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- Subject — Irrigation engineering
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Question No# 1

Part (A)

Explain Anti. water-logging measures

Answer:-

Following are the anti water logging measures.

→ **Lining of Canals and water courses:-**

It reduce seepage of water.

P.T.O

→ **Reducing intensity of irrigation:-**

→ only small portion of land should be recieve canal water in one particular season.

→ Redmining areas can be recieve water in next season by rotation.

→ **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 ~~area~~ quantity of water rather then 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.

→ **Pumping or Tubewells :-**

lift irrigation should be introduced to use Gw. Canal irrigation may be substituded by the well irrigation.

∴

⇒ **Adoption of sprinkler method of irrigation :-**

→ only predekermined amount of water is supplied to land

→ No percolation from water courses.

Question No # (1)
Part (B)

Differentiate between saline and alkaline soil.

Answer:

Saline Soil.	Alkaline Soil.
Soil having PH between 7 and 8.5 and also an exchangable Sodium percentage below 15% are called saline soil	Soil having PH greather then 8.5 and also an exchangable Sodium percentage greather then 51%. are called alkaline soil.

Saline soil	Alkaline soil
electrical Conductivity is 4 or more mmhos/cm	electrical Conductivity is usually less than 4mmhos/cm
Organic matter content is high	Organic matter content is low.
Colour of the soil is white or light gray	Colour of the soil is black.

Question No# 1

Part (c)

How do yo reclaim salt affected lands?

Answer:-

⇒ **Reclamination of Salt effect Land:-**

→ By maintaing the water table suffiently below the root.

→ Hence all the measure which ~~are~~ were suggested ~~from~~ for preventing water dogging hold good for preventing ~~san~~ Salinity of land.

→ An efficient drainage (surface and sub surface) must be provided to lower the water table in saline soil

→ Land should be flooded with water so that alkaline salts will be disolved in water.

Question No # 2 (9)

Part (A)

Explain the procedure of designing of an irrigation Canal by Kennedy's theory?

Answer :-

The following steps will be taken when we will designing irrigation Canal by Kennedy's Theory:-

→ **STEP No # 1**

Assume the trail value of D and put in equ. 1 and determine

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

→ STEP No # 2

In Equation .1

$$Q = AV$$

$$A = Q/V$$

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

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

For Assume D determine B

Fin $R = A/P$

⇒ STEP No # 3

substitute the values of R in equ. 2 (Kutters and Chazys Eqn) to obtain v which will be the actual velocity of assumed dimensions.

⇒ STEP No # 4

If velocity worked out from Eqn.2 agrees with that of obtained with the Eqn 3 (Kennedeys Eqn.). Then the assumed depth is correct. Other wise repeat the procedure with * changed values of D.

Question No #2 (12)

Part (B)

Design an irrigation channel by Kennedy's theory to carry a discharge of 30 ~~cm~~ 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

Answer:-

Given Data:-

Discharge (Q) = $30 m^3/se$

$C V_r = 1$

$N = 0.0225$

Bed slope = 2.3m

Depth (D) = 2.3m.

Solution:-

Finding velocity, By formula.

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

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

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

Now Area of canal:-

$$Q = AV$$

$$A = 30/0.930$$

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

Now Calculate B:-

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

$$BD + 0.5 D^2$$

Now Calculate Hydraulic Radius:-

$$R = \frac{A}{P}$$

$$R = \frac{32.25}{18.01}$$

$$\boxed{R = 1.79\,m}$$

Now Calculate Velocity from Chezy Equation:- ∴

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

$$C = \frac{\frac{1}{0.0225} + \left(23 + \frac{0.00155}{(1/5000)}\right)}{1 + \left(23 + \frac{0.00155}{(1/5000)}\right) \times \left(\frac{0.0225}{(1.79)}\right)}$$

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

$$V_C = 49.56\left(1.79\left(\frac{1}{5000}\right)\right)^{1/2} = \boxed{0.93\ m}$$

Question No # 3

Part (A)

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

Answer :-

Initial regime :-

A channel is said to be initial regime condition when only the bed slope of channel gets & affected by silting and scouring anel other parameters are independent even in non silting and nun scouring velocity condition.

Final Regime:-

If all the parameters (perimeter, depth and slops) have equally free to vary and adjust according to discharge and silts grades then the channel is said to have final regime.

Question No # 3 (18)

Part (B)

Design a regime channd by Laceys theory for discharge of 30 cumecs and mean ~~discharge~~ diameter of silt Particles of 0.56mm.

Answer:

Given Data:

$Q = 30 m^3/sec$

$M = 0.56 mm$

Solution:

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

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

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

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

$$Vm = 0.844$$

$$Q = AV$$

$$A = \frac{Q}{V} = \frac{30}{0.844}$$

$$A = 35.54$$

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

$$P = 4.75\sqrt{30}$$

$$P = 26.01$$

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

$$\boxed{R = 1.36}$$

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

$$35.54 = BD + \frac{D^2}{2} \quad \text{—— (1)}$$

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

$$26.01 = B + 2.236D$$

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

put eq (2) in eq (1)

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

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

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

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

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

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

By Quadratic equation

P. T. O

$$D = \frac{-(26.01) + \sqrt{(26.01)^2 - 4(-1.731)(-35.54)}}{2(-1.736)}$$

$$D = 1.52$$

Put in eqn (1)

$$B = 26.01 - 2.36(1.52)$$

$$\boxed{B = 22.611}$$

$$S = \frac{f^{(5/3)}}{3.340\,Q^{1/2}}$$

$$S = \frac{(1.3)^{5/3}}{3340\,(30)^{1/2}}$$

$$\boxed{S = 0.00026}$$

Question No #4 (22)

Part (A)

Explain the components of headwork with neat diagram.

Answer :-

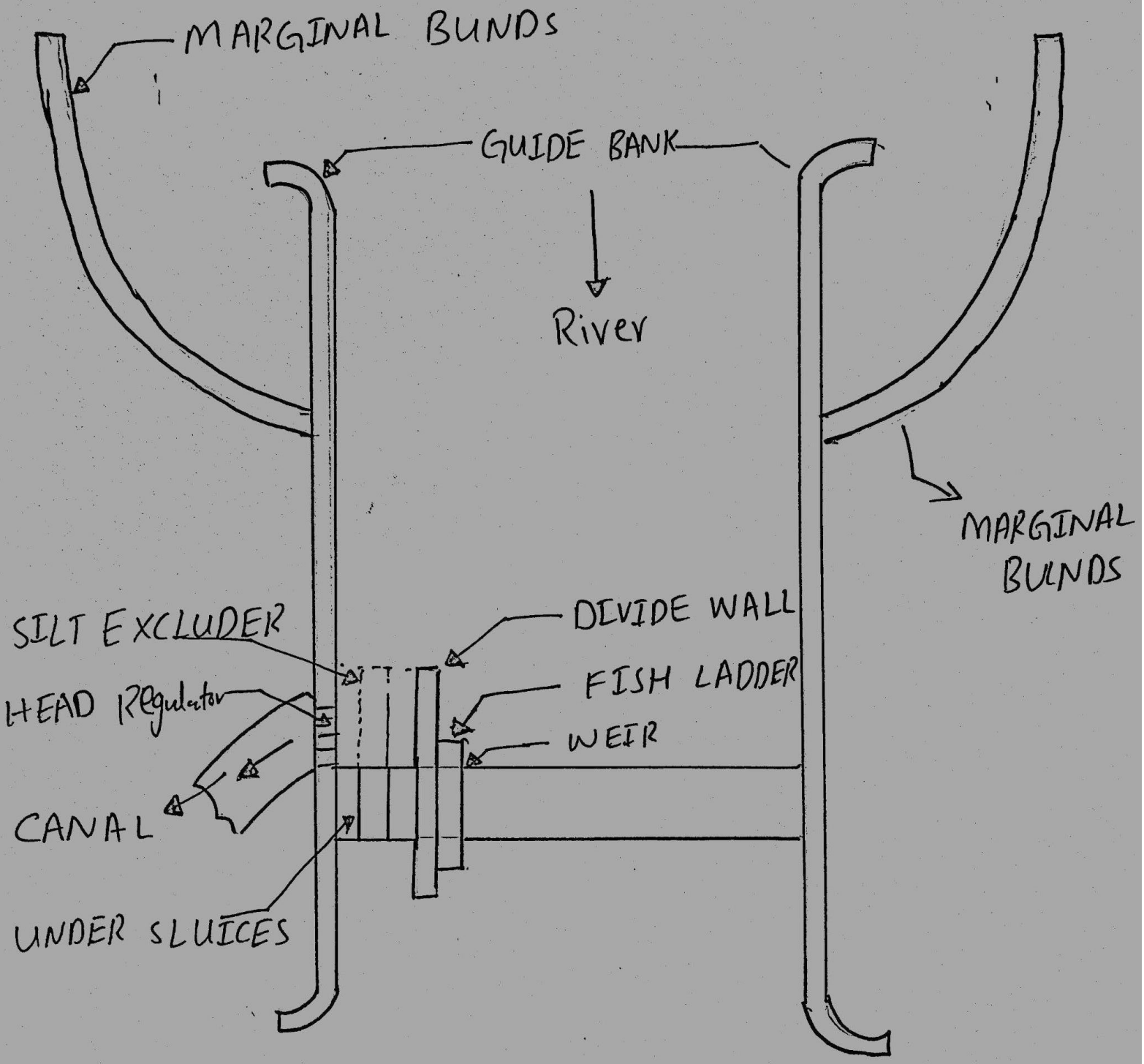
Headwork:

A hydraulic structure which supplies water to the off-taking canal is called head work.

Head work is divided into two catogeries.

(1) Storage head work

(2) Diversion head work.


MARGINAL BUNDS
GUIDE BANK
River
MARGINAL BUNDS
SILT EXCLUDER
DIVIDE WALL
FISH LADDER
HEAD Regulator
WEIR
CANAL
UNDER SLUICES

Components of diversion headwork.

→ weir or barrage

→ undersluices

→ Divide wall

→ Fish ladder

→ Canal head regulator

→ Silt excluders/ silt prevention devices

→ River traing works

Weir:-

Normally the water level of any perennial river is such that it can not be diverted to the irrigation canal

→ The bed level of the canal may be higher than the existing water level of the river.

→ In such case weir is constructed across the river to raise the water level

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 shutters at different tives over the weir.

Divide wall:-

A divide wall is constructed parallel to the direction of flow of river to seperate the weir section and undersluices section to avoid flows.

Undersluices :-

→ They mantain a clear well defined river channel in front of the head regulator.

→ They are used to socur away the silt deposited in the front of the head regulator.

Fish ladder :-

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

Canal head regulator:-

A structure which is constructed at the head of the canal to regulate flow of water is know as canal head regulator.

Silt Excluders:-

The silt excluder is located on the u/s of diversion weir and in front of the head regulator and the object to remove silt that has entered in the silting basin through scouring sluices.

River training work:

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.

Question No #4 (30)

Part (B)

What are the function of head regulators?

Answer:-

Functions of Head Regulator:

⇒ To control the entry of water either from the reservior or from the main Canal.

⇒ To Control the entry of silt into off taking or main Canal.

→ To serve as a meter for measuring discharge of water

→ It prevents the river floods from entering the canal.

→ To serve for measurment of discharge.