{S}}{1 + \left(23 + \frac{0.00155}{S}\right)\frac{N}{\sqrt{R}}}\sqrt{RS}$$

P-T-O →

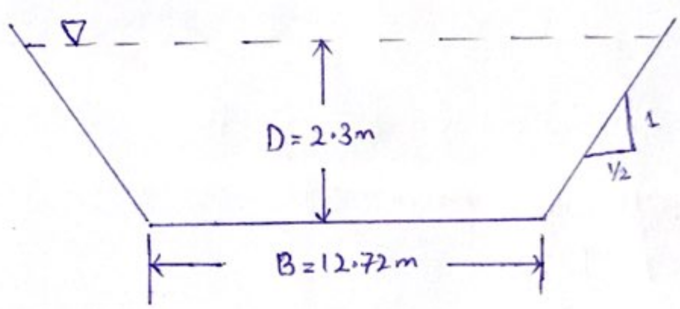
$$V_c = \frac{23 + \frac{1}{0.0225} + \frac{0.00155}{1/5000}}{1 + \left(23 + \frac{0.00155}{1/5000}\right)\frac{0.0225}{\sqrt{1.78}}} \left(\sqrt{1.78 \times 1/5000}\right.$$

$$V_c = \frac{23 + 44.44 + 7.75}{1 + (23 + 7.75)\,0.0168}(0.000264) = \frac{75.19}{1.51}(0.00026$$

$$\boxed{V_c = 0.14 m}$$

$$\boxed{\begin{array}{l} B = 12.72 m \\ D = 2.3 m \end{array}}$$

Q No. 03



Q No: 03

Part: a :-

Lacey's Theory differentiated between Initial Regime and final Regime but This Theory is applicable to final Regime

Initial Regime:

→ When only bed Slope of Channel Changes but The Cross Section Remains Same Then also no Silting or Scouring Take place too. But This in Rare Cases.

→ The Shape of The Regime Channel is Semi elliptical for Course Silt and Semi Circle for Fine Silt.

Final Regime: When a Channel is Constructed (with defective Slope) It tries to Throw off The Incoherent Silt on the bed to insure increase Their Slops and attain Longitudinal Slope.

→ The Channel after attaining its Section and Longitudnal slope, will be Said to be in Final Regime

P-T-O →

Q:03

Part : b :-

Given data :

Discharge = 30 Cumecs

dmm = mean diameter of silt particles

= 0.56mm

Solution:

By Lacey's Theory

$f = 1.76 \times \sqrt{d_{mm}}$ ($\Rightarrow f \Rightarrow$ Silt Factor)

$f = 1.76 \times \sqrt{0.56}$ = $f = 1.317$

$V = \left(\frac{Qf^2}{140}\right)^{1/6}$ By putting the values

$V = \left(\frac{30 \times (1.317)^2}{140}\right)^{1/6} \Longrightarrow V = (0.372)^{1/6}$

$V = 0.848$ m/sec

$A = Q/V \Rightarrow A = \frac{30}{0.848}$

$A = 35.377 m^2$

$P = 4.75\sqrt{Q}$ (Formula)

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

P-T-O →

Q,3 part b Continue

$$D = \frac{P - \sqrt{P^2 - 6.944A}}{3.742}$$

by putting values

$$D = \frac{26.01 - \sqrt{(26.01)^2 - 6.944(37.04)}}{3.742}$$

$$D = \frac{26.01 - \sqrt{676.52 - 257.20}}{3.742}$$

$$D = \frac{26.01 - \sqrt{419.32}}{3.742}$$

$$D = \frac{26.01 - 20.477}{3.742} \Rightarrow \frac{5.533}{3.742}$$

$$\boxed{D = 1.478m}$$

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

$$B = 26.01 - \sqrt{5} \times 1.478$$

$$\boxed{B = 22.70m}$$

$$R = \frac{5}{2} \frac{V}{f} \Rightarrow R = \frac{5}{2}\left(\frac{0.848}{1.317}\right)$$

$$\boxed{R = 1.609m}$$

P-T-O →

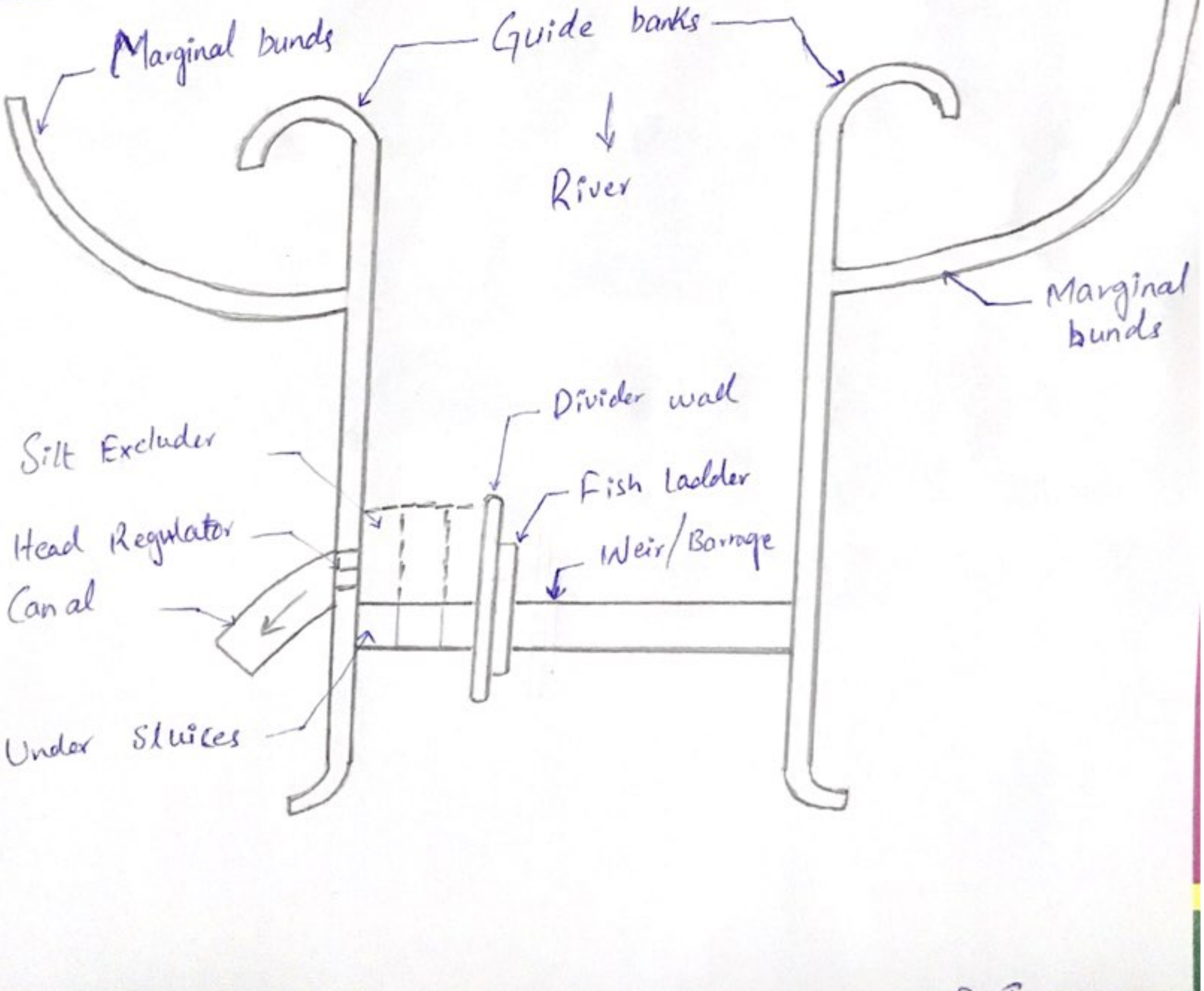
$$S = \frac{f^{5/3}}{3340\,Q^{1/6}}$$ — (Formula)

by putting values

$$S = \frac{(1.317)^{5/3}}{3340\,(30)^{1/6}} = \frac{1.58}{5886.19}$$

$$\boxed{S = 0.000268}$$ Ans

QNO: 04 **Part: a** Diagrams of Headworks with components



Q No : 04

Part : a :- Components of headwork :

1- Weir :
It is a wall/Dam type which is Constructed across a River or Stream which is used to Raise The Level of water flows over The top of weir.

2 - Barrage : It is the type of low head, diversion damm which Consist of a number of Large gates that Can be open or Closed to Control The amount of Water

3- Fish Ladder : It is a small elevated Steps/wall with water Releases to enable fish to migrate/move in The upper Stream or down Stream

4 Divide Wall : It is a Long wall Constructed at Rightangles a in The weir or barrage On The upstream Side The wall is extended to Cover The Cannal head Regulato

5 Silt excluder : It Consist of a number of Rectangula tunnels Running parallel to The head Regulator and terminating near the under Sluiced weir.

(6) - Under Sluices: They are the openings provided at the base of the weir or barrage It is kept at a lower Level of the weir.

(7) - Guide Banks: It is define the site of barrages, weir etc to guide the river flow through the Confined water way without Causing damage to the Structure and it's approches.

→ Q NO: 04
Part: b

Function of Head Regulators:

→ It regulates the Supply of water entering the Canal.

→ It prevents the river floods from entering the Cannal

→ The entry of Silt into the Canal is Controlled

→ Silt gets deposited in the pocket, and only the Clear water enters the regulator bays

- To serve as a meter for measuring discharge of water
- Consists of a number of piers which divide the total width of the canal into a number of spans which are known as bays.

: THE END :