ID= 7795

Page (1)

QNo1 Part (A)

ANS:-

Anti water-logging measures:-

Some of the measures use to control water logging are

control of cannal seepage

→ Cannal seepage is major sources of water losses, and water logging in irrigated areas and it can be contool by.

→ Lining of cannal with impervious material like clay, concrette to control seepage.

→ Convert water system from cannal to piped system.

Reducing intensity of irrigation:-

→ The major important aspect to avoid water logging is to provide the water to the small portion of land water necessary.

→ Applying only the required amount of water so that all the water applied is used by plants.

→ Use efficient irrigation method i.e drip irrigation.

Rotation of crops

→ Its mean that we should plants croops in such away that it prevent the land from water logging.

→ Crops which used large amount of water should be followed by those plants which used less water.

Example:- Rice followed by wheat and then by cotton.

Page (2) = ID = 7795

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.

⇒ Revenue should be charged on the basis of quantity of water rather than the area of land.

Improving natural drainage of area:-

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

⇒ natural flow is provided by bush and jungle cutting.

QNO 1 part (b)

ANS:-

saline soil:- The soil with excess salt is called saline soil.

Alkaline soil:- Alkaline soil are clay soil which have PH greater than 7.3 having poor soil structure.

P.T.O

Differentiate btw saline and alkaline soil:-

Saline soil:-

⇒ saline soils are the soil that have a PH in between 7 and 8.5 an exchangeable sodium percentage below 15 %.

⇒ PH less than 8.5

⇒ sodium percentage less than 15 %

⇒ Electricity conductivity is 4 or more mmhos/cm.

⇒ organic matter content is high in saline soil.

⇒ saline salt are white or light gray in colour.

Alkaline soil:-

⇒ Alkaline soil are the soils ~~that~~ ~~85~~ have a PH greater than 8.5 and an exchangeable sodium percentage greater than 51 %.

⇒ PH greater than 8.5.

⇒ sodium percentage greater than 15 %

⇒ usually less than 4 mmhos/cm.

⇒ organic matter content is low in alkalin soil.

⇒ Alkalin soil are black in colour.

page (4) =ID= 7795

QNO 1 part (c):-

ANS:- **Reclaim salt affected lands:-**

salt affected lands can be reclaimed by the following method.

Avoiding Efflorosences:-

⇒ By mainting the water table sufficiently below the roots.

⇒ Hence all the measure which were suggested for preventing water logging hold good for preventing ~~water~~ salinity of lands.

⇒ An efficient drianage must be provided to lower the water table in saline soils.

leaching process:-

In this process

⇒ land is flooded with water.

⇒ Alkaline salts will be dissolve in water.

⇒ percolation to the ground water.

⇒ Driainage by sub surface drains.

⇒ High salt resistant crop like rice are grown on leached land for one or two seasons.

⇒ Then ordinary crops like wheat or cotton are grown.

⇒ Then the land is said to have reclaimed.

⇒ When sodium carbonate is present in soil gypsum is added before leaching.

⇒ sodium sulphate is formed which is leached out easily.

$Na_2CO_3 CaSO_4 \rightarrow Na_2SO_4 + CaCO_3$

QNO2 Part (A)

ANS:-

Designing of an irrigation cannal by Kennedy's theory:-

⇒ Kennedy theory says that the silt carried by following water in a channal is kept suspension by the eddy current rising to the surface.

The equation choosen by Kennedy are

1) $Q = AV$

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

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

MKS system

$$C = \frac{41.65 + \frac{0.00281}{S} + \frac{1.811}{n}}{1 + \frac{n}{\sqrt{R}}\left(41.65 + \frac{0.00281}{S}\right)}$$

FPS system

3) $V_0 = 0.546\, m D^{0.64}$ MKS system

Following data should be known

⇒ Design Discharge (Q)

⇒ Slope (S).

⇒ Rugosity coefficient (n).

⇒ C.V.R = m = V/V_0.

Kennedy procedure for cannal design

Step#1:-

Assume the trial value of D put in eq (1) and determine

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

Step #2:-

In eq (i)

$$Q = AV$$

$$A = Q/V$$

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

$$P = B + D\sqrt{5}^{1/2}$$

For assumed D determine B

find $R = A/P$

Step #3:-

substitude the value of R in equation 2 (Kutter and Chazys equation) to obtain V which will be the actual velocity for assumed dimension.

Step # 4:

if the velocity worked out from eq (2). agrees with that of obtained with eq 3. (Kennedy eq). Then the assumed depth is correct. Otherwise repeat the procedure with changed value of D.

QNo 2 Part (B)

Numerical:-

Given:-

Discharge (Q) = 30 m^3/sec

cur (m) = 1

Bed slope = 1 in 5000

Depth (D) = 2.3 m

solution:-

Finding velocity by formula

$V_K = 0.546 m D^{0.64}$

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

$= \boxed{V_K = 0.930 m}$

⇒ Now calculating area of canal. by formula

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

$A = 30/0.930$

$\boxed{A = 32.25 m^2}$

⇒ Now we have to calculate B by using formula

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

by putting value

$A = BD + 0.5D^2$

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

$32.25 - 2.645 = 2.3(B)$

$29.605 - 2.3(B)$

$\boxed{B = 12.78 m}$

P.T.O

Page (8)

⇒ Now we have to calculate wetted perimeter so by formula

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

⇒ Now to calculate hydraulic radius

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

⇒ Now calculate mean velocity from chezy eq.

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

where

$$C = \frac{\frac{1}{n} + \left(23 + \frac{0.00155}{S}\right)}{1 + \left(23 + \frac{0.00155}{S}\right)\frac{n}{\sqrt{R}}} \Rightarrow \frac{1/0.0025 + \left(23 + \frac{0.00155}{1/5000}\right)}{1 + \left(23 + \frac{0.00155}{(1/5000)}\right) \times \left(\frac{0.0025}{\sqrt{1.79}}\right)}$$

$$C = 75.19/1.517 = 49.56$$

$$V_C = 49.56\left(1.79\left(\frac{1}{50000}\right)\right)^{1/2}$$

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

Scanned by TapScanner

Page (9)

Q NO 3 Part A

ANS:-

Differentiate btw initial and final regime according to laceys theory:-

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

⇒ He differentiated between initial regime and final regime but this theory is applicable to final regime.

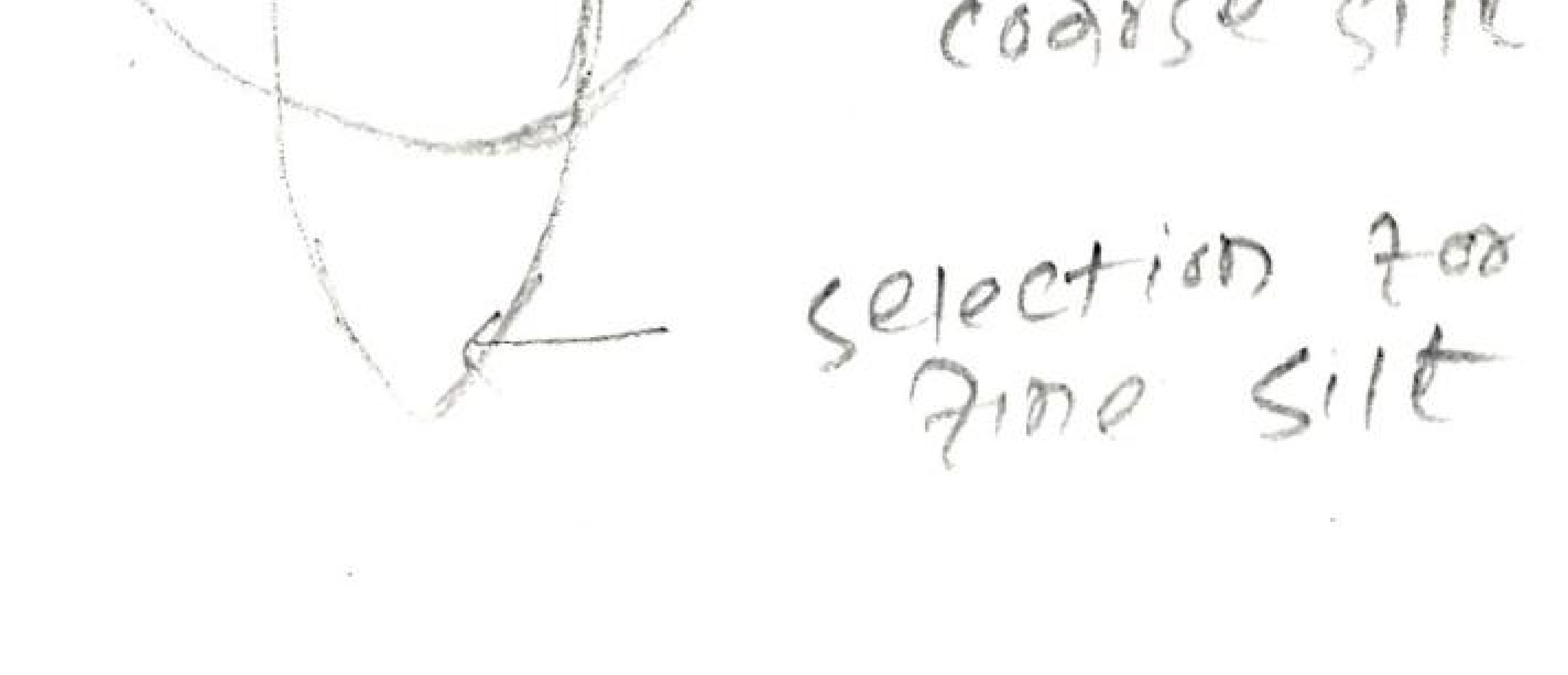
initial regime:-

⇒ When only bed slope of channel changes but the cross section remains same then also no silting or scouring take place. But this is rare.

final regime:-

⇒ 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.

In final regime the cross section assume semi ellipse shape.



Page (10)

QNO 3:-

Numericals-

Given:-

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

$m = 0.56\, mm$

Sol:- As

$\text{silt factor} = f = 1.76 \times M^{0.5}$

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

$\boxed{f = 1.3}$

Now

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

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

$\boxed{v_m = 0.844}\, m$

⇒ calculating area

$Q = AV$

$A = Q/V$

$30/0.844$

$\boxed{A = 35.54\, m^2}$

⇒ Now by formula

$P = 4.75\sqrt{Q}$

$P = 4.75\sqrt{30}$

$\boxed{P = 26.01\, m}$

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

$\boxed{R = 1.36}$

Scanned by TapScanner

Page (11)

We know that

$A = BD + D^2/2$

$35.54 = BD + D^2/2 \rightarrow (i)$

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

$26.01 = B + 2.236D$

$B = 26.01 - 2.236D \rightarrow (2)$

put eq 2 in eq (i)

$35.54 = (26.01 - 2.236D)D + D^2/2$

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

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

$35.54 = 26.01D - 1.736D^2$

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

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

by quadratic equation

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

$\boxed{D = 1.52}$ put in eq (2)

$B = 26.01 - 2.236(1.52)$

$\boxed{B = 22.611}$

$$S = \frac{7^{(5/3)}}{3340\,Q^{1/6}}$$

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

$\boxed{S = 0.00026}$

QNO 4:- Part A

ANS:- Head works:-

⇒ Any hydraulic structure which supplies water to the off-taking cannal is called a headwork.

⇒ Headwork may be divided into two

i) Storage head work

ii) Diversion head work

Components of head work:-

⇒ **weir or Barrage:-**

⇒ Weir is a structure constructed across river to raise the water level and divert the water into the canal. weir aligned at right angles to the direction flow. shutters are provides at the crest of the weir so that part of raising up of water is carried out by shutters.

Divide wall:-

⇒ long wall constructed at right angles in the weir or barrage, with stone mansory 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.

Page (13)

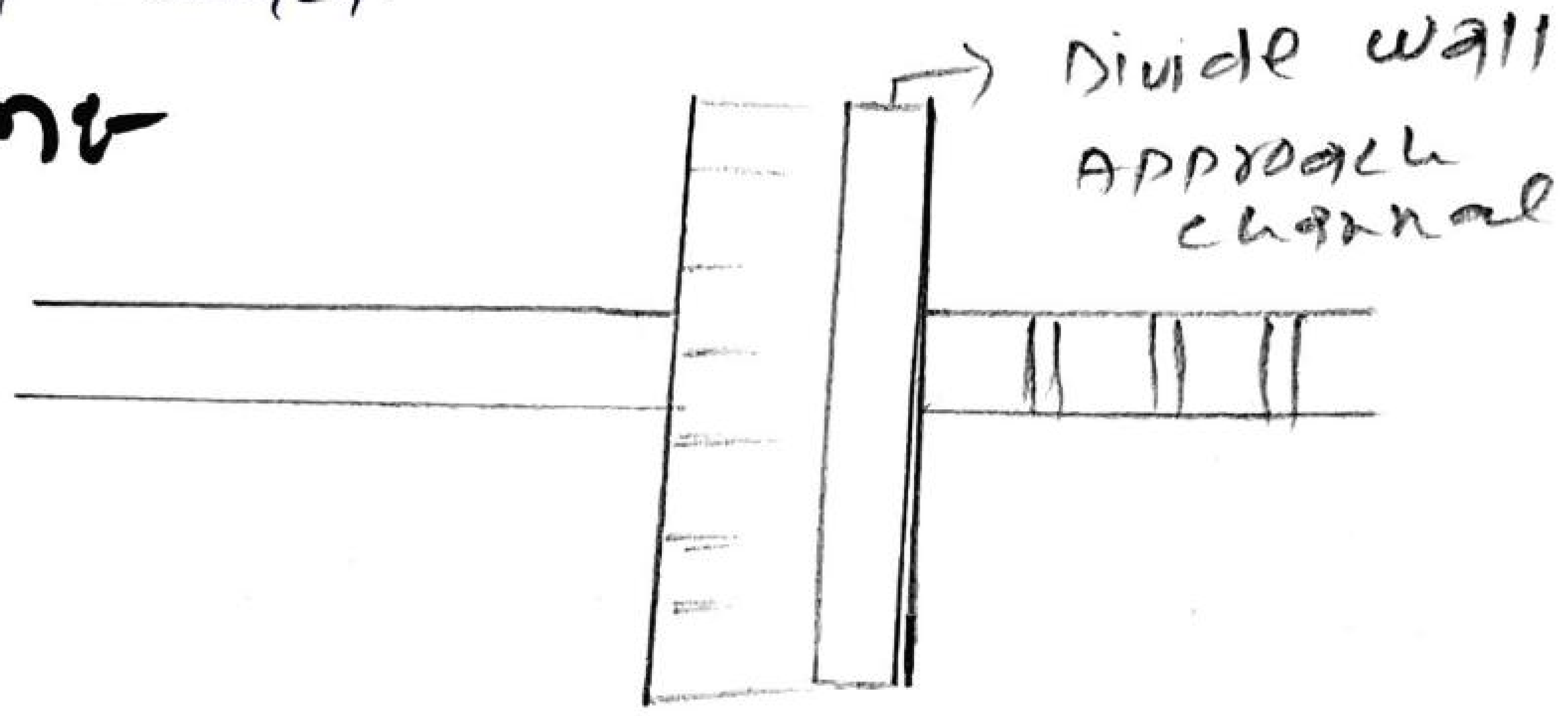
Function:-

⇒ Form a still water pocket in front of the canal head in which helps in settling of silt.

⇒ controls the eddy current or cross current in front of the cannal head.

⇒ provides a straight approach in front of the cannal head.

Diagram:-

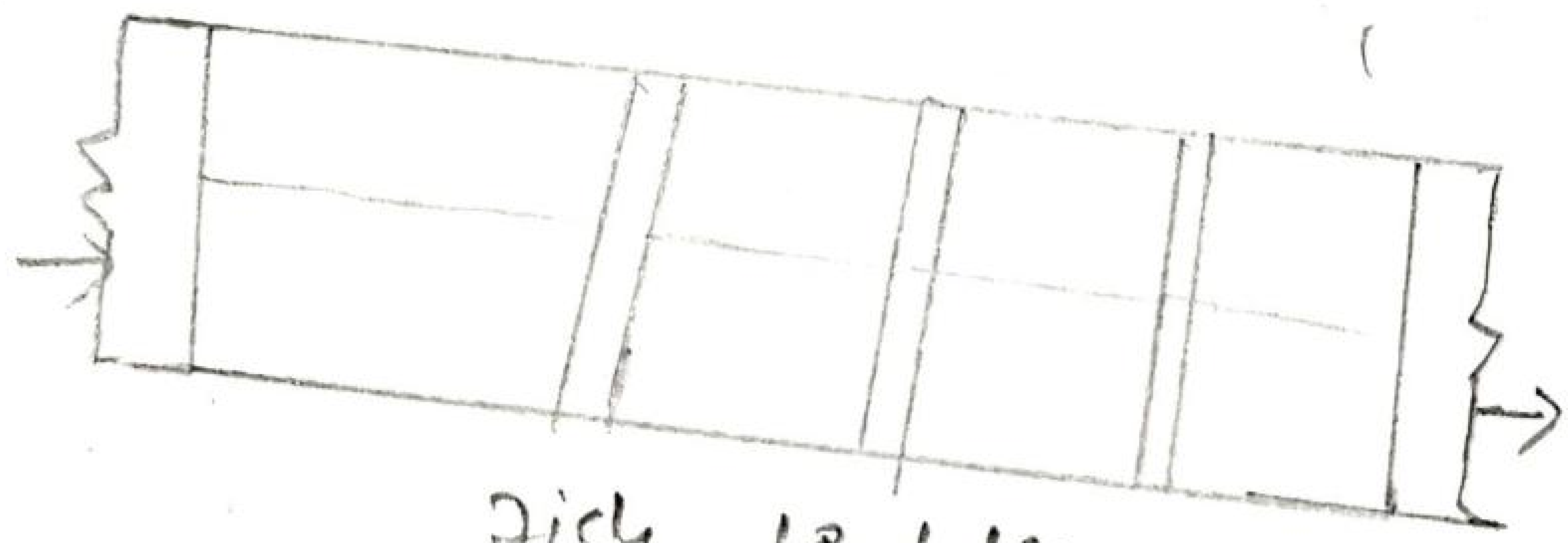


Fish ladder:-

⇒ consists of an inclined channel with a slope not exceeding 1 in 10.

⇒ The compartment of bays of fish ladder should be sufficiently large so that the fish do not collide with sides of the bay when ascending.

Diagram:-



fish ladder

Silt excluder:-

- Device to exclude silt from water entering the cannal.
- Consists of a number of rectangular tunnels.
- The tunnels are of different lengths.
- The length of the tunnels gradually decreases as the distance of the head regulator.

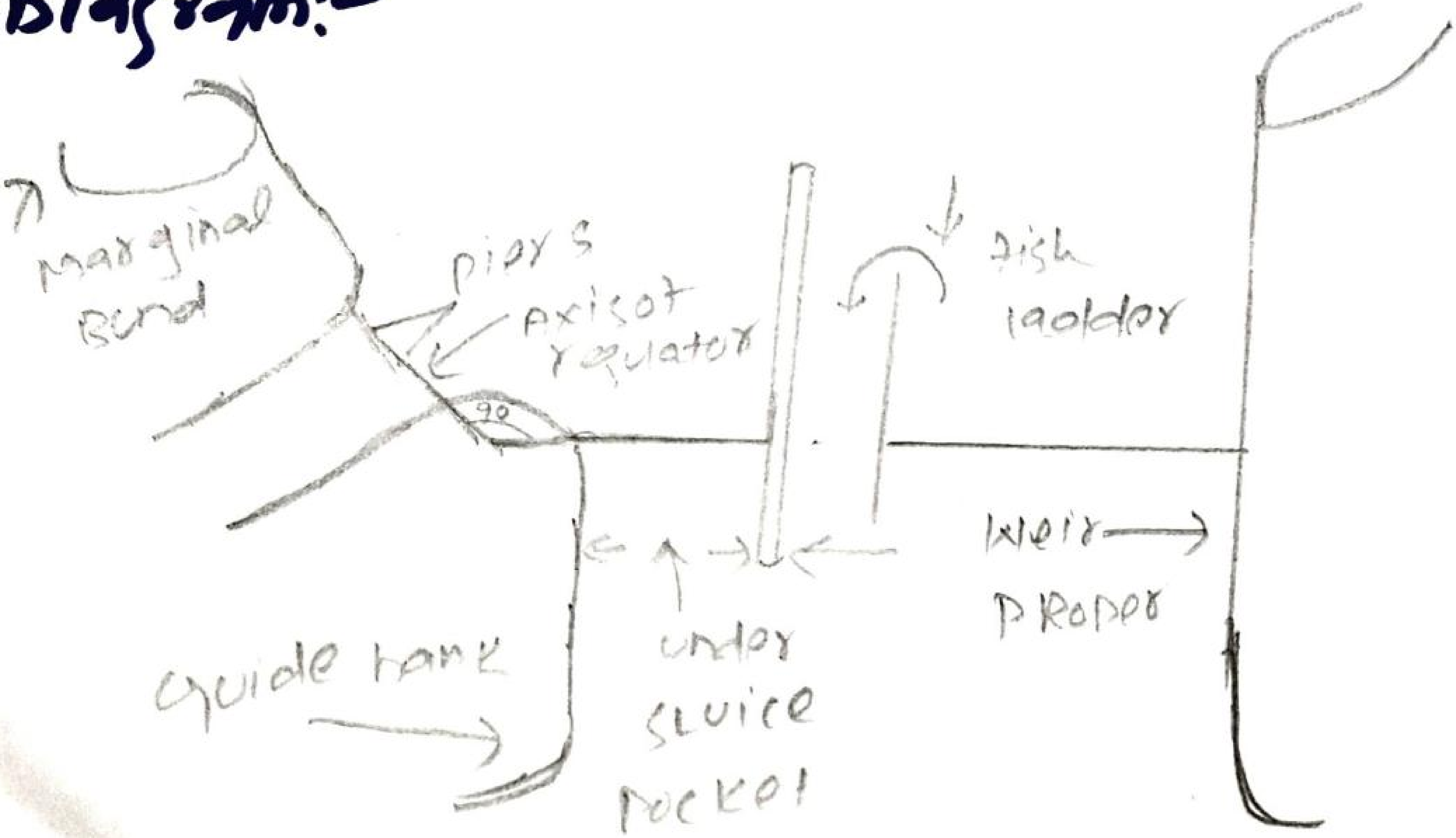
Canal head regulator:-

- A structure which is constructed at the head of the canal to regulate flow of water is known as canal head regulator.
- It consist of no of piers which divide the total width of the cannel into a number of span which are known as bays.
- The piers consist of number tiers on which the adjustable gates are placed.

Function:-

- It regulates the supply of water entering the cana
- It controls the entry of silt in the canal.

Diagram:-



Page (15)

QNo4 part (B)

ANS:-

Function of head regulator

⇒ It regulates the supply of water entering the canal.

⇒ It controls 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 and observed head of water on the crest.