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Section:→ A

Subject:→ Irrigation Engineering

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Department:→ civil engineering

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Q1:→

a):→ Explain anti water-logging measures?

Ans:→ Anti water logging measures:→

*):→ water-logging control:→

→ Quantity of water into soil below is reduced.

→ Inflow into underground reservoir is reduced and and outflow should be increased.

*):→ Methods of control of water logging:→

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 receive water in next season by rotation.

3) :→ By introducing crop rotation:→

→ High water requiring crop should be followed by one 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.

→ Revenue should be charged on the basis of quantity of water rather than the area of land.

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:→

→ Lift irrigation should be introduced to use Gr.W. canal irrigation may be substituted by tube well irrigation.

7) :→ Adoption of sprinkler method of irrigation:→

→ Only predetermined amount of water is supplied to land.

→ No procolation losses from water courses.

Q1:→

b):→ Differentiate between saline and alkaline soil?

Ans:→

Saline soil	Alkaline soil
→ Saline soil are the soils that have a pH in between 7 and 8.5 and an exchangeable sodium percentage below 15%.	→ Alkaline soil are the soil that have pH in greater than 8.5 and an exchangeable Sodium percentage greater than 51%.
→ Electrical conductivity 4 or more mmhos/cm	→ Electrical conductivity usually less than 4 mmhos/cm
→ Organic matter content High.	→ Organic matter content low
→ white or light gray colour	→ Black colour.
→ Soluble salt concentration is equal to or more than 0.1%.	→ Soluble salt Conc < 0.1%.
→ Easy to manage because physical condition of soil is good.	→ Such soils can be managed because physical condition is not so good.
→ O.M or human is always found in soil	→ very less amount of O.M or humans or even absent.

Q1

C):→ How do you reclaim slat affected lands?

Ans:→ By maintaining the water table sufficiently below the roots.

→ Hence all the measures which were suggested for preventing water logging hold good for preventing salinity of Lands.

→ An efficient drainage must be provided to lower the water table in saline soils

*):→ Leaching:→ In this process.

i):→ Land is flooded with water.

ii):→ Alkaline slats will be dissolved in water

iii):→ Percolation to the ground water

→ High salt resistant crops like rice are grown on leached land for 1 or 2 seasons.

→ Then ordinary crops like wheat or cotton are grown.

→ Then the land is said to have reclaimed.

→ When sodium carbonate is present in the soil gypsum is added before leaching.

Q2:→

a):→ Explain the procedure of designing of an irrigation canal by kennedy's theory?

Ans:→ Kennedy Procedure for canal design:→

Step #01:→ Assume the trial value of D and put in equation(1) and determine

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

Step #02:→

In equ ① $Q = AV$

$$A = Q/V$$

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

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

for assumed D determine B

find $R = A/P$

Step #3:→ Substitute the value of R in eq(2). (kutters and chazy Eq/n) to obtain v which will be the actual velocity for assumed dimensions.

Step #4:→

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

Q2):→

b):→ Design are irrigation channel by Kemedy's theory to carry a discharge of 30cumecs with cur(m) of 1 and N as 0.0225 and bed slope of 1 in 5000. Assume the depth (D) as 2.3m.

Given Data

$Q = 30\ m^3/sec$

$cur(m) = 1$

$N = 0.0225$

Bed slope = 1 in 5000

$D = 2.5m$

Sol:→ Finding velocity

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

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

$$V_K = 0.930m$$

~~Step 4 of 7~~

$$Q = AV$$

$$A = Q/V$$

$$A = 30/0.963$$

$$A = 31.153 m^2$$

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

$$31.153 = B \times 2.4 + \frac{(2.3)^2}{2}$$

$$B = 12.87 m$$

→ Now we have to calculate wetted perimeter.

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

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

$$P = 18.01 m$$

→ Now we have to calculate Hydraulic radius.

$$R = A/P$$

$$R = 32.25/18.01$$

$$R = 1.79 m$$

→ Now calculating mean velocity from chezy equation.

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

where

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

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

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

$$C = 49.56$$

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

$$V_c = 0.93$$

$$V_c = 0.93 m$$

Q3:→

a):→ Differentiate between intial regmine and final regmime in accordance to lacey's theory.

Ans:→ (a) According to laceys theory intial regime and final regime:→

*):→ Initial regime:→ when only bed slope of channel but the cross section remains same then also no silting or scouring take place. But this is rare.

*):→ Final regime:→ If all the parameters (Perimeter, depth and slope) have equally free to vary and adjust according to discharge and silt grades then the channel is said to have final regime.

b):→ Design a regime channel by lacey's theory for discharge of $30 m^3/sec$ and mean diameter of silt particle of 0.56mm.

Given Data

$Q = 30 m^3/sec$

$m = 0.56 mm$

Sol:→ silt factor $= f = 1.76 \times m^{0.5}$

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

$f = 1.3$

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

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

$V_m = 0.844$

$Q = AV$

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

$A = 35.54$

$P = 4.75\sqrt{\Phi}$

$P = 4.75\sqrt{30}$

$P = 26.01$

$R = \frac{5}{2} \times \frac{v^2}{f} \Rightarrow \frac{5}{2} \times \frac{10.844^2}{1.3}$

$R = 1.36$

$A = BD + D^2/2$

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

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

$26.01 = B + 2.236D$

$B = 26.01 - 2.236D \rightarrow (2)$

put eq(2) in eq(1)

$35.54 = (26.01 - 2.236D)D + D^2/2$

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

$35.54 = 26.01D - 1.736D^2$

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

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

By quardatic equation.

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

$D = 1.52$ Put eq (2)

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

$$B = 22.611$$

$$S = \frac{\neq^{(5/3)}}{3340\,(0)^{1/6}}$$

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

$$S = 0.00026$$

Q4):→

a):→ Explain the components of headworks with neat diagram?

Ans(a):→ Head work:→ Any hydraulic structure which supplies water to the off taking cannal is called head work.

→ It can be divided into two parts

i) Storage head work

ii) Diversion head work

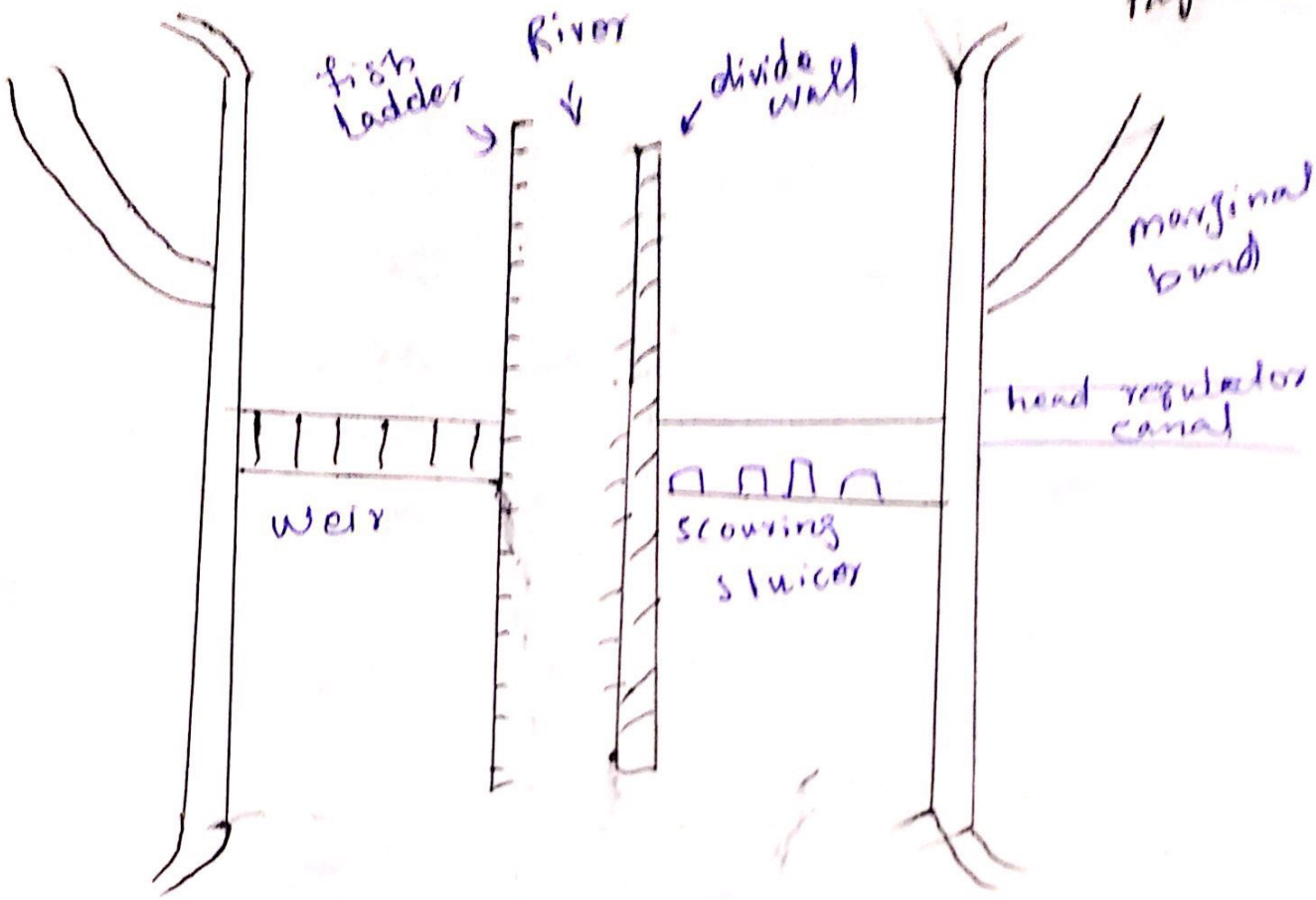
*):→ Component of diversion head work:→

①:→ Weir or Barrage:→ Normally the water level of any perennial river is such that it cannot be diverted to irrigation cannal The bed level of canal may be higher than the existing water level of the river. In such cases weir level is constructed across the river to raise the water level. Adjustable shutters are provided on the crest to raise the watter level to some required height.

*):→ 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 arrangment of adjustable gates or shutter at different tires over the weir.

Divide wall:→ The divide wall is a long wall constructed at right angles in the weir or barrage, it many be constructed with stone masonry or cement concrete.

*):→ Fish Ladder:→ The fish ladder is provided just by the side of the divide wall for the free moment of fishes. The ~~tendancy~~ tendancy of fish is to more from upstream to downstream in winters and from downstream to upstream in monsons. This ~~movement~~ movement is essential for their survival.



Q4):→

b):→

Ans:→ Head regulator:→

Regulator constructed at the of taking point area called head regulator.

→ When it is constructed at the head of main cannal it is known as canal head regulator and when it is constructed at the head of distributary it is called distributary head regulator.

*):→ Function:→

To control the entry of water either from the reservoir 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.