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Section :- B

Semister :- 6th

Subject :- Irrigation Engineering

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Question No : 01

(a)

Explain anti water-logging measures.

Answer No 1 (a)

Method of control water loging.

1). Lining of canals and water causes. It reduces seepage of water.

2). 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.

3) By introducing crop rotation:-

. High water required crop should be followed by one required less water, and then by one required 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 educate so that not to use more water.

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 Tubwells or Vertical Drainage:

Lift irrigation should be introduced to use GW. canal irrigation may be substituted by tube well irrigation.

Q No 1 (b)

Differentiate between saline and alkaline soil?

Answer.

	Saline soil	Alkaline soil.
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 PH is 7 - 8.5.	4) PH greater than 8.5
5)	Dominating compound is sodium salts.	5) Dominating compound in sodium carbonate.

Question No 01 (c)

How do you reclaim salt affected lands?

Answer.

Reclamation salt effected lands:

Alkali salts (sodium chloride, sodium sulphate and sodium carbonate) are injurious to agriculture.

Nacl ..... Least harmful.
Na_2SO_4 ..... Medium harmful.
Na_2CO_3 ..... Most harmful.

- The above salts are soluble in water.
- When W.T rises up or roots are in capillary zone, the G.W moves upwards and salt 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 Efforescence.

Land affected by efforescence is called saline soil salts surrounding the root reduce the osmotic activity of Plants.

Diagram (osmosis)

- semipermbeable membrane

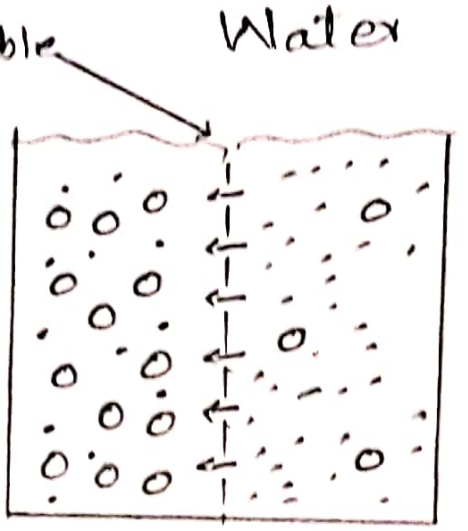
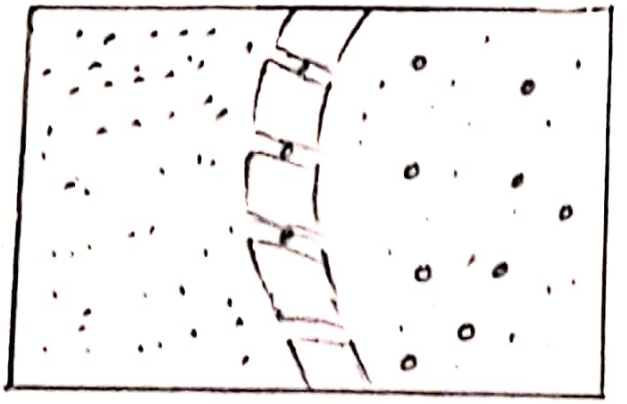


Diagram (osmosis)



Question No 02 : (a)

Explain the Procedure of designing of an irrigation canal by kennedys theory.

Answer No 02 (a).

KENNEDYS 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.

Kennedy Procedure for canal design.

step 1. Assume the trial value of D and put in eq^n. 1 and determine

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

Step 2.

In Eq^n. 1 : $Q = AV$ for assumed D determine B

$A = Q/V$

$A = BD + D^2/2$ Find $R = A/P$

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

Step 3.

Substitute the value of R in eqn. 2 (Kutters and Chazys Eq,n.) to obtain V which will be the actual velocity for assumed dimension.

Step 4.

If the velocity worked out from Eqn. 2 agrees with that of obtained with the Eq,n. 3 (Kennedeys Eq,n). Then the assumed depth is correct. other wise repeat the Procedure with changed value of D.

Question No 02 (b)

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

Given Data:-

Discharge (Q) = $30\ m^3/sec$

Cvr (m) = 1

N = 0.0225m

Bed slope = 1 in 5000

Depth (D) = 2.3m

Solution:-

Finding velocity

By formula.

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

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

$V_k = 0.930 m/$

Now calculating area of canal

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

$30/0.930 = 32.25 m^2$

To find value of B

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

Putting values

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

$$B = 12.8m$$

Now we have to calculate, P

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

$$= 12.8 + \sqrt{5}\,(2.3)$$

$$= 18.00 m$$

Now we have to find R

$$R = A/P = 32.25/18 = 1.78 m$$

Now

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

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

$$\Rightarrow \frac{1}{0.0225} + \frac{\left(23 + \frac{0.00155}{1/5000}\right)}{1 + \left(23 + \frac{0.0015}{1/5000}\right) \times \left(\frac{0.025}{\sqrt{1.79}}\right)^2}$$

$$\boxed{C = 49.5}$$

$$V_c = 49.5\left(1.79 \times \frac{1}{5000}\right)^{1/2}$$

$$V_c = 0.925\ m$$

Q. No "03" (a)

Differentiate between initial regime and final regime in accordance to Laceys theory.

Answer No 03

LACEY'S THEORY

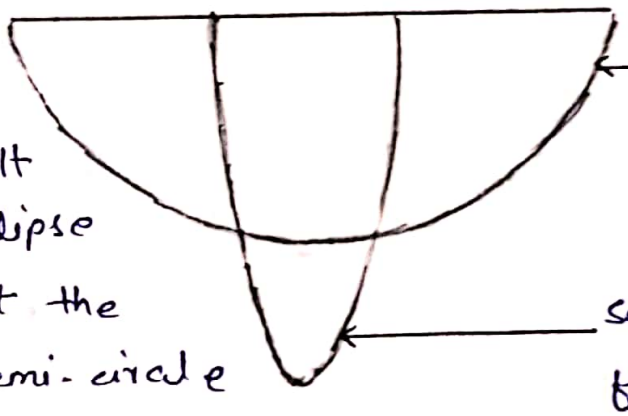
- According to kennedy, a channel is regime (No silting, No scouring) but according to Lacey even through channel with no silting or scouring may actually be not in regime.
- He differentiated between intial regime and final regime but this theory is applicable to final regime.

- INITIAL REGIME :-
- when only bed slope of channel changes but the cross section remain same then also no silting or scouring take Place. But this is rare.

FINAL REGIME

- If all the Parameters (Perimeter, depth and slope) have equally free to vary and adjust according to discharge and silt grades then the channed is said to have final regime.

- In final regime the cross section assumes semi-ellipse shape



coarser the silt flatter the ellipse

finer the silt the section is semi-circle

The channed is said to be regime when the following condition are satisfied

1) The channed is following in unlimited in coherent alluvium of same character.

2) Silt grade and silt charge is constant.

3) Q is constant.

Question No 03 (b)

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

Given:

$$Q = 30\ m^3/sec$$

$$M = 0.56$$

solution:

$$f = 1.76\ M^{0.5}$$

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

$$f = 1.3$$

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

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

$$Vm = 0.844$$

$$Q = AV$$

$$A = Q/V = 30/0.844$$

$$A = 35.55$$

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

$$P = 26.00$$

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

$$R = 1.36$$

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

$$35.5 = BD + \frac{D^2}{2} \longrightarrow (i)$$

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

$$26.01 = B + 2.236D \longrightarrow (ii)$$

Put (i) & (ii)

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

$$35.54 = 26.01D - 1.736D^2$$

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

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

By Quadratic Eq

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

$$\boxed{D = 1.52}$$

Put in eq, (2)

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

$$B = 22.611$$

$$S = \frac{f^{5/3}}{3.340\ Q^{1/6}}$$

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

$$S = 0.00026$$

Question No "04"

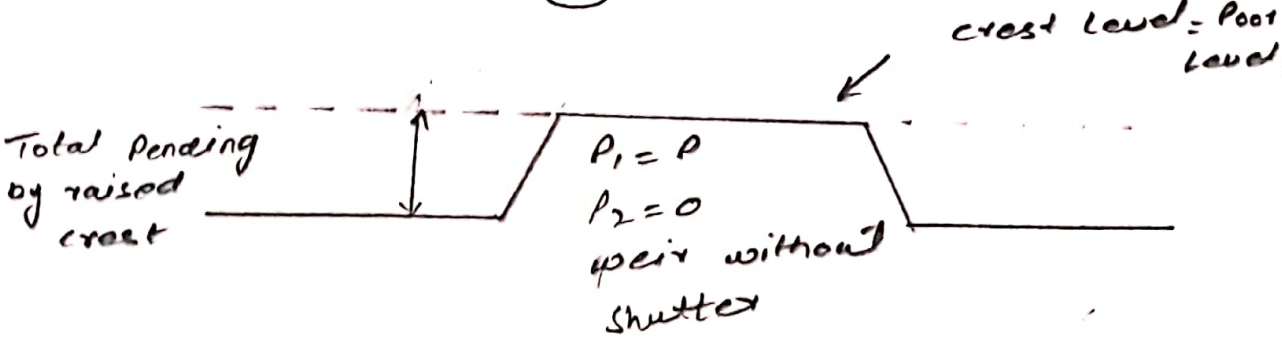
a) Explain the components of headworks with neat diagram.

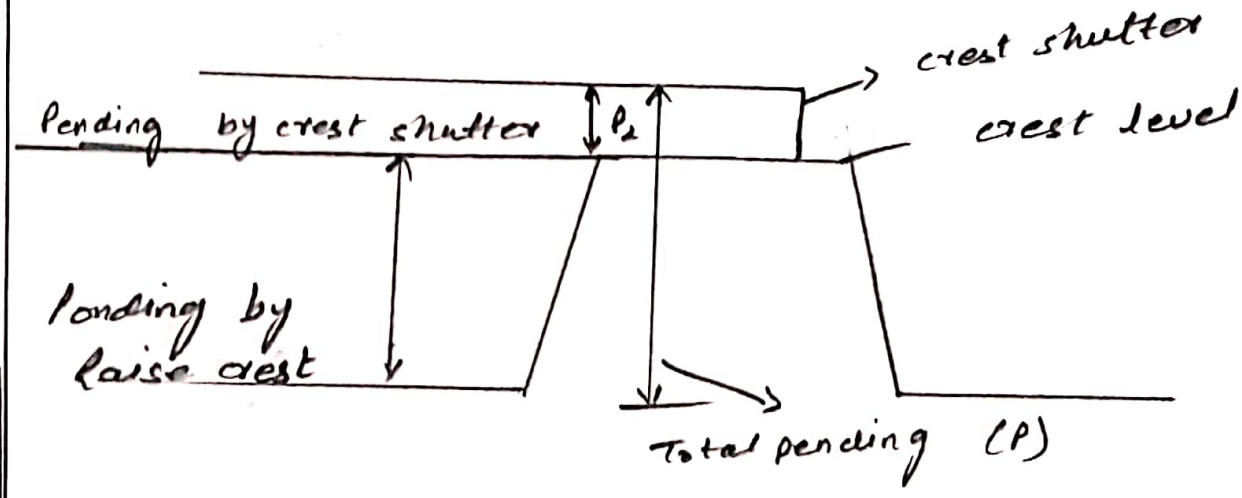
Answer No "04" "a"

component of a diversion headwork.

- Weir or barrage.
- Under sluices
- Divide wall
- Fish ladder
- Canal head regulator.
- silt excluders / silt prevention device
- River training work (Marginal bunds and guide banks).

Weir :- when the water level on the up stream side of the weir is required to be raised to different level at different time, barrage is constructed. Barrage is an arrangement of adjustable gates or shutters at different tires over the weir.





$P_1 >>>> P_2$

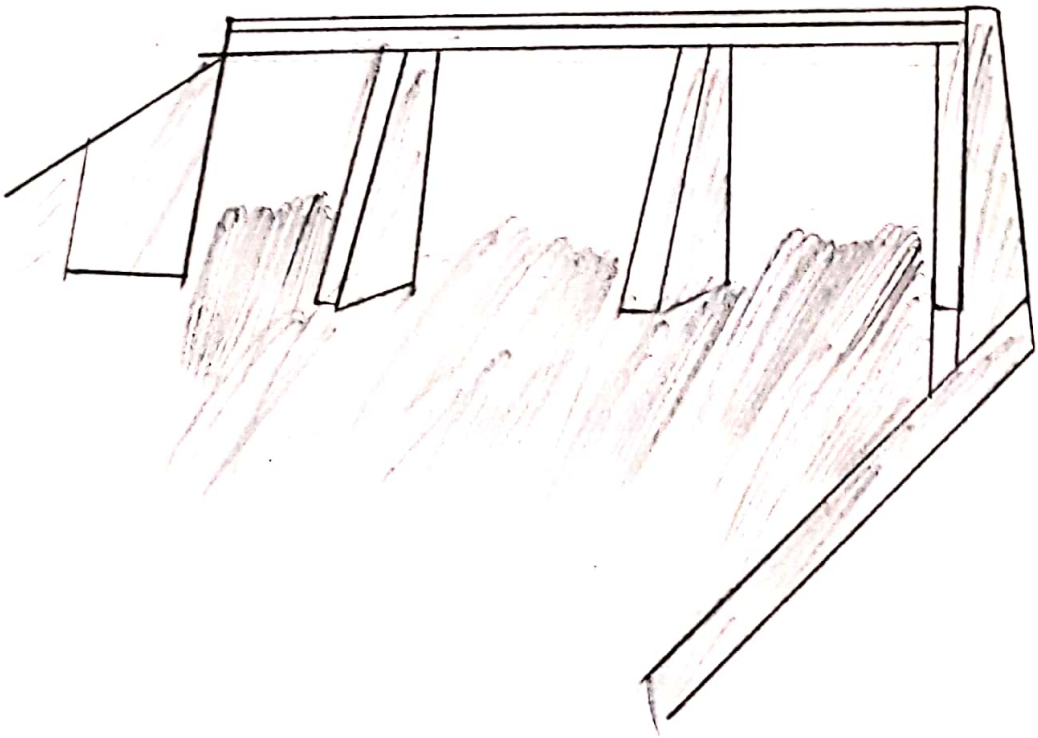
weir with shutter

Barrage.

- When the water level on the up stream side of the weir is required to be raised to different levels at different time, barrage is constructed. Barrage is an arrangement of adjustable gates or shutter at different times over the weir.

Under sluices:-

Also known as scouring sluices. The under sluices are the openings provided 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.



Under sluices.

- Divide wall

The divide wall is a long wall constructed at right angles in the weir or barrage, 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 down stream side, it is extended up to the launching apron.

- The function of divide wall are as follows. To form a still water Pocket in front of the canal head so that the suspended silt can be settled down which then later can be cleared through the scouring sluices from time to time.

Fish Ladder :-

The fish ladder is provide just by the 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 winters and from downstream to upstream in monsoons. This movement is essential for their survival. Due to construction of weir or barrage, this movement get obstructed and is detrimental to the fishes.

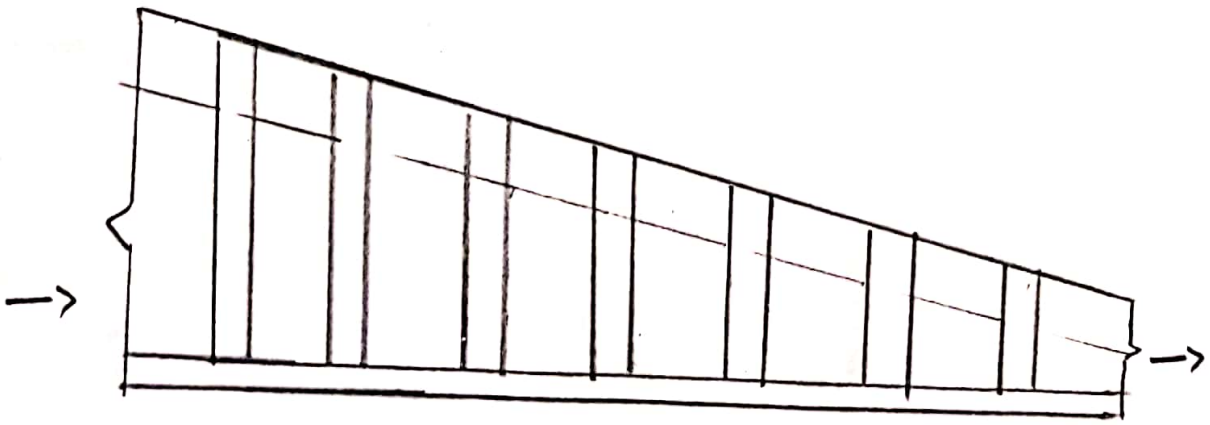


Fig. Fish Ladder

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. It 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 piers consist of number tiers on which the adjustable gate are placed.

- The gates are operated form the top by suitable mechanical device. A Platform is provided on the top of the piers for the facility of operating the gates. Again some piers are constructed on the down stream side of the canal head to support the roadway.

Function of canal Head Regulator

It regulates the supply water entering the canal. It controls the entry of silt in the canal. It prevents the the river flood from entering the canal.

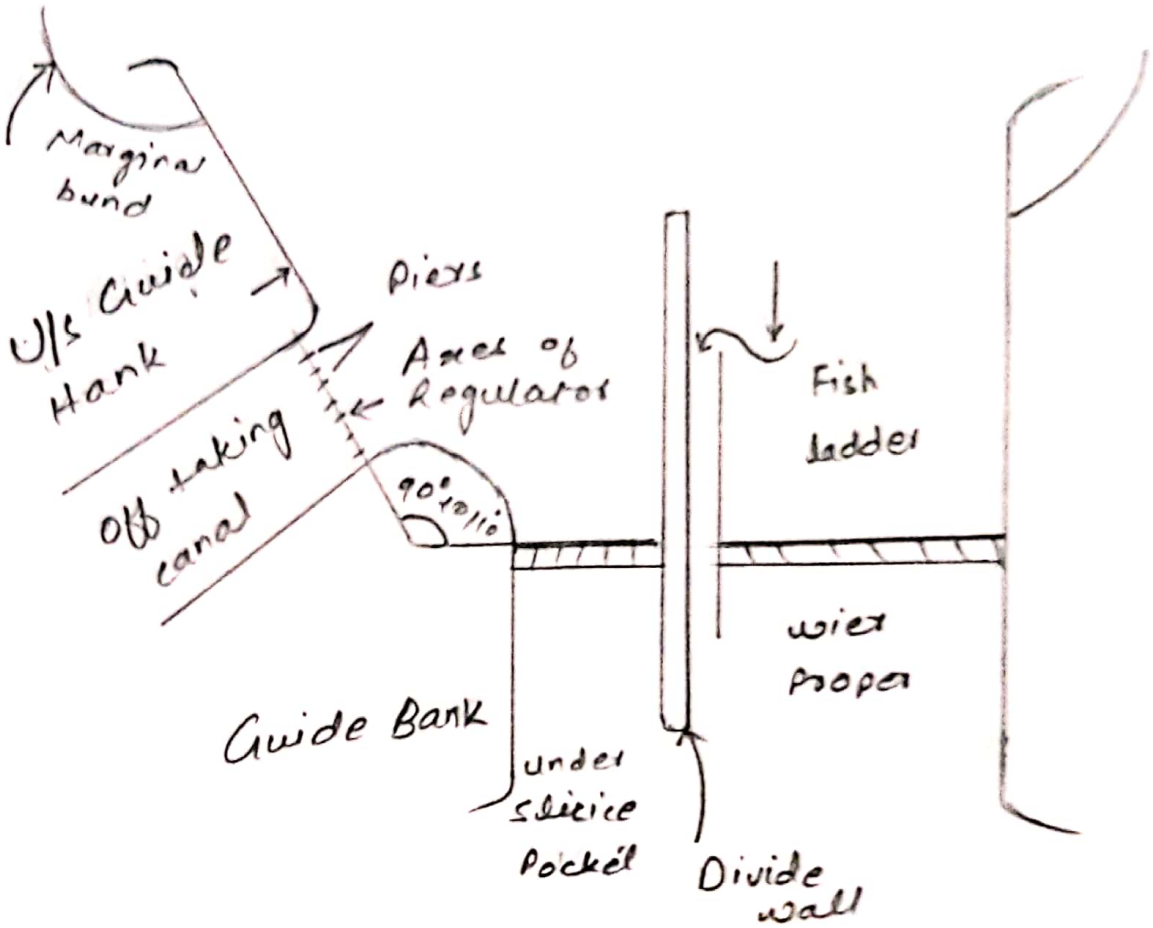


Fig: Alignment of a canal head Regulator

Silt regulation work

The entry of silt into the canal, which take off from a head works. can be reduced by constructed certain special works. cadled silt control works. These work may be classified into the following two types.

a) Silt Excluder
b) Silt Ejectors.

- Silt Excluder: silt excluder those work which are constructed on the bed the river. upstream of the head regulator.

- Silt Ejectors: silt ejectors. also cadled silt extractor. are those devices which extract the silt form the canal water after silt water has travelled a certain distance in the off take canal Those work are therefore. constructed on the bed of the canal and little distance downstream from the head regulator

River training works

River training work are required near the weir site in order to ensure a smooth and an axial flow of water and thus, to Prevent the river from outflanking the work due to a change in its course. The river training work required on a canal head work are.

a) Guide banks
b) Marginal bunds
c) Spurs or groynes

Question No 4 (b)

what are the function of Head regulator?

Answer.

Canal Head Regulator.

A structure which is constructed at the head of canal to regulate flow of water is known as canal Head Regulator.

Function :-

- To regulate the supplies into the canal
- To indicate the discharge Passed into canal.
- To control the silt entry into the canal.