Final Examination

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Section: A

Subject: Irrigation Engineering

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Question No 1 Part "A"

(1)

a) Explain Anti water-logging measures:

Answer:-

1. Lining of canals and water courses:
   It reduces seepage of water.

2. Reducing Intensity of irrigation.
   - Only small Portion of land should receive canal water in one Particular reason.
   - Remaining areas can receive 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.

   Example: Rice followed by wheat and 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.

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Revenue should be charged on the basis of quantity of water rather than the 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. **Pumping or Tubewells or Vertical Drainage.**
   Lift irrigation should be introduced to use G.W. Canal irrigation may be substituted by the tube well irrigation.
7. **Economical use of water according to need.**
8. **Addoption of Sprikler Method of irrigation.**
   - Only Predetermined amount of water is supplied to land.
   - No percolation losses from water courses.

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Question No 1 Part (b)

Differentiate between saline and Alkaline soil?

	Saline	Alkaline
1-	Saline soil contain high content of soluble salts.	1- Alkaline soil are clay soil.
2	They have less PH	2- They have high PH.
3-	It is basic in nature	3 They are more basic.
4-	It's PH is 7-8.5	4- PH greater than 8.5
5-	Dominating compound is sodium salts	5 Dominating compound is sodium carbonate.

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Question No 1 Part "C"

Part c

How do you reclaim salt affected lands?

Answer.

Alkali salts (Sodium chloride, Sodium Sulphate, and Sodium Carbonate) are injurious to agriculture.

NaCl ------ Least harmfull

Na_2SO_4 ----- Medium harmfull.

Na_2CO_3 ------ Most harmfull.

- The above salts are soluble in water.
- When W.T riseup or roots are in capillary Zone, G.W moves upwards and salts are deposited in root zone and surface of soil.

The Phenomena of salts Comming up in solution and forming a thin crust (5-7.5cm) on the surface after evaporation of water is called Efforescense.

Land affected by efforesense is called saline soil salts surrounding the roots reduce the osmotic activity of plants

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Question No 2 Part "A"

Part "A" Explain the Procedure of designing of irrigation canal by Kennedy's Theory.

Answer.

Kennedy's Theory:-

- R.G. Kennedy studied straight reaches of Upper Bari Doab canal which are stable for 30 years.
- $V_o = CD^n$

  Where V_o 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.

1- Weight of sediment vertically acts downwards.

2- Vertical Component of eddies acts upwords.

3- Result: the sediment is in suspension.

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4. $V_o = 0.84 D^{0.64}$ FPS system.

5. $V_o = 0.546 D^{0.64}$ MKS system, D is depth.

6- $V_o = 0.546 m D^{0.64}$ where $m = V/V_o$ = critical velocity ration (C.V.R). depends upon silt grade.

7- V = critical velocity for all sizes of sediment, V_o is V_{cr} for upper Bari Doab canal only.

Kennedy Procedure for Canal Design.

Step 1.

Assume the ~~ver~~trial value of D and put in eq- 1. and determine.

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

Step 2:

In Eqn 1: $Q = AV$

$A = Q/V$

$A = BD + D^2/2$

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

For assumed D determin B.

Fin $R = A/P$.

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Step 3.

Substitute the value of R in eq 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 the Eqn.3 (Kennedeys Eq). Then the assumed depth is corrected. Other wise repeat the Procedure with changed value of D.

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Question No 2.

Part "B" Design an irrigation channel by kennedy's theory to carry a discharge of 30 m^3/sec with $CV_r(m)$ of 1 and N as 0.0225 and bed slope of 1 in 5000. Assume the depth (D) as 2.3m.

Solution:-

Given Data:-

Discharge (Q) = 30 m^3/sec.

$CV_r(m) = 1$

$N = 0.0225$

Bed slope = 1 in 5000

Depth (D) = 2.3m.

Finding Velocity

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

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

$$\boxed{V_k = 0.930 m}$$

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Now calculating Area of canal.

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

$A = 30/0.930$

Area = 32.25 m²

Calculate B

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

$A = BD + 0.5D^2$

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

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

$32.25 - 2.645 = 2.3(B)$

$29.605 = 2.3B$

B = 12.87 m

Calculate wetted Perimeter.

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

$= 12.87 + \sqrt{5}(2.3)$

P = 18.01m

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Calculate Hydraulic Radius.

$$R = A/P$$

$$= 32.25/18.01$$

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

Calculating mean velocity From chazy eqn.

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

Where

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

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

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

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Question No 3

Part 'A' Differenciate between initial regime and final regime in accordance to Lacey's Theory.

Answer.

Lacey's Theory:

- According to kennedy, a channel is regime (No silting, No Scouring) but according to lacay' even though channel with no silting or scouring may actualy be not in regime.
- He differentiated between initial regime and final regime but this theory is applicable to find regime.

Initial Regime	Final Regime.
= When only bed slope of channel changes but the Cross section remain same then also no silting or scouring that Plase. But this is rare.	If all the parameters (Perimeter, depth and slop) have equally free to vary and adjust according do discharge and silt grades then the channel is said do have final regime.

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Question No 3 Part B

Part B

Design an regime channel by Laceys theory For discharge of 30 cumes and mean diameter of silt particle of 0.56mm.

Ans

Give Data:

$Q = 30 m^3/sec$

$M = 0.56mm.$

Solution:

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

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

$$\boxed{f = 1.3}$$

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

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

$$\boxed{V_m = 0.844}$$

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

$$\boxed{A = 35.54}$$

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

$$P = 4.75\sqrt{30}$$

$$\boxed{P = 26.01}$$

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

$$\boxed{R = 1.36}$$

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

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

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

$$26.01 = B + 2.236D$$

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

Put eq (1) in eq (2)

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

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

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

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

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

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By Quardratic eq.

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

$$\boxed{D = 1.52}$$

Put in Eq (2)

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

$$\boxed{B = 22.61}$$

$$S = \frac{\text{[illegible]}\, f^{(5/3)}}{3340\, Q^{1/6}}$$

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

$$\boxed{S = 0.00026}$$

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Question No 4 Part "A"

Part "A"

Explain the Components of Head work with neat diagram.

Answer. Components of Head Work

1- Weir or Barrage
2- Under Sluices
3- Divide Wall
4- Fish ladder
5- Canal Head Regulator
6- Silt excluder
7- River training works.

1- **Barrage:**

Barrage is an arrangement of adjustable gates or shutter at different tires. over the wier

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Under Sluices.

Also known as scouring sluices. The Under sluices are the opening Provided at the base of weir or barrages. There opening Provided with adjustable gates.

3- **Divide wall:.**

The divide wall is a long wall Constructed at right angles in the weir or barrages. It may be constructed with stone masonary or cement Concrete.

4. **Fish Ladder:.**

The fish ladder is Provided Just by the side of the divide wall for the free movement of fisher.

5. **Canal Regulator:**

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

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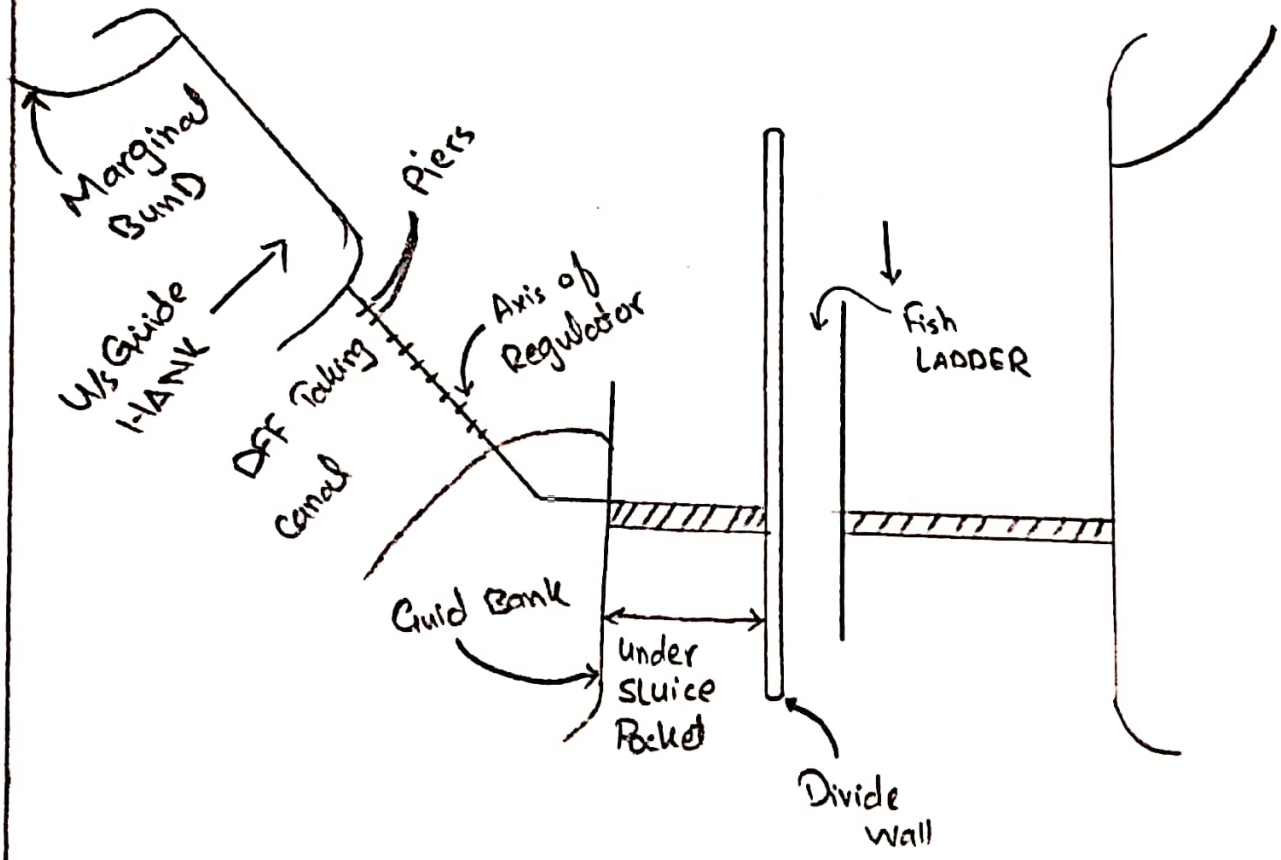
6. Silt Regulation Work:

The entry of silt into a canal which takes off from a head work, can be reduced by constructed certain special work caused silt control work.



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Question No 4 Part B

Part B. What are the functions of head regulators:

Ans. The function of the canal head regulators are as follow.

- It regulates the supply of water entering the canal.
- It control the entry of silt in the canal.
- It prevents the river-floods from entering the canal.
- To Indicate the discharge passed into the canal from design discharge formula & observed head of water on the crest.

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