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Q.NO#1:
(Part A)

Answer:

Anti-water logging measure:
OR
Methods of control of Water logging:

To control water logging several methods are used.

1) **Lining of Canals and Water Courses:**

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 recieve water in next season by rotation.

3) **By Introducing crop rotation:**

- High water requiring crop should be followed by one required requiring less water, and then by one requiring 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 educated 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 tubewells or Vertical Drainage.

7) Economical use of water according to need.

8) Adoption of Sprinkler method of irrigation.

- Only Predetermined amount of Water is supplied to land.
- No percolation losses from Water courses.

Q.No #1
Part B

Answer:

Differentiate between Saline and Alakine Salt:

Saline Salt	Alakine Salt
1- Saline soil contain high content of soluble salts.	1- Alkaline soil are clay soil
2- They have less PH i-e 7-8.5	2- They have high PH i-e greater than 8.5.
3- It is basic in nature.	3- They are more basic.
4. Dominating compound is Sodium.	4- Dominating compound is Sodium Carbonate.

Q.No#1
(Part C)

Answer:

Reclamation of Saline 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 upward and salts 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 Efflorescence.

Land affected by efflorescence is called saline soil. Salts surrounding the roots reduce the osmotic activity of plants.

Management of Salt affected soils:

- The white surface crusting in areas of fields or some areas that are wetter than others after a few days of rain, this could be an indication of salt-affected soil.

Steps of management:

The very first step to managing salt-affected soils is to understand and identify them.

- Salt can be leached out of the root zone through good quality irrigation water or by heavy rainfall.

- Create good surface and internal drainage. The use of tile drains and open ditches in the fields can increase drainage and remove some of the salts.

- Breake the compacted layers that occur near or at the soil surface.

- Add organic matter, such as rotted hay or feedlot manure, at 10-15 tons/acre to improve soil porosity.

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Q.NO#2 :-

part A :-

Ans :-

Kennedy procedure for canal Design:-

Step NO#1:- Assume the trail value of D and put in eq(1) and determine $V_o = 0.54 m D^{0.64}$

Step NO#2: in eq 1 $\because Q = AV$

$$A = Q/V$$

$$A = BD + D^2/2 \Rightarrow P = B + D^{1/2}$$

For Assumed D determine B, Find $R = A/P$

Step NO#3:- Substitute the value R in eq 2 (Kutter and cheezy equcation) to obtain V which will be the actual velocity for assumed dimension.

Step NO#4:- if the velocity worked out from eq(2) agrees with that of obtained (V) with eq(3). Then assumed depth is correct. otherwise repeat the procedure with changed value of (D).

Kennedys Theory :- R.G. Kennedy studied straight reaches of upper Bari Doab Cannal 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.

* Sediment is kept in suspension soley by the vertical component of eddies.
  - Weight of the sediment vertically acts downward.
  - Vertical component of eddies acts upward.
  - Result the sediment is in suspension.

$V_0 = 0.84 D^{0.64}$ FPS System.

$V_0 = 0.546 D^{0.64}$ MKS system, D is depth.

$V_0 = 0.546 m D^{0.64}$ where $m = V/V_0$ = Critical velocity ratio (C.V.R) depends upon silt grade.

V = Critical velocity for all size of sediment, V_0 is V_{cr} for upper Bari Doab canal only.

n various regions

Types of silt load in the canal	Value of n
Westen Ghat fine salt	0.53
In Punjab Sandy salt	0.64
Himalayn Sandy salt	0.69

Values of C and n for various regions

Region	C	n
Upper Bari Canal	0.546	0.64
lower Chenab	0.518	0.50
Krishna Delta region	0.532	0.52

(Part - B)

Design an irrigation channel by Kennedy's theory to carry a discharge of 30 m^3/sec 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:

Discharge (Q) = 30 m^3/sec

Cvr (m) = 1

N = 0.0225

Bed slope = 1 in 5000

Depth (D) = 2.3 m.

Solution:

Finding velocity.

By using formula:

$V_K = 0.546 m D^{0.64}$

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

$\Rightarrow V_K = 0.930 m$

Now, calculate Hydraulic Radius

formula ⇒ $R = A/P$

by putting values

$R = 32.25 / 18.01$

$\Rightarrow R = 1.79\,m$

To calculate mean velocity from chezy equation.

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

where

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

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

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

$V_c = 49.56\left(1.79\left(1/5000\right)\right)^{1/2}$

$V_c = 0.93 \Rightarrow (V_c = 0.93\,m.)$ Ans

Now calculating Area of Canal:

By formula,

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

$A = 30/0.930$

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

Now, we have to calculate B,

By using formula:

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

$\Rightarrow BD + 0.5D^2$

By putting values:

$A = BD + 0.5D^2$

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

$32.25 - 2.645 = 2.3(B)$

$29.605 = 2.3(B)$

$\Rightarrow B = 12.87 m.$

Now, calculate wetted perimeter, so, by formula,

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

$= 12.87 + \sqrt{5}(2.3)$

$\Rightarrow P = 18.01 m.$

Q.NO#3:-

Part A:-

Ans:- **Laceys Regime Theory:-**

Geled lecay 1930

Lacey Followed Lindley's hypothesis:- Dimensions and slope of a channel to cary a given discharge and sil load easily erodable soil are uniquely determined by nature

According to lacey:- Silt is kept in suspension by the verticale component of eddies generated at all points of forces normal to the wetted perimeter.

Regime channel:- A channel is said to in regime. if there is neither silting nor scouring

According to lacey there be three regime condition

(i) True regime.
(ii) Initial regime
(iii) Final regime

(ii) Initial regime

* Bed slope of a channel varies
* Cross-section or wetted perimeter remains unaffected.

Final Regime :-

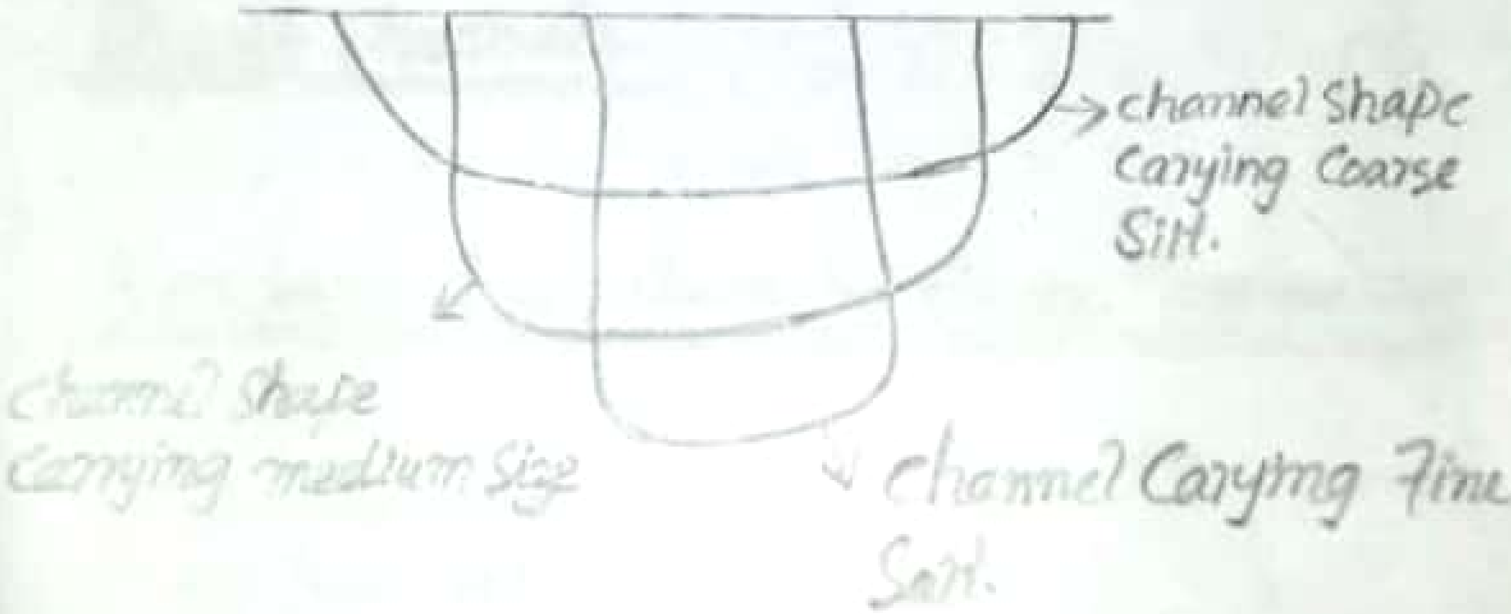
All the variable Such as Perimeter, depth, Slope etc are equally free to vary and achive Permanent Stability Called Final regime.

* In Such channel :-

· The coarser the silt, the flatter is the Semi-ellipse.

· the finer the silt, the more nearly the Section attains a Semi-Circle.

Daigrame :-



Q.NO#3:-
Part B:-
Ans:-

Given Data:-

$Q = 30 m^3/sec$

$M = 0.56 mm$

Solution:-

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

$f = 1.3$

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

$V_m = 0.844$

$Q = AV \Rightarrow A = Q/V = \frac{30}{0.844}$ $A = 35.54$

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

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

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

$B = 26.01 - 2.236D \rightarrow (2)$ put eq (2) in eq (1)

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

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

By Quadratic EQ

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

$D = 1.52$ put in eq ②

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

$$\beta = 22.611$$

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

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

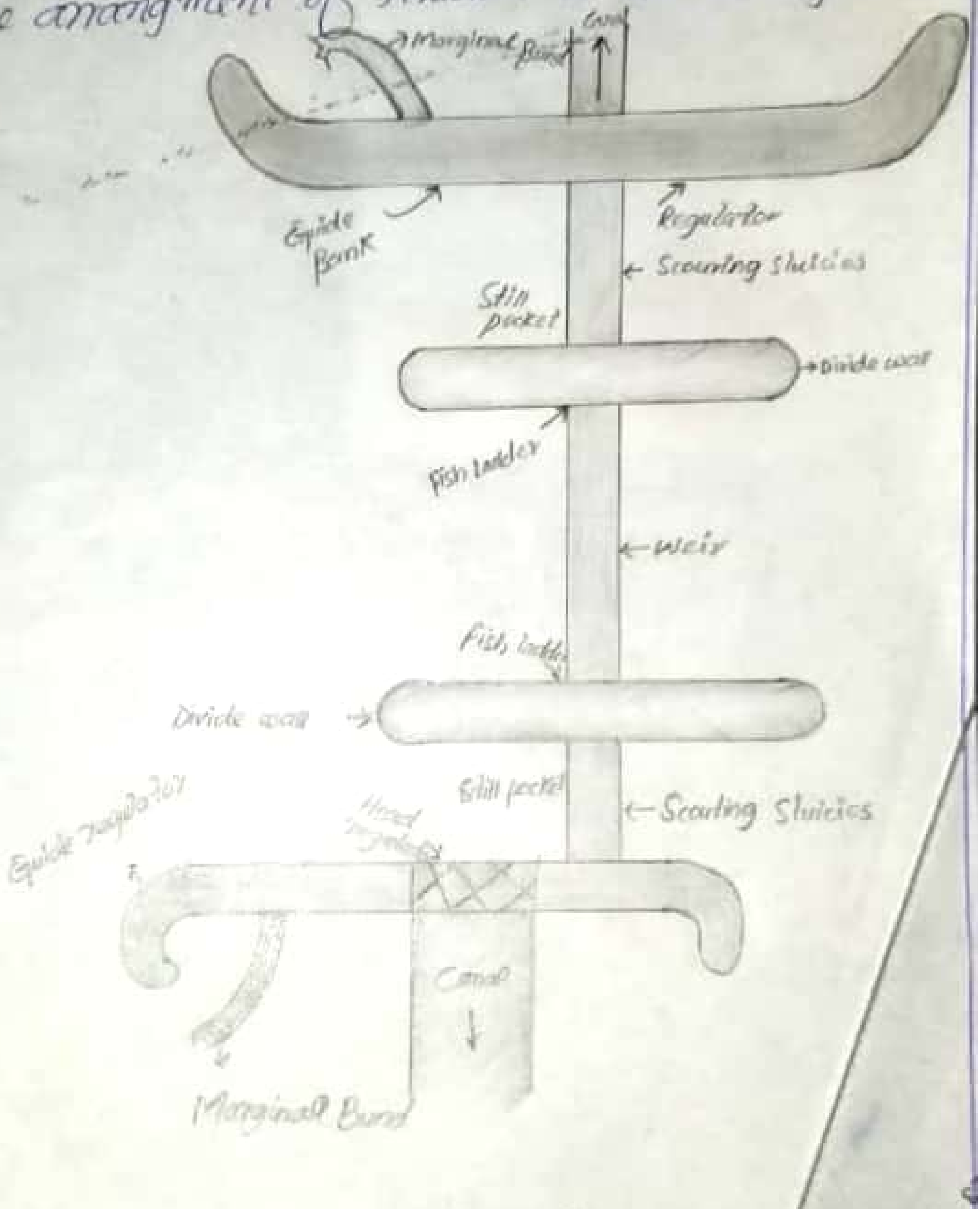
$S = 0.00026$

Q.NO# 4 :-

part A :-

Ans :- **Components of headwork with Daig:-**

The arrangment of structure as shown in Fig.



* Layout Head works

1. Weir or Anicut:-

A weir is an obstruction or a barrier constructed across the river. The obstruction is of smaller height in comparision with a dam it raises the water level locally and supports the water against its face. thus the diversion of the water from the river into the canal take place. So far as possible weire is aligned at right angles to the direction of flow of water in the river.

2) Divide Wall:-

Divide wall is a long wall constructed at right angle in weir, it may be constructed with stone masonary or cement concrete.

Function of Divide Wall:-

1) To form a still water pocket in the front of the canal head so that the suspended silt can be settled down which then later be cleaned through the scouring sluices from time to time.

2) It resist the overturning effect on the weir or barrage caused by the pressure of the impounding water.

3) Under Sluices:-

Also known as scouring sluices. The under sluices are the opening are provided with adjustable gates, Normally, the gates are kept closed.

4) 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.

5) Fish Ladder:- 1) The fish ladder is provided just by the side of the divide wall for free movement of fishes.

2) Fish ladder rivers are important source of fishes.

6) Canal head regulator:- 1) A structure which is constructed at the head of the canal to regulate flow of water is known as canal head regulator.

2). Again some piers are constructed on the down stream side of the canal head to support the roadway.

7) Silt Ejectors:- Silt ejectors, also called silt extractors are those devices which extract the silt from the canal.

8) Silt Regulator works:-

The entry of silt into canal which takes off from a head works.

Q.No#(04)

(Part#B)

Answer:

Canal Head Regulator:

It is a structure construc-ted at the entrance (head) of the canal where it takes off from the rivers or a reservoir may consist of number of spans separated by piers and operated by gates.

Temprature requirement.

Regulators are normally aligned at 90°c to the weir. up to 10 are consider-ed Preferable for smooth entry into canal.

Functions of Canal Head Regulators.

The functions of Canal Head Regulator are.

1. To admit water into the off taking canal.

2. It regulates the flow of water (irrigation water) entering into the canal.

3. To indicate the discharge passed into the canal from design discharge formula and observed head of water on the crest.

4. It control the silt entry into canal. During heavy floods, it should be closed otherwise high silt quantity will leave to the cannal.

On the bases of function it has some common types.

1. Still Pond regulation.

- Canal draws water from still pond.
- Water in excess of canal requirements is not allowed to escape under the sluice gates.
- Velocity of water in the pocket is very much reduced; silt is deposited in the pocket.
- When the silt has a level about 1/2 to 1m below the crest level of Head Regulator. Supply in the canal is shut off.

2. Open flow regulation:

- Sluice gates are opened and allow excess of the cannal requirements.
- Top water passes into canal.
- Bottom water maintain certain velocity in the pocket to keep the silt to remain in

Suspension.

- Canal is not closed for escouring the Sill.

3) **Silt Control devices:**

- Silt control at Head works can be controlled by providing a divide wall to create a trap or pocket.
- Create scouring capacity of under sluices By concentrating the currents toward them.
- Paving the bottom the approach channel to reduce disturbance because due to disturbance sediment remains in suspension.

Installing silt excluders:

- Making entry of clear top water by providing raised still in the cannal.
- Lower sill level of scouring sluices.

- Wide head regulator reduces velocity of water at intake.
- Smooth entry to avoid unsteady flow.