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Q1 Part (A)

Explain anti Water-logging measures?

Ans: Following are the anti water-logging measures.

(i) Lining of Canals & water courses:

⇒ Lining of canal makes the water login through the proper channel reducing major losses to greater extent.

⇒ It also reduces seepage of water.

(ii) Reducing intensity of irrigation

- Only small portion of land should receive canal water in one particular season.
- Remaining areas can receive water in next season by rotation.

(iii) By introducing crop rotation:

High water requiring crop should be followed by one requiring less water and then by one requiring almost no water.

e.g: Rice followed by wheat and then by cotton.

(iv) 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 you more water.

(v) Improving natural drainage of area.

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

⇒ Natural flow is provided by bush and jungle cutting.

(vi) Pumping ~~and~~ or tubwells or vertical drainage. Lift irrigation should be introduced to use G.W. canal irrigation may be substituted by tube well irrigation.

(vii) Adoption of sprinkler methode of irrigation.

⇒ There should be no percolation losses from water courses.

⇒ Only predetermined amount of water is supplied to land.

Q1B Differentiate b/w Saline & alkaline Soil.

Ans:-

Saline Soil	Alkaline Soil.
⇒ By Principle of osmosis, Pure water from roots flow outwards in a plant die due to lack of water Such Soil is unproductive and is called Saline Soil.	⇒ If the Salt efforessence continous for a longer period a base exchange reaction with clay take Place thus Sodium the clay making it impermeable, illaerated & heighly unproductive, Such Soil are called alkaline Soil.
⇒ Saline Soil appearance is as black crusty core over the surface of earth.	⇒ It is white in appearence as white patches appear over earth's surface.

Q1c How do you reclaim Salt affected lands?

Ans The Salt affected lands are reclaimed by the following processes:

(i) By efforoscence and how to avoid:

The efforoseence is avoided by maintaining 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 (Surface and Subsurface) must be provide to lower the water table in Saline Soils.

(ii) Leaching:-

⇒ In this process:

* The land is flooded with water.
* Alkaline salts will be dissolved in water.
* Percolation to the ground water.
* Drain by subsurface drains.

⇒ High salt resistant crops like rice are grown on ~~lead~~ leached Soil/land for 1 or 2 seasons.

⇒ then ordinary crops like wheat and cotton are grown.

⇒ Then 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.

⇒ $Na_2CO_3 + CaSO_4 \longrightarrow Na_2SO_4 + CaCO_3$

Q2(A) Explain the procedure of designing and irrigation canal by Kennedy's Theory.

Ans:- Following the steps required for designing an irrigation canal using Kennedy's theory.

Step 1.

Assume the trail value of D and put it in equation ($Q = AV$) and determine

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

Step 2

In equation (1) is $Q = AV$

Thus

$$A = Q/V$$
$$A = BD + D^2/2$$
$$P = B + D\sqrt{2}$$

For assumed D determine B, Find $R = A/P$

Step 3

Substitute the value of R in equation 2 (Kutters & Chezys equation) to obtain V which will be the actual velocity for assumed dimension.

Step 4:- If the velocity worked out from equation 2 agrees with that of obtained with the Kennedy's equation. Then the assumed depth is correct. Otherwise repeat the procedure with changed value of D.

Q2 (b) Design an irrigation channel by ~~trial~~ Kennedy's theory to carry a discharge of 30 cumecs with CVR(m) of 1 and N as 0.0225 and bed slope of 1 in 5000. Assume the depth(D) as 2.3 m.

Solution. Given Data.

Discharge (Q) = 30 m^3/sec

CVR(m) = 1

N = 0.0225

Bed Slope = 1 in 5000

Depth (D) = 2.3 m

Solution.

Finding Velocity

By Formula,

$V_K = 0.546 m D^{0.64}$

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

$\Rightarrow \boxed{V_K = 0.930 m}$

Now calculating area of canal.

By Formula

$Q = AV \Rightarrow A = \frac{Q}{V}$

$A = 30/0.930$

$\boxed{\text{Area} = 32.25 m^2}$

$\Rightarrow$ Now we have to calculate B, By Using formula. $A = BD + \frac{D^2}{2} \Rightarrow BD + 0.5D^2$

By Putting values

$A = BD + 0.5D^2$

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

$32.25 - 2.645 = 2.3(B)$

$29.605 = 2.3(B)$

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

Now we have to calculate wetted perimeter, so By formula

$$P = B + \sqrt{5}D$$
$$= 12.87 + \sqrt{5}(2.3$$
$$\Rightarrow \boxed{P = 18.01 m}$$

Now we have calculate hydraulic radius.

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

Now calculating mean velocity from Chezy equation

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

Where

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

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

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

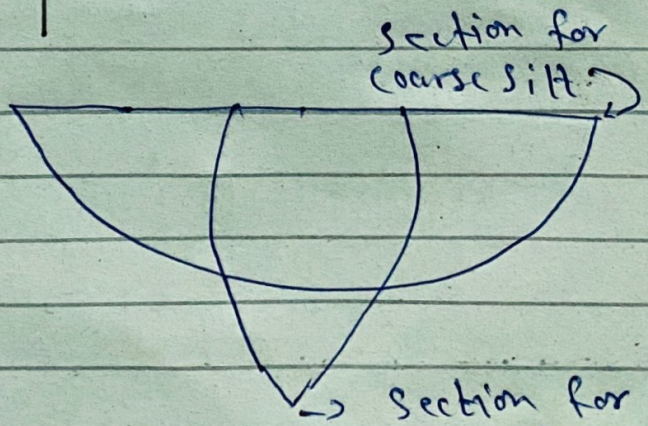
$$\Rightarrow V_c = 49.56 (1.79 (\frac{1}{5000}))^{1/2}$$

$$\Rightarrow V = 0.93$$

$$\Rightarrow \boxed{V = 0.93 m}$$

Q3 A. Differentiat b/w initial regim and final regime in accordance to Lacey's theory.

Initial Regime	Finial regime.
• When only bed slop of channel chaiges but the cross-sectional remain same then theire will be no silting & scouring.	• If all the peremeter (perimeter depth & slop) have equally free to vary & adjust according to discharge and silt grades then the channel is said to have final regime.
• Cross-section or wetted peremeter remain unaffected	• If final regime the cross-section assume semi-ellipse shape.
• It is quick proces & occur within short span of time.	



Q3 B Design a regime channel by Laceys theory for discharge of 30 cumecs and mean diameter of silt particle of 0.56mm.

Given Data:

Discharge (Q) = 30 m^3/sec

Mean dia of silt particles (M) = 0.56mm

Solution:

First we have to calculate velocity (mean)

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

$$= \left[\frac{30 (1.32)^2}{140}\right]^{1/6}$$

V_m = 0.85 m/sec

∵ f = Lacey's silt factor

$f = 1.76 M^{0.5}$

$= 1.76 (0.56)^{0.5}$

$f = 1.32$

⇒ Now we will hydraulic mean depth

$$R = 5/2 \left(\frac{V^2}{f}\right)$$

$$= \frac{5}{2}\left(\frac{(0.85)^2}{1.32}\right) \Rightarrow \boxed{R = 1.36}$$

⇒ Now finding the value of 'P'

By formula

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

First we have to find area:

By Discharge formula,

$Q = AV$

$\Rightarrow A = Q/V$

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

Now

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

$$= 4.75\sqrt{30} \Rightarrow \boxed{P = 26.02}$$

Finally, we have to calculate "S" By using formula.

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

$$= \frac{(1.32)^{5/3}}{3340 \times (30)^{1/6}} \Rightarrow \boxed{S = 0.000269}$$

Dimensions calculations

By formula

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

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

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

$$26.01 = B + 2.236D$$

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

Put eq (2) in eq (1)

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

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

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

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

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

By Quadratic Equation

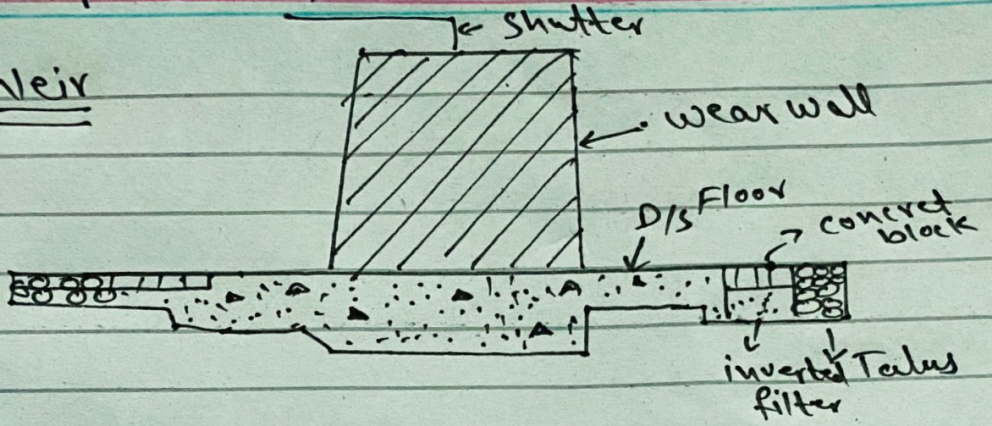
$$D = \frac{-(26.01) + \sqrt{(26.01)^2 - 4(-1.73)(-35.29)}}{2(-1.736)}$$

$\boxed{D = 1.51\,m}$ ⟶ Put in eq, (2)

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

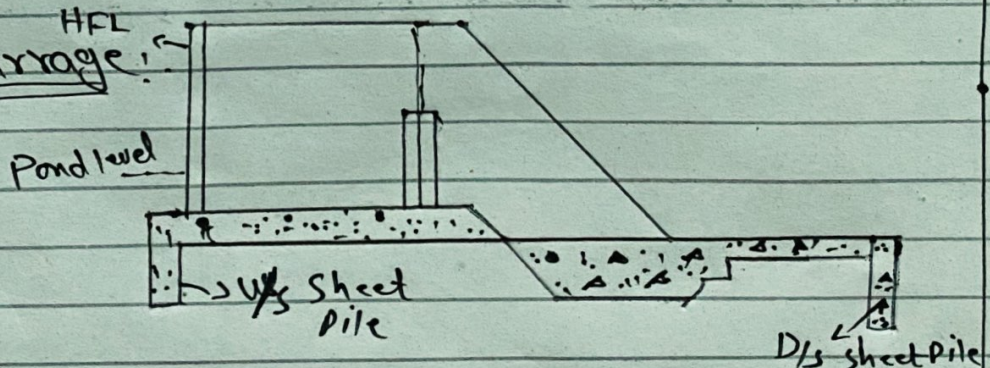
$$\Rightarrow \boxed{B = 22.63\,m}$$

① 4(A)(1) Weir



Normaly the water level of any perennial river is such that it can't be diverted to the irrigation canal. The bed level of the canal may be higher than existing water level of river. In such case weir constructed across the river to raise the water level. Surplus water pass over the crest of weir. Adjustable shutters are provided on the crest to rise the water level to required height.

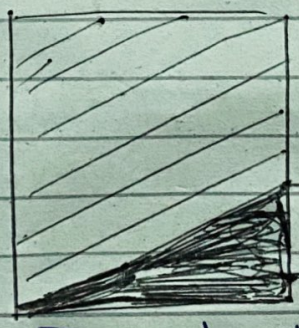
* 2. Barrage:



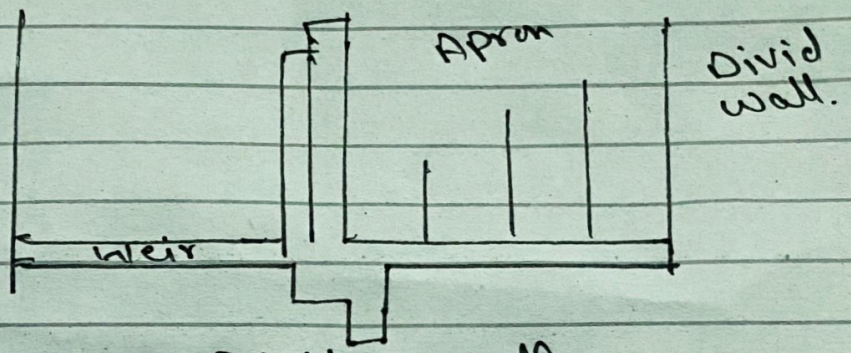
When the water level upstream side of weir is required to be raised to different value it different time barrage is constructed. Barrage is an arrangment of adjustable gates or shutter at different tires over the weir.

③ Under Sluices:.

Also known as scouring sluices. The under sluices are opening providing at the base of the weir or barrage. these opening are provided with adjustable gates. Normally the gates are kept closed. The suspended silt goes on depositing in front of the canal head regulator. when the silt deposition becomes appreciable the gates are opened & the deposited silt is loosened with an agitator mounting on a boat. The gates are then closed. But, at the period of flood, the gates are kept opened.



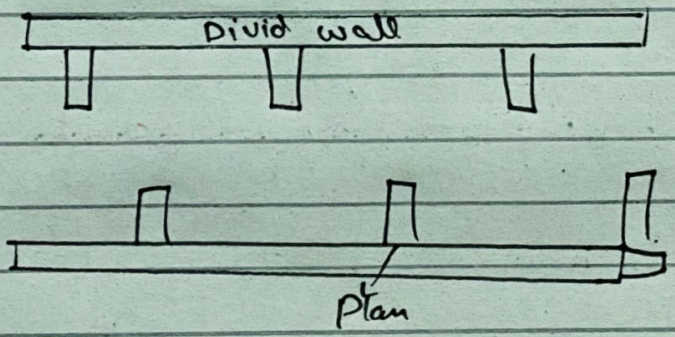
④ Divide Wall: The divide wall is a long wall constructed at right angle in the weir or barrage. It maybe constructed with stone measonry or cement concrete. on the upstream side, the wall extended just to cover the canal head regulator & on the downstream side, its extended up to the launching apron.



Divide Wall

(f) Fish ladder:-

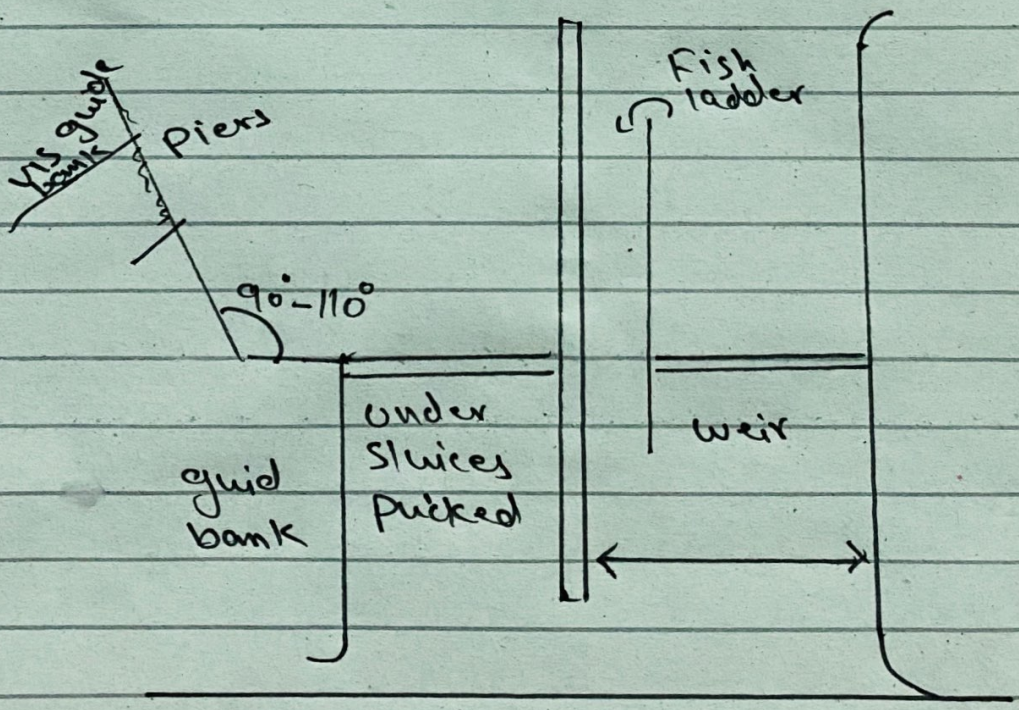
It is provided just by side of the divide wall for the free movement of fishes. River are important source of fishes. The tendency of fish is to move from upstream to downstream in winter and from downstream to to upstream in moonsoons.



Fish ladder.

(6) Canal Head Regulator.

A structure which is constructed at the head of the canal to regulate flow of water is known as canal head regulator.
The pier consist of number tiers on which the adjustable gates are placed.



Head

Qy B What are the functions of Head regulators.

Ans:- The major function is to regulate the ~~supply of~~ Supply of water entering the Cannal. It controlls the entry of silty in the canal.

- It pavement the river flood from entering the canal.

- ~~It~~ It regulates/indicates the discharge passed into the canal from design discharge formula.

The End.