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Subject	Irrigation

Q 1, A

Explain anti water-logging measures?

Anti-water logging Measures:-

Quantity of water into soil below is reduced. In flow into underground reservoir is reduced and outflow should be increased.

Methods of control of water logging:-

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

3) 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.

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. Cultivates 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.

6) Pumping or Tubewells or verticle Drainage:

Cannal irrigation may be substituted by tube well irrigation.

7) Economical use of water according to need.

8) Adoption of sprinkler methode of irrigation:.

9) only predetermined amount of water is supplied to land.

Q1

Part-B, Differentiate between saline & Alkaline soil

Saline soil	Alkaline soil
Saline soils are the soil that have a PH in between 7 & 8.5 an exchangeable sodium percentage below 15%.	Alkaline soils are the soil that have PH greater then 8.5 and an exchangable sodium percentage greater then 51%.
PH less then 8.5	PH greater the 8.5
Sodium percentage less then 15%.	Sodium percentage greater than 15%.
Electricity conductivity is 4 or more mmhos/cm.	usually less then 4 mmhos/cm.
organic matter content is high in saline soil.	organic matter content is low in alkaline soil.

Q no 1, Part 'C'

How do you reclaim salt affected lands?

Ans 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 rises up 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 coming up in solution and forming a thin crust (5-7.5cm) on the surface after evaporation of water is called efforescense.

Land affected by efforescense is called saline soil salts surrounding the roots reduce the osmatic activity of plants.

Qno 2, Part "A"

Explain the procedure of designing of irrigation canal by Kennedy's Theory:

Ans 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

  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 aids downwards
2) Vertical component of eddies aids upwards.
3) Result: the sediment is in suspension.
4) $V_o = 0.84D^{0.64}$ FPS system
5) $V_o = 0.546D^{0.64}$ MKS system
6) $V_o = 0.546mD^{0.64}$ $m = V/V_o$ = Critical velocity
7) V = critical velocity for all sizes of sediment.

Kennedy Procedure for canal Design

Step 1.

Assume the value of D and put in eqn-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 determine B

Fin $R = A/P$

Step 3:-

Substitute the value of R in eq 2. 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 Eq 3 Then the assumed depth is corrected other wise repeat the procedure with changed value of D.

Qno 2 (B)

Given Datar

Discharge (Q) = 30 m³/sec

CVr(m) = 1

N = 0.0225

Bed slope = 1 in 5000

Depth (D) = 2.3 m

Solution:

Finding velocity

By formula

$V_k = 0.54 m D^{0.64}$

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

$V_k = 0.930 m$

→ Now calculating Area of canal

By Formula

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

$A = 30/0.930$

Area = $32.25 m^2$

→ Now we have to calculate B, By using formula

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

⇒ By putting values

$A = BD + 0.5D^2$

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

$32.25 - 2.645 = 2.3(B)$

$29.605 = 2.3(B)$ $B = 12.87 m$.

→ Now we have to calculate wetted perimeter,

By Formula,

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

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

⇒ Now we have to calculate hydraulic Radus

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

⇒ Now calculating mean velocity From chezy equation

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

where

$$C = \frac{\frac{1}{n} + \left(23 + \frac{0.00155}{5}\right)}{1 + \left(23 + \frac{0.00155}{5}\right)\frac{n}{\sqrt{R}}} \Rightarrow \frac{\frac{1}{0.0225} + \left(23 + \frac{0.00155}{(1/5000)}\right)}{1 + \left(23 + \frac{0.00155}{(1/5000)}\right) + \left(\frac{0.0225}{\sqrt{1.79}}\right)}$$

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

→ $V_C = 49.56(1.79(\frac{1}{5000}))^{1/2}$

$V_C = 0.93$

→ $V_C = 0.93m$

Qno 3, Part "A"

Differentiate between initial regime and Final regime in according to Lacey's Theory..

Lacey's Theory:-

According to Kennedy, a channel is regime (No silting, No scouring) but according to lacey's even though channel with no silting or scouring may be not in regime.

Initial Regime	Final Regime
When only bed slop of Channel changes but the Cross section remain same then also no silting or scouring that place. But this is rare.	If all the parameters have equally free to vary and adjust according to discharge and silt grades then the channel is said to have Final regime.

Qno 3 Part (B)

Given Data:

$Q = 30 m^3/sec$

$M = 0.56mm$

Solution:

Silt Factor $= f = 1.76 + M^{0.5}$

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

$f = 1.3$

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

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

$V_m = 0.844$

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

$A = 35.54$

$P = 4.75\sqrt{Q}$

$P = 4.75\sqrt{30}$

$P = 26.01$

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

$R = 1.36$

$A = BD + D^2/2$

$35.54 = BD + \frac{D^2}{2}$

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

$26.01 = B + 2.236D$

$B = 26.01 - 2.236D$ — ②

Put eqn ② in eq, ①

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

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

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

$35.54 = 26.01D - 1.736D^2$

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

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

By Quadratic eqn

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

$D = 1.52$

Put in eqn 2

$B = 26.01 - 2.236(1.52)$

$B = 22.611$

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

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

$S = 0.00026$

Qno 4 Part "A"

Explain the components of Head work with neat diagram.

Ans Components of Head work:-

1) Weir or Barrage
2) Under sluices
3) Divide wall
4) Fish ladder
5) Canal Head
6) Silt excluder
7) River training work

1) Barrage:-

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

2) under sluices:-

Also known as scouring sluices. The under sluices are the opening Provided at the bow of weir or barrages.

3) Divide wall:-

The divide wall is a long wall constructed at right angles in the weir as barrages.

4) Fish ladder :-

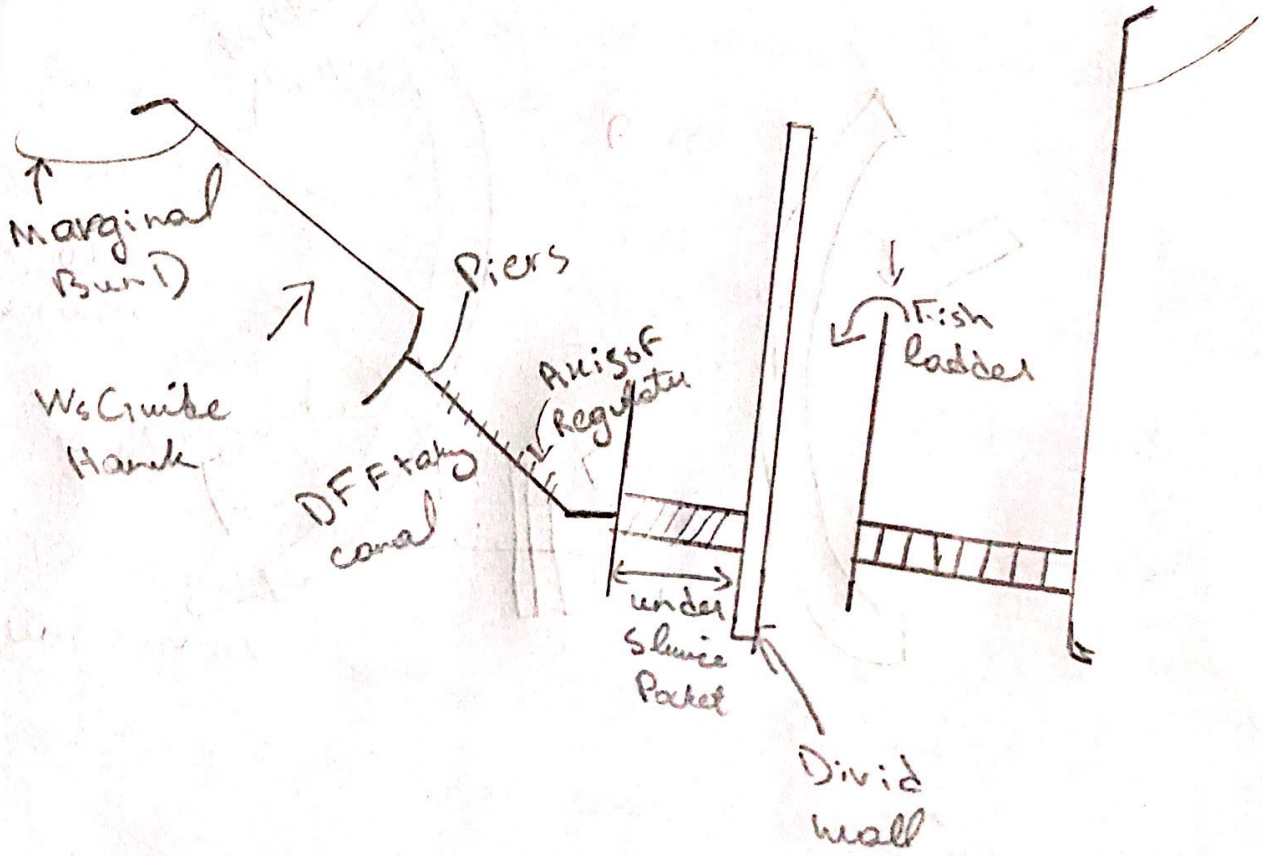
The Fish ladder is provided just by the side of the divide wall for the free movement.

5) Canal Regulation :-

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

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 called silt



Part B

What are the Functions of head regulators.

Following are the Functions of head regulatorrs

It regulates the supply of water entering the canal.

It control the entry of silt in the canal

It prevents the river-Fluids From entering the canal.

To indicate the discharge passed into the canal From design discharge Formula & observed head of water on the crest.