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Q No 1 (a) Explain anti water-logging measures.

Ans Following are the anti water logging measure

(1) Reducing intensity of irrigation :-

⇒ Small portion of land should recive canal water in one particular season.

⇒ The remaining area of land can receive water in next season by crop rotation.

(2) Lining of canals and water courses :-

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

⇒ It also make the dinning through the proper channel reducing major losses to greater extent.

(3) Introduction to crop rotation :-

⇒ High water requires crops should be folled by one requiring less water and then by one requiring almost no water.

~~Explain~~ Example

⇒ Rice followed by wheat and then by cotton.

(4) Optimum use of water

⇒ Certain amount of water water gives the best result less or more water reduce the yield.

⇒ Cultivated should be educated so that not to use more water.

(5) Pumping or Tube wells :-

⇒ Lift irrigation should be introduced to use ground water.

⇒ Canal irrigation should be ~~[struck out]~~ subsitituted by tube well irrigation.

(6) Improving natural drainage of area :-

⇒ water should not be allowed to stay in one area

⇒ Natural flow is provided by brush and jungle cutting.

(b) Differentiate between saline and alkaline soil

Ans

Saline soil	Alkaline soil
⇒ By principle of osmosis, pure water from root flow outwards in a plant die due to lack of water, such soil is unproductive and is called saline soil.	⇒ If the salt effores cence continous for along period, a base exchange reaction with clay take place thus sodiumizing the clay making it impermeable and highly unproductive, such soil are called alkaline soil.
⇒ Saline soil appearence is as a black crustly case over the surface of earth	⇒ It is white in appearence as white patches appears over earth surface.

(C) How do you reclaim salt affected land?

Ans Follow are the major aspects to reclaim salt effected lands.

(1) An efficent drainage (surface and subsurface) must be provided to lower the water table in saline soil.

(a) Maintain the water table sufficiently below the roots.

(e) The pratice of crops reversal is necessary to reduce the establishment of salt or efforesence

(d) Land should be fodded with water so that alkaline salts will be disolved in water

(c) High salt resistant crop like rice are grown on leached land for 1 or 2 season.

Q No2 Explain the procedure of designing of an Irrigation canal by Kennedy theory?

Ans Following are the steps required for designing an irrigation canal using Kennedy theory

Step #01

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

$$V_0 = 0.546\, m D^{0.64}$$

Step #02

As equation (1) is $Q = AV$

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

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

$P = B + D S^{1/2}$

For assumed D determine B,

Find $R = A/P$.

Step #03

⇒ Substitute the value of R in eq (Kutters and chazys equ) to obtain V which will be the actual velocity for assumed dimension.

Step #04

⇒ If the velocity worked out from eq 2 agrees with that of obtained with the eq (Kennedeys equ) ⇒ Then the assumed depth is correct. otherwise repeat the procedure with changed value of D.

(b) Design an Irrigation channel by 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 2.3m.

Given Data

$D = 2.3m$

$Q = 30$ cumec

$C.V.R = m = 1$

$N = 0.0225$

$S = \frac{1}{5000} = 0.0002$

As we Know $Q = AV$

$A = Q/V = \frac{30}{V} \rightarrow (1)$

Thus using formula to compute "V"

$V_0 = 0.546(1)(2.3)^{0.64}$

$\boxed{V_0 = 0.935 m/s}$ → put this value in eq (1)

$A = \frac{30}{0.935} = 32.01 m^2$

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

$32.01 = B(2.3)^2 + \frac{2.3^2}{2}$

$\boxed{B = 12.77m}$ put the value in below eq

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

$P = 12.77 + 2.3\sqrt{5} \Rightarrow \boxed{P = 17.9m}$

Now $R = \frac{A}{P} = \frac{32.01}{17.9} = 1.76$

Subsituting the value of "R" in Kutter's and chazy's equation

$U = C(RS)^{1/2} \rightarrow a$

$C = \frac{\frac{1}{n} + (23 + \frac{0.00155}{S})}{1 + (23 + \frac{0.00155}{S})^{n}/\sqrt{R}} = \frac{\frac{1}{1} + (23 + \frac{0.00155}{0.0002})}{1 + (23 + \frac{0.00155}{0.0002})^{1}/\sqrt{1.76}}$

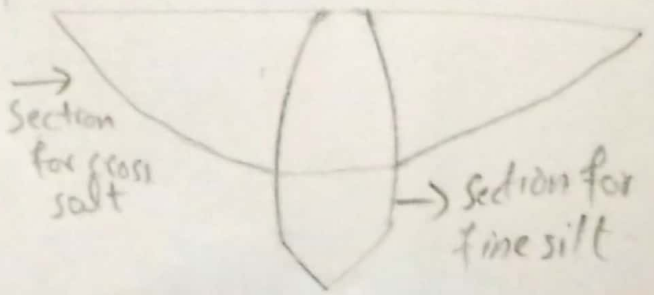
Put the value in eq (a)

$V = 49.526(1.76 \times 0.0002)^{1/2}$

$\boxed{V = 0.93 m/s}$ This is equation to V_0. Thus no more trial required.

Q No 3 (a) Differenentiate b/w initial regime and final regime in accordance to Laceys theory.

Initial Regime	Final Regime
⇒ When only bed slop of channel changes but the cross-sectional remain the same then their will be no silting and scouring ⇒ Cross-section or wetted perimeter remains unaffected ⇒ It is a quick process and occurs within short span time.	⇒ If all parameter (depth, shape) have equally free to vary and adjust according to discharge and silt grade then the channel is said to have final regime. ⇒ In final regime, the cross sectional assume semi-ellipse shape.



(b) Design a regime channel by lacey's theory for discharge of 30 cumecs and mean diameter of silt Particle of 0.56mm.

Given Data

$Q = 30 cumec, d = 0.56 mm (M)$

By formula silt factor

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

$\boxed{f = 1.3}$

$\rightarrow V_m = \left[\frac{Qf^2}{140}\right]^{1/6} = \left[\frac{30 \times (1.3)^2}{140}\right]^{1/6}$

$\rightarrow \boxed{V_m = 0.844 m/s}$

$\rightarrow Q = AV, \; A = Q/V \Rightarrow \frac{30}{0.844} \Rightarrow \boxed{A = 35.54 m^2}$

$\Rightarrow P = 4.75\sqrt{Q} = 4.75\sqrt{30} \Rightarrow \boxed{26.01}$

$\rightarrow R = \frac{5}{2} \times \frac{V^2}{f} \Rightarrow \frac{5}{2} \times \frac{0.844^2}{1.3}$

$\boxed{R = 1.36 mm}$

As we Know

$\Rightarrow A = BD + D^2/2$, $35.54 = BD + \frac{D^2}{2} \rightarrow (1)$

$\Rightarrow P = B + D\sqrt{5}$, $26.01 = B + 2.236D \rightarrow 2$

Thus $B = 26.01 - 2.236D \rightarrow (3)$

Put eq(3) in eq(1)

$35.54 = (26.01 - 2236D)D + D^2/2$

$35.54 = 26.01D - 236D^2 + D^2/2$

$35.54 = 26.01D - 1.736D^2$

$1.736D = 26.01D + 35.54 = 0$ (using quadrant formula)

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-26.01 \pm \sqrt{(26.01)^2 - 4(1.736)(65.54}}{2(1.736}$

$D = 1.52$ Put in eq(3) we get

$B = 26.01 - 2.236(1.52)$

$B = 22.611 mm$

Now $\frac{f^{5/3}}{83400^{1/3}} = \frac{(1.3)^{5/3}}{3340(30)^{1/6}}$

$S = 0.00027$

Q.No 4 Explain the components of head work with neat diagram?

Ans Following are the components of headwork

(1) Weir or barrage
(2) Undersluices
(3) Divide wall
(4) Fish ladder
(5) Canal head Regulator
(6) Site excluded/silt prevention devices river trainning work.

(1) Weir or Barrage

Normally the water level of any perennial river is such that it cannot be diverted to the irrigation canal. The bed level of canal may be higher then the existing water level of river. In such cases weir is constructed across the river to rise the water level. Adjustable shutter are provided on the crest to a rise the water level to same required height.

⇒ When the water level on the upstream side of the weir is required to be raised to different level at different time, barrages is constructed. Barrages is the arrangement of adjustable gates at different tides over the weir.

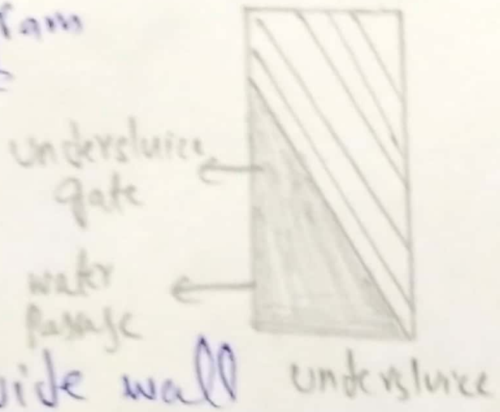
Diagram

(2) Undersluice :- It is also known as scouring sluices

The undersluice are the opening provided at the base of the wire. These opening are provided with adjustable gates are kept closed. The suspended silt goes on depositing in front of the canal head regulator.

⇒ When the site depositing becomes appreciable the gate are opened and the deposited site is loosened with an agitator mounting on a boat.

Diagram



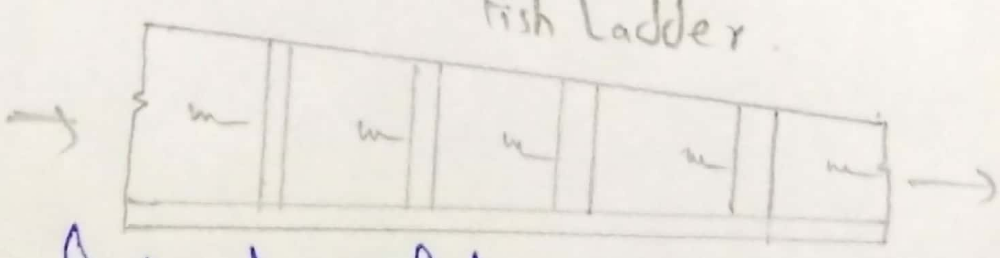
(3) Divide wall

The divided wall is a long wall constructed at a right angles in the wier. It may be constructed with stone masonry or cement concrete. On the upstream side, the wall is extended just to cover the canal head regulator and on the downword side, It is extanded upto the launching apron.

(4) Fish Ladder

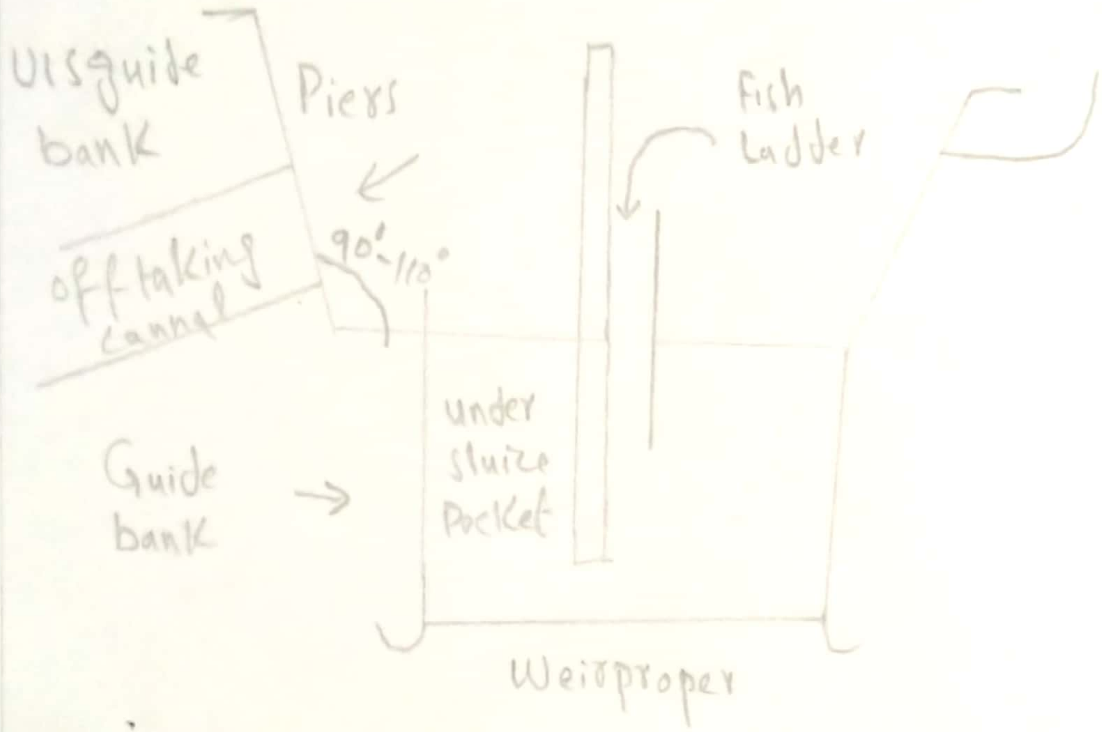
The fish ladder is provided just by the side of the divide wall for the free movemant of fishes. Rivers are the important sources of fishes The tendency of fish is to move from upstream to downstream in wihter and from downstream to upstream in mansoons. This movemant is essential for their survival. Due to construction of weir and barrages, this movemant gets obstructed and is determinental to the fishes.

Diagram



(5) channal head regulator

⇒ A structure which is constructed at the head of the canal head regulator gt consist of number of pires which divide the total width of the canal into number of span which are known as boys. The piers consist of number of tieses on which the adjustable gates are placed.



(b) What are the function of head regulator!

Ans The major function of head regulator is to regulate the supply of water entry the canal. It control the entry of silt in the canal. It prevent the river floods from entering the canal.

⇒ It regulate/indicate the discharge passed into the canal from design discharge formula.

End