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Semester: 6th

Irrigation Engineering

23-06-2020

Q No 1(a)

Explain anti water logging measures

ANSWER:

WATER LOGGING:

Land is said to be water logged when its Productivity is affected by high water Table:

METHOD OF CONTROL OF WATER LOGGING:

1- Lining of Canals and water Courses:-

It reduce seepage of water.

2- Reducing intensity of Irrigation.

- only small portion of land should recieve canal water in one particular season.
- Remaining areas can recieve water in next season by rotation.

3- By introducing crop rotation:

- High water required crop should be followed by one requiring less water, and then by one requiring almost no water.

e.g

Rice followed by wheat and then by cotton.

4- Optimum use of water:

Certain amount of water give the best result. Less or more water reduce yield.

5- Improving natural drainage of area:

Water should be allowed to stay in one area.

6- Adoptation of spinkler method of irrigation.

Q NO 1(b)

Differentiate between saline and alkaline soil?

ANSWER:

SALINE SOIL	ALKALINE SOIL
1- Saline soil contain high content of soluble salts.	1- Alkaline soil are clay soil
2- They have Less PH	2- They have high PH.
3- It is basic in nature	3- They are more basic
4- It PH is 7 - 8.5	4- PH greater than 8.5
Dominating compound is Sodium ~~Carbonate~~ Salts	5- Dominating compound is Sodium Carbonate

Q No 1 (c)

How do you reclaim salt affected land

ANSWER:

RECLAIMATION OF SALT AFFECTED LAND:

- Alkali salts (sodium chloride, sodium sulphate, and sodium carbonate) are injurious to agriculture.

$NaCl$ --- Less harmful

Na_2SO_4 --- Medium harmful

Na_2CO_3 --- Less harmful

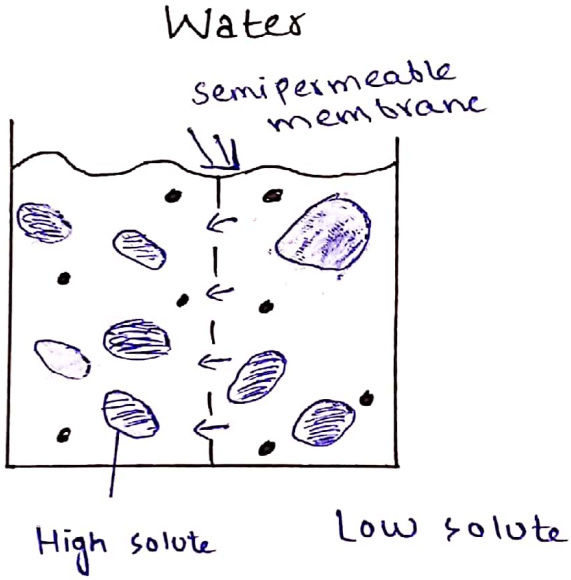
- The above salts are soluble in water

- When water table rise up or roots are in capillary zone, the Ground water move upward and salts are deposited in root zone and surface of soil.

- The phenomena of salt coming up in solution and forming a thin crust (5-7 cm) on the surface after evaporation of water is called Efflorescence.

- Land affected by efflorescence is called saline soil.

- Salt surrounding the root reduce the osmotic activity of plants.



Q No 2(a)

Explain the procedure of designing of an irrigation canal by Kennedy theory.

ANSWER:

KENNEDY'S THEORY:

- R.G Kennedy studied straight reaches of upper Bari Doab Canal which are stable for 30 years.

$$V_o = CD^n$$

V_o is critical velocity. (non-silting or non-scouring)

C is contant depends upon quantity of silt.

Kennedy Procedure for Canal Design

Step: 01

Assume the trial value of D and put in eqn and determine

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

Step: 2

In eq (1)

$$\therefore Q = AV$$

$$A = Q/V$$

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

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

For assumed D determine B.

Find $R = A/P$

Step: 03

Substitute the value of R in eq 2 (Kutters and chazzy Equation) to obtain V which will be actual velocity for assumed dimension.

Step: 04

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

Q No 2(B)

GIVEN DATA:

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

$C_{Vr}(m) = 1$

$N = 0.0255$

Bed slope = 1 in 5000

Depth, $D = 2.3m$

Solution:

Finding velocity

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

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

$V_K = 0.930m$

Now calculating area of canal

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

$30/0.930 = 32.25 m^2$

To find value of B

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

Putting values

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

$B = 12.8m$

Now we have to calculate, P

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

$$= 12.8 + \sqrt{5}\,(2.3)$$

$$= 18.00m$$

Now we have to find R

$$R = A/P = 32.25/18 = 1.78m$$

Now

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

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

$$\Rightarrow \frac{1}{0.025} + \left(\frac{23 + \frac{0.00155}{Y_{5000}}}{1 + \left(23 + \frac{0.0015}{Y_{5000}}\right) \times \left(\frac{0.025}{\sqrt{1.79}}\right)}\right)$$

$$\boxed{C = 49.5}$$

$$V_c = 49.5\left(1.79 \times \frac{1}{5000}\right)^{1/2}$$

$$V_c = 0.925m$$

Q No 3(a)

Differentiate between initial regime and final regime in accordance to Laccy theory?

ANSWER:

LACEY'S THEORY:

A channel is regime (No silting, No scouring) but according to lacy even though channel with no silting or scouring may actually be not in regime.

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

INITIAL REGIME:

When only bed slope of channel changes but the cross section remain same then also no silting or scouring take place.

FINAL REGIME:

If all parameter have equally free to vary and adjust according to discharge and silt grades then the channel is

Q No 3(b)

Design a regime channel by lacey theory for discharge of 30cumec and mean dia of silt particle of 0.56mm

GIVEN:

$Q = 30\ m^3/sec$

Lacey silt factor $M = 0.56$

SOLUTION:

$$f = 1.76\ M^{0.5}$$

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

$$f = 1.3$$

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

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

$$V_m = 0.844$$

$$Q = AV$$

$$A = Q/V = 30/0.844$$

$$A = 35.55$$

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

$$P = 26.00$$

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

$$R = 1.36$$

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

$$35.5 = BD + \frac{D^2}{2} \quad \text{— (i)}$$

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

$$26.01 = B + 2.236D \quad \text{— (ii)}$$

Put (i) & (ii)

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

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

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

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

By Quadratic Eq

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

$$\boxed{D = 1.52}$$

Put in Eq (2)

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

$$B = 22.611$$

$$S = \frac{f^{5/3}}{3.340\,Q^{1/6}}$$

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

$$S = 0.00026$$

Q NO 4(a)

Explain the component of head work with neat diagram

ANSWER:

COMPONENT OF HEAD WORK:

- Weir or barrage
- under sluices
- Divide wall
- Fish ladder
- Canal Head Regulator
- Silt excluder
- River training works

- Barrage;

Barrage is an arrangement of adjustable gates or shutter at different bries over the wier.

Under sluices:

Also known as scouring sluices. The under sluices are the opening provided at the base of weir or barrages. These opening are provided with adjustable gates.

Divide Wall:

The divide wall is along wall constructed at right angles in the weir or barrages, it may be constructed with stone masonary or cement concrete

Fish Ladder:

The fish ladder is provided just by the side of the divided wall for the free movement of fishes.

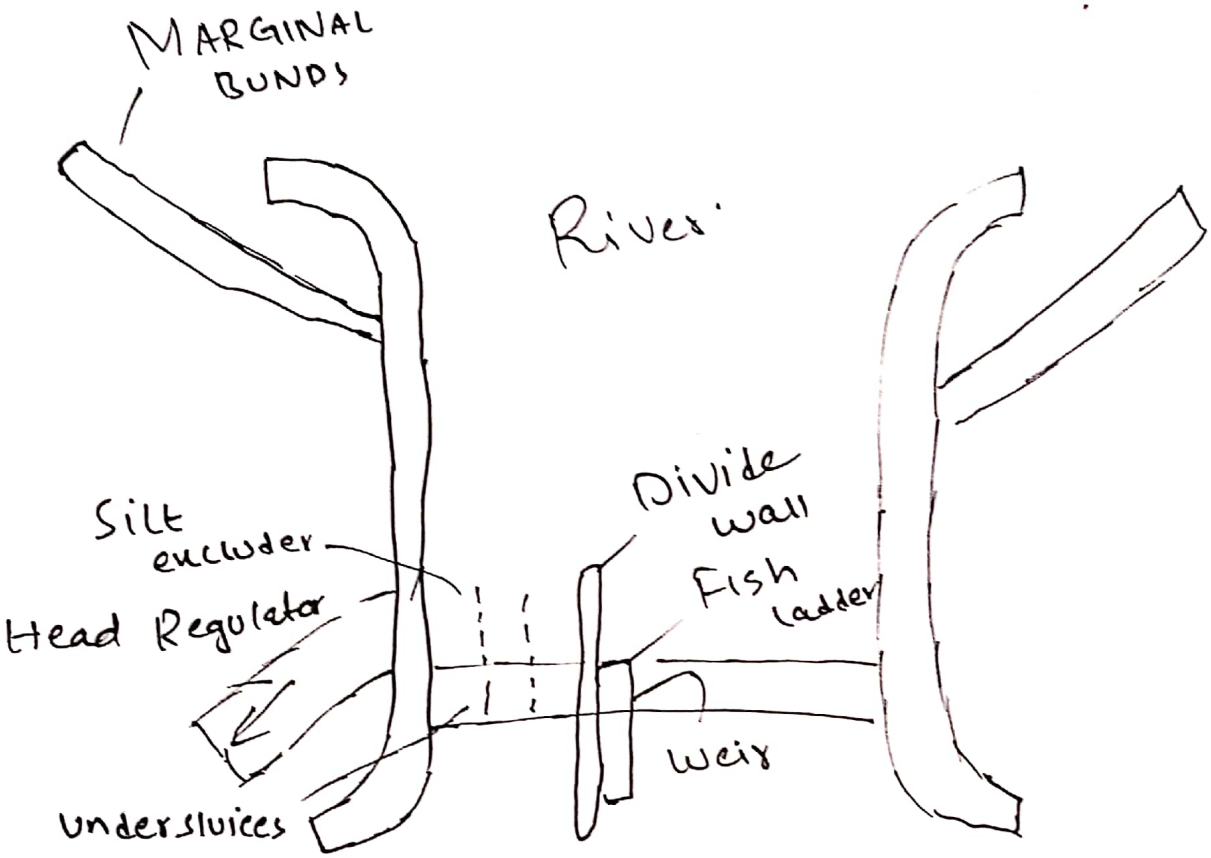
Canal Regulator:

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

Silt regulation work:

The entry of silt into a canal, which takes off from a head work, can be

reduced by constructed certain special work called silt control work



Q NO 4(b)

What are the funcation of Head regulators?

ANSWER:

CANAL HEAD REGULATOR.

A structure which is constructed at the head of canal to regulate flow of water is known as canal Head Regulator.

FUNCATION:

To regulate the supplies into the canal

To indicate the discharge passed into canal

To control the silt entry into the canal.