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Section	A
Program	(BE (Civil)
Paper	Irrigation Engineering
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as Canal

Q No (01)

Part (a) :-

Explain Anti water logging measures.

Ans :→

Anti water logging means the quantity of water into soil below the ground is reduced.
Some of the measure to control water logging are given below.

↳ control of Canal Seepage :-
Cannal Seepage is major source of water losses and water logging in irregated areas and it can be control by
→ lining of canal by impervious material.
→ convert water system from canal to piped.

↳ Reducing intensity of irrigation :-
The most important aspect to avoid water logging is to provide the water to the small portion of the land. where neccessory.
→ Applying only the required amount of water so that all the water applied are used by the plant
→ use efficient irrigation method i-e Drip irrigation.

↳ Rotation of Crop :-

It means that we should plant crops in such a way that it prevent the land from water logging.

→ Crops which are used large amount of water should be followed by those plant which is used less water or no water.

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Q no 01.

Part (b) :-

Differentiat between Saline & alkalin Soils

Ans :→

Differentiation

Saline Soil	Alkaline Soil
1→ Mainly Cl^- & SO_4^{2-} of Na^+ but also Cl^- SO_4^{2-} & HCO^- of Ca^{2+} and Mg^{2+} in Small amount	1→ Mainly CO_3^{2-} of Na^+ but also CO_3^{2-} of K^+, Ca^{2+} and Mg^{2+} in Small amount.
2- Soluble Salt Concentration is equal to or more then 0.1%	2→ Soluble Salt Conc is less then 0.1%
3→ Exchangeable Sodium is less the 15%	3→ ESP > 15%
4→ PH < 8.5	4→ PH > 8.5

5→ EC of Saturated Soluble extract at 25°C is more then or equal to 4 milli mho per cm i-e EC > 4 mmho/cm	5→ EC < 4 mmho/cm
6→ White/light grey Color hence called white alkali	6→ Black Coloured hence called black alkali.
7→ Flocculated Soils Therefore Soil, aeration and permeability is normal.	7→ Dispersed & compact Soil aeration and permeability is low.
8→ O.M or humus is always found in Soil	8→ very less amount of OM or humus or even absent.
9→ Easy to manage because of physical condition	Not easy to manage because of Physical condition.

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Q No (01).

part c:-

Reclamation of Salt effected lands

Ans:-

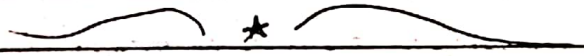
→ By maintaining the water table Suffering below the Root Sufficietny.

→ Hence all the measurs which were Suggested for preventing water logging. hold good for preventing salinity of lands.

→ An efficient drainage must be provided to lower the water is Saline Soils.

→ Create good Surface and Internal drainage.

The use of tile drainge and open ditches in the field can increase drainge and remove Some of the Salt.



Q no (02)

Part (a)

Ans:-

Kennedy procedure for canal design

Step 1:-

Assume the trial value of D and put in eq 1 and Determine

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

Step 2:-

In Eq 1 $Q = AV$

So

$$A = Q/V$$

Therefore

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

& So

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

For Assumed D Determine B & Find $R = A/P$

Step 3:-

Substitute the value of R in eq 2 (kutters and chazys Eq) to obtain V which will be the actual velocity for assumed dimensions.

Step 4:-

If the velocity worked out from Eq 2 agrees with that of obtained with the eq 3 (Kennedeys Eq). Then the assumed depth is correct. Other wise Repeat the procedure with changed value of D.

Q No (2)

part B :→

Given Data

$Q = 30\ m^3/sec$

C.V.R = $m = 1$

CV = 0.0225

S = 1/5000

Sol :→

Assuming the Depth which is

So $D = 2.4m$

Trial 1 :-

Step 01 :→

$V_o = 0.55m D^{0.64}$

$V_o = 0.55 \times 1 \times (2.4)^{0.64}$

$\boxed{V_o = 0.963}$

Step 02 :-

$Q = AV$

$A = Q/V$

Further $A = 30/0.963$

$\boxed{A = 31.153}$

$A = BD + D^2/2$

$31.153 = B \times 2.4 + \frac{(2.4)^2}{2}$

$\boxed{B = 11.78m}$

$$P = B + 2\sqrt{5}$$

$$P = 11.78 + 2.4\sqrt{5}$$

$$\boxed{P = 17.146 m}$$

$$R = A/P \Rightarrow \frac{31.153}{17.146}$$

$$\boxed{R = 1.82}$$

Step 3:-

$$V = C(\sqrt{RS})$$

$$C = \frac{1}{0.025 + \frac{\left(23 + \frac{0.00155}{0.0002}\right) \times \frac{0.0025}{\sqrt{1.82}}}{1 + \left(23 + \frac{0.00155}{0.0002}\right)}}$$

$$C = \frac{75.194}{1.513}$$

$$\boxed{C = 49.703}$$

$$V = C(\sqrt{RS})$$

$$V = 49.703 \times \sqrt{1.82 \times .0002}$$

$$\boxed{V = 0.948}$$

As V is less $V = 0.96$ so decrease the depth to $2 = 2.3$

So

Trial 2

Due to the shortage of time the 2nd trial value will directly calculated.

$$2 = 2.3$$

Step 01:-

$$V_0 = 0.55 \times 1 \times (2.3)^{0.64}$$

$$\boxed{V_0 = 0.937 m/sec}$$

Step 02:-

$$A = Q/V = 30/0.937$$

$$\boxed{A = 32.017\ m^2}$$

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

$$\boxed{B = 12.17\ m}$$

$$P = B + 1.5\sqrt{5}$$

$$\boxed{P = 17.913}$$

Step 3:-

$$C = \frac{75.195}{1.518}$$

$$\boxed{C = 49.535}$$

$$R = A/P$$

$$\boxed{R = 1.787}$$

$$V = Ca\sqrt{RS}$$

$$V = 49.535\sqrt{1.787 \times 0.002}$$

$V = 0.93\ m/s$ which is now equal to V_0

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Q.No (03)

Part a) :→

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

Ans:→

According to Lacey the channel is though than with no silting or scouring may actually be not in regime.

Further he differentiat b/w 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 also this is rare.

→ Final regime:-

→ If all the parameters (perimeter, slope and depth) 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 assumes semi ellipse shape.

Q NO (03)

Part B:-

Given Data.

$Q = 30\ m^3/sec$

$M = 0.56\ mm$

Sol:-

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

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

$\boxed{f = 1.3}$

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

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

$V_m = 0.844$

$Q = AV \Rightarrow A = Q/V = \frac{30}{0.844}$

$A = 35.54$

$P = 4.75\sqrt{Q}$

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

$R = \frac{5}{2} \times \frac{V^2}{f} = 5/2 \times \frac{(0.844)}{1.3} \Rightarrow \boxed{R = 1.36}$

$A = BD + D^2/2$

$35.54 = BD + \frac{D^2}{2}$ — ①

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

$26.01 = B + 2.236D \Rightarrow B = 26.01 - 2.23D$ — ②

Put eq (2) in eq (1)

$$\Rightarrow \quad 35.54 = (26.01 - 2.236\,I)I + I^2/2$$

$$35.54 = 26.01\,I - 2.236\,I^2 + 0.5\,I^2$$

$$35.54 = 26.01\,I - 1.736\,I^2$$

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

By quadratic formula

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

Simplify

$$\boxed{I = 1.52}$$

Put this value in eq (2)

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

$$\boxed{B = 22.611}$$

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

$$S = \frac{(1.7)^{5/3}}{3340(30)^{1/6}}$$

$$\boxed{S = 0.00026}$$

Q no (04)

Part (a) :→

Ans :→

↳ Head work :-

Any hydroulic Structure which Supplies water to the off-Tacking channel is called a Head work

This may be Devided into two

i→ Storage head work

ii→ Diversion head work

Component of Head work :-

Following are Some basic components of Head work.

↳ weir or Barrage :-

weir is a Structure Constructed across river to raise the water level and divert the water into canal. weir alinged at right angle to the direction of flow. Shutter are provided at the crest of the weir so that part of raising up of water is carried out by Shutter.

Divide wall :-

Long wall Constructed at right angle in the weir or barrage with Shone 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.

Functions :-

→ Form a still water pocket in front of the canal head in which helps in setting of silt.

→ Also controls the eddy current or cross current in front of the canal head.

→ Also it provide straight + approach in front of

↳ Fish ladder :-

→ consists of an inclined channel with a slope not exceding 1 in 10.

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

↳ Silt excluder :-

→ Device to exclude silt from water entering the cannal.

→ Consists of number of rectangular Tunnels.

→ The tunnels are of different length.

→ The length of the Tunnels gradually decrease as the distance of the hard regulator.

↳ 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.

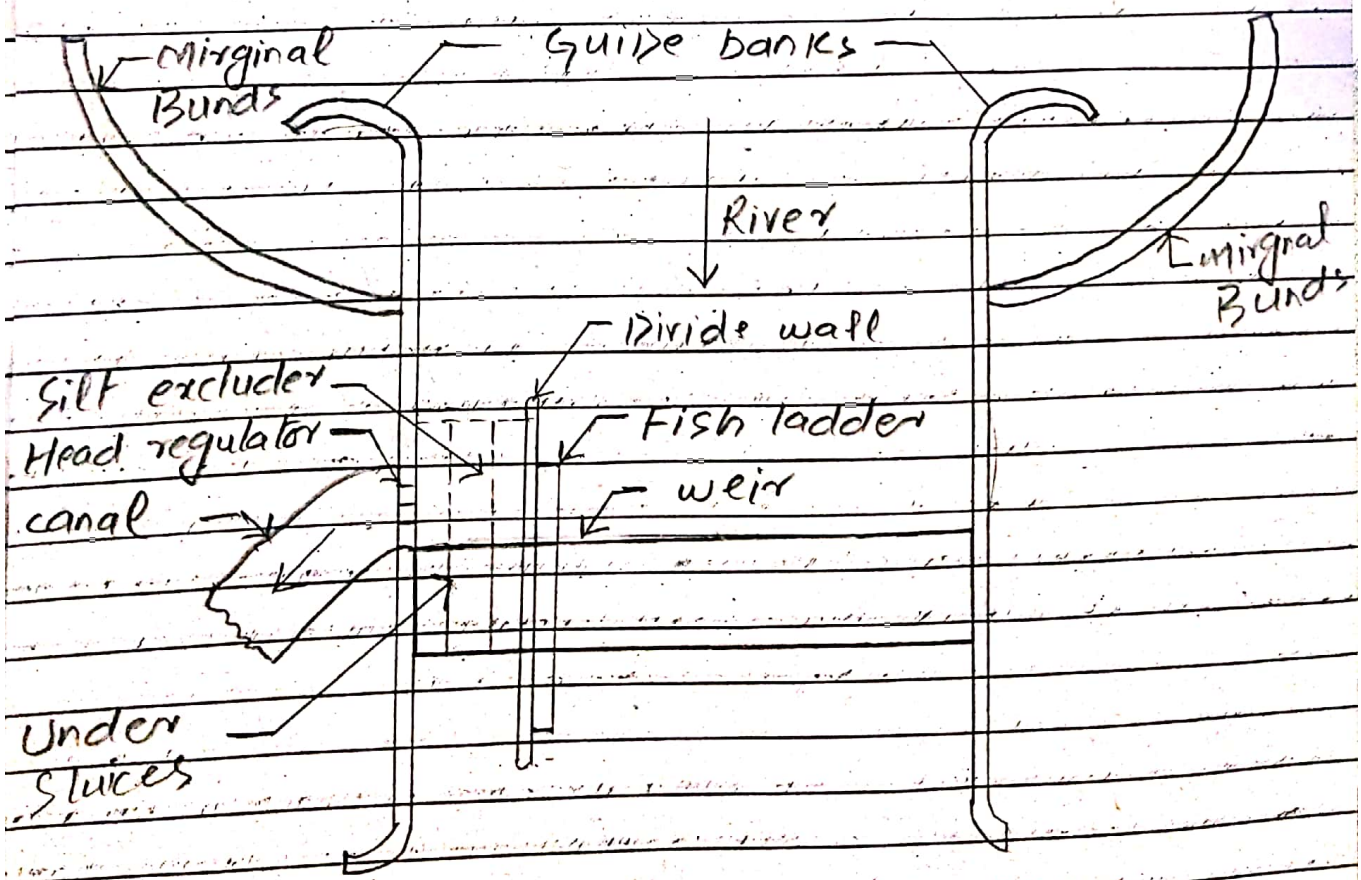
→ The piers consist of number tiers on which the adjustable gates are placed.

→ Functions :-

→ It regulates the supply of water entering the canal.

→ It also control the entry of silt in the canal.

Neat Diagram



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Q No (04)

part B :→

Ans :- **Head Regulator :-**

Regulator constructed at the off taking point are called head Regulator. when it is constructed at the head of the main canal it is then know as canal head Regulator. and when it is constructed at the head of Distributary it is call distributory ~~Canal~~ head. Regulator.

Functions of Head Regulator :-

→ It Regulates the Supply of water entering the canal.
→ It control the entry of silt in the canal.
→ It prevents the rivers Floods from entering the canal.
→ To indicate the discharge passed into the canals from Design discharge formula and observed head of water on the Crest Head Regulater is used.

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