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Section A

Subject Irrigation

Semester 6th

Final exam

Q1 (a)

Explain anti water logging measures?

Some of the measures use to control water logging are.

Reducing intensity of irrigation:

The most important aspects to avoid water logging is to provide water to a small portion of land where necessary.

- Apply only required amount of water
- Use sufficient irrigation method i.e drip irrigation.

2. By introducing crop rotation:-

High water requiring crop should be followed by one requiring low water.

3. Optimum use of water:-

Certain amount of water gives the best result. less or more water reduces the yield. Cultivators should be educated so not to use more water.

4. Improving natural drainage:-

Water should be allowed to stay in one area.

5- Tube Wells:-

Canal irrigation may be substitutal by tube well irrigation.

6. Use of water according to need:-

- Adoption of sprinkler method of irrigation.
- No precolation loose from water courses

Q1(b)

Differentiate between saline and alkaline soils?

Saline Soils	Alkaline Soils
1. Saline soils are the soils that have a pH in between 7 and 8.5 and exchangeable sodium percentage below 15%.	Alkaline soils are those soils that have a pH greater than 8.5 and exchangable sodium percentage greater than 51%.
2. Organic matter content is high.	Organic matter content is low.
3. Colour of saline soil is White or light gray.	Colour is black.
4. Soluble salt concentration is equal to or more than 0.1%.	Soluble salt concentration <0.1%.
5. EC of saturated soluble extract at 25°C is more than or equal to 4 milli mho per cm	EC < 4 m mho/cm
6. Easy to manage because physical condition of soil is good.	Such soil can be managed because physical condition is not so good.
7. O.M or humus is always found in soil	Very less amount of OM.
8. Can be reclaimed by mechanical methods upto some extent	Use of amendments is must.

Q1 (c)

How do you reclaim salt affected lands?

Following are the steps to reclaim salt affected land.

1. By creating good surface and internal drainage The use of tile drains and open ditches in field can increase drainage and remove some of salt.
2. We can leached out salt from root zone through good quality irrigation water or by heavy rainfall
3. By adding organic matter such as rotted hay at 10 - 15 tons / acre to improve porosity.
4. Reclamation of saline sodic salt takes long time.

Leaching:-

Leaching can be use to reclaim salt affected soil. We add enough low salt water to soil surface to dissolve the salts and move them below root zone. The water must be relatively free of salts, particularly sodium salts.

Land Grading:-

It is continuous land slope towards fields drains. It is good for irrigation & removal of salt.

Applying Magnetized water

Magnetized water break down salt crystal as fast as unmagnetized water allowing the salt to extract from soil.

Q2 (a)

Explain procedure of designing of an irrigation canal by kennedy's theory?

Kennedy Procedure for canal Design

Step 1:-

Assume the trial value of D and put it eqn 1 and determine

$$V_0 = 0.56\, m D^{0.64}$$

Step 2

In eqn 1 $Q = AV$

$$A = Q/V$$

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

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

For assumed D determine B

Fond $R = A/P$

Step 3:-

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

Step 4

If Velocity worked out from eqn 2 agrees with that of obtain from eqn 3 (kennedy's eqn) Then assumed depth is correct.

Otherwise repeat the procedure with different value of D.

Q2 (B)

Given Data:-

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

Cvr(m) = 1

N = 0.0225

Bed slope = 1 in 5000

Depth (D) = 2.3m.

Sol:-

Finding Velocity

$V_k = 0.546\, mD^{0.64}$

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

$V_k = 0.930\, m$

Now Area

$Q = AV$

$A = 30/0.930 = 32.25\, m^2.$

Calculate B using formula.

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

$BD + 0.5D^2$

$A = BD + 0.5D^2$

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

$B = 12.87\, m.$

Calculate Wetted Perimeter

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

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

$= 18.01\, m.$

Calculate hydraulic Radius

$R = A/P \quad 32.25 / 18.01 \quad R = 1.79\,m$

Calculate mean velocity from chezy eqn.

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

$$C = \frac{\frac{1}{n} + \left(23 + \frac{0.00155}{5}\right)}{1 + \left(23 + \frac{0.00155}{5}\right)\frac{n}{\sqrt{R}}}$$

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

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

$$= 49.56$$

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

$$= 0.93\,m.$$

Q3 (a)

Differentiate between initial regime and Final regime in accordance to Lacey's theory.

According to Lacey's theory

Initial Regime:-

When only bed slope of channel changes but cross section remains same Then also no scouring or setting take place But this is rare.

Final regime:-

If all the parameters (Diameter, depth, and slope) have equally free to vary and adjust according to discharge and silt grades. Then channel is said to have final regime.

Q 3 (B)

Given :-

$Q = 30 m^3/sec$

$M = 0.56 mm$

Solt

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

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

$= 1.3$

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

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

$V_m = 0.844$

$Q = AV$

$A = Q/V = 30/0.84$

$A = 35.54$

$P = 4.75\sqrt{Q}$

$= 4.75\sqrt{30}$

$P = 26.01$

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

$= 1.36$

$A = BD + D^2/2$

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

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

$26.01 = B + 2.236D$

$B = 26.01 - 2.236D \rightarrow 2$

Put eq 2 in eq 1

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

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

$35.54 = 26.01D - 1.736D^2$

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

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

By Quadratic eq.

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

$D = 1.52$

Put in eq 2.

$B = 26.01 - 2.236(1.52)$

$B = 22.611$

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

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

$S = 0.00026$

Q4 (a)

Explain component of headwork with neat diagram?

Headworks:-

Any hydraulic structure which supplies water to off taking channel is called headwork.

It is divided into two.

i) Storage headwork.

ii) Diversion headwork.

Components:-

Barrage:-

Barrage is an arrangment of adjustable gates or shutters at different tires over the weir.

When the water level on the up stream side of weir is required to be raised at different level, barrage is constructed.

· Weir:-

A weir is an obstruction or a barrier constructed across river. The obstuction is of small height in comparison with dam.

· Divide Wall:-

Long wall constructed at right angles in barrage with some massonry. On the upstream side the wall is extended just to cover canal head regulator and on down stream side it is extended upto launching apron.

Under Sluices:-

They are opening provided in body of weir at low level. They are located in smaller compartments in still pond. These slices are controlled by gates which are operated from top.

Fish Ladder:-

When a weir is constructed across a river with a view to check the flow of water the passage is fully closed. Now fishes which are always present in river are obstructed from moving freely. If some provision are not made for them fish life may be perished.

Fish ladder.

Canal Head regulator:-

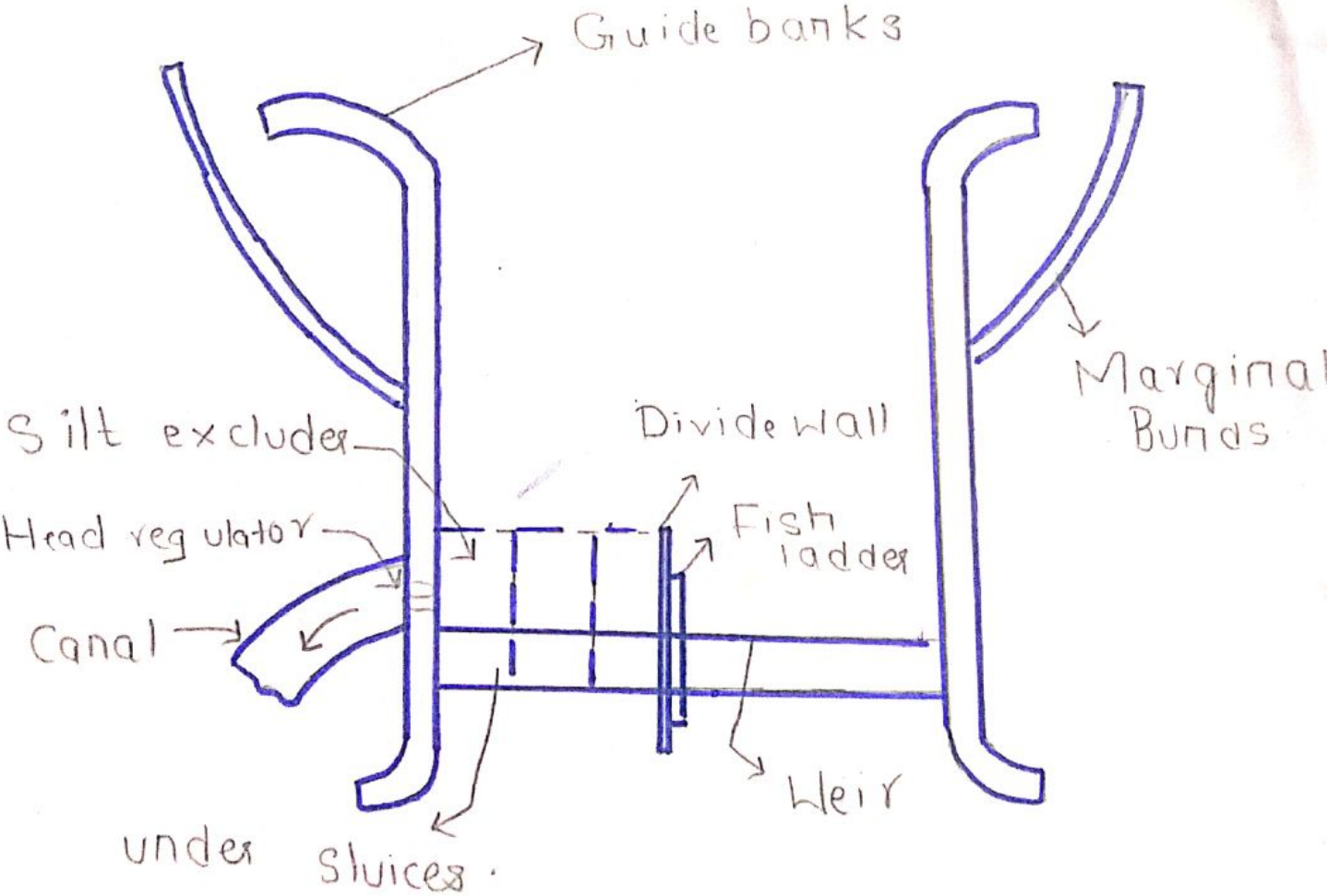
A structure which is constructed at head of a canal to regulate flow of water is known as canal head regulator.

Slit exclude:-

Device to exclude slit from water entering canal.

Consist of a number of rectangular canal.

The length of tunnel gradually decreases as the distance of head regultor increases.



Q4 (b)

What is fuction of head regulator?

Function:-

The function of head regulator are

1. To admit water into off taking canal.
2. To regulate supplies into canals.
3. To serve as a meter for measuring discharge of water.

Regulators constructed at off taking point are called head regulators.

4. To control the entry of slit into off taking or main canal.
5. It prevents ~~eh~~ river floods from entering canal.
