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Section A

paper Irrigation Engineering

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Qno1)

Ans a) Anti water logging measures;-

Some of the measure use to control water logging are;

Control of canal seapage;

canal seapage is major source of water losses & water logging in irrigated area & it can be controlled by;

→ lining of canal with impervious material like clay, concrete to control seapage.

→ convert water system from canal to pipe system

Reducing intensity of irrigation;-

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

→ Applying only the request amount of water so that all the water applied is used by plants

→ use efficent irrigation method i-e drip irrigation

Rotation of crops

At mean that we should plant crops in such a way that it prevent the land from water logging

→ crops which used large amount of water should be followed by those which use less water or no water.

Qno1)

Ans b)

Saline soil	Alkaline soil
1) Soluble salt concentration is equal to or more than 1%	1) Soluble salt concentration is less than 1 %.
2) Exchangeble sodium percentage is less than 15 %	2) Exchangeble sodium percentage is greater than 15 %
3) $p^H < 8.5$	3) $p^H > 8.5$
4) White/light colour hence called white alkali	4) Black colour and hence called black alkali
5) Flocculated soil therefore soil, aeration & permeability is normal	5) Dispersed & compact soil aeration & permeability is low.
6) Can be reclaimed by mechanical methods upto some extent.	6) Use of amendments is must.

Qno1)

Ans c) Reclaimation of salt affected land:

→ By maintaining the water table sufficently below the ~~table~~ roots

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

→ An efficent drainage (surface & subsurface) must be provided to lower the water is saline soils.

→ Create good surface & internal drainage. The use of tile drains & open ditches in the field can increase drainage & remove some of the salt.

Q no2)

Ans a) Kennedy procedure for canal design.

Step 1:-

Assume the trial value of D

& put in eq 1 & determine

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

Step 2:-

In Eq 1 ; $Q = AV$

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

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

For assumed D determine B

Find $R = A/P$

Step 3:- Substitute the value of R in eq (2) (Kutters & chazys Eq) to obtain v which will be actual velocity for assumed dimension.

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 no2)

Ans b) Given:-

$Q = 30 m^3/sec$

CVR (m) = 1

N = 0.0225

Bed slope = 1 in 5000

Depth = 2.3m

Solution:-

Finding Velocity . By Formula

$V_K = 0.546 m D^{0.64}$

$0.546(1)(2.3)^{0.64} \Rightarrow V_K = 0.930 m$

Now calculating area of canal;

$\phi = AV \Rightarrow A = \phi / V$ $\Rightarrow A = 32.25 m^2$

Now we have to calculate B By using formula;

$A = BD + \frac{D^2}{2} \Rightarrow BD + 0.5D^2$

$\Rightarrow A = BD + 0.5D^2$

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

$\Rightarrow B = 12.87 m$

Now we have to calculate wetted parameter.

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

$= 12.87 + \sqrt{5}(2.3) \Rightarrow P = 18.01 m$

Now we have to calculate Hydraulic radius

$R = A/P$

$= 32.25/18.01$ $\Rightarrow R = 1.79 m$

Now calculating mean velocity from chezy eq

$V_C = C(Rs)^{1/2}$

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

$\Rightarrow C = \frac{\frac{1}{0.025} + \left(23 + \frac{0.00155}{(1/5000)}\right)}{1 + \left(23 + \frac{0.00155}{(1/5000)}\right) \times \left(\frac{0.025}{\sqrt{1.79}}\right)}$ $\Rightarrow C = 49.56$

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

$V_C = 0.93$

$V_C = 0.9 m$

Qno3)

Ans a) Difference b/w initial regime & final regime accordance to Laceys theory:-

Initial Regime:

when only bed ~~shape~~ slope of channel changes but the cross section remain same then also no silting or scouring take place. But this rare.

Final Regime:

If all the parameter (parameter, depth & slope) have equally free to vary & adjust according to discharge & silt grades then the channel is said to have final regime.

Qno3)

Ans b) Given:-

$Q = 30 m^3/sec$

$m = 0.56 mm$

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

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

$f = 1.3$

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

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

$V_m = 0.844$

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

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

$$P = 4.75\sqrt{30}$$

$$\boxed{P = 26.01}$$

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

$$\boxed{R = 1.36}$$

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

$$35.54 = BD + \frac{D^2}{2} \quad \text{—(1)}$$

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

$$26.01 = B + 2.236D$$

$$B = 26.01 - 2.236D \quad \text{—(2)}$$

Put eq (2) in eq (1)

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

$$35.54 = 26.01D - 2.236D^2 + 0.5D^2$$

$$\Rightarrow 1.736D^2 + 26.01D - 35.54 = 0$$

By quadatic formula.

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

$$\boxed{D = 1.52}$$

put in eq (2)

$$B = 26.01 - 2.236(1.52) \quad \boxed{\Rightarrow B = 22.611}$$

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

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

$$\boxed{S = 0.00026}$$

Qno 4)

Ans a) Head work:-

Any hydraulic structure which supplies water to the off taking canal 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) ~~Write~~ Weir or Barrage:-

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

Barrage:-

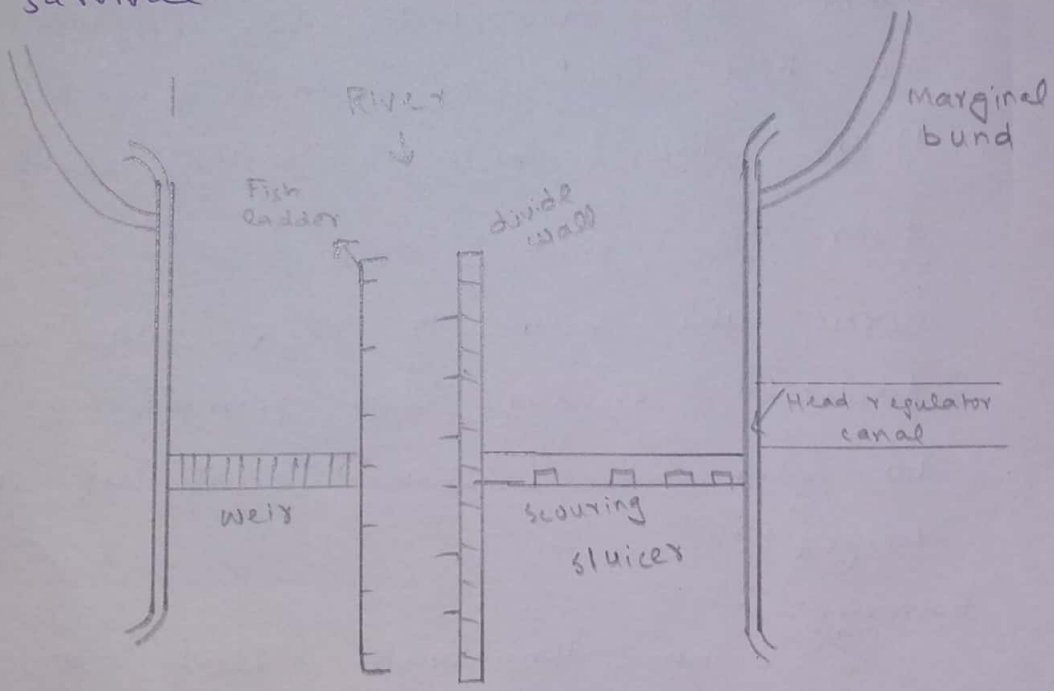
when the water level on the up stream side of the weir is required to be raised to different levels at different time, barrage is constructed. Barrage is an arrangment of adjustable gates or shutter at different tives over the weir.

Divide wall:-

The divide wall is a long wall constructed at right angles in the weir or barrage, it may 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 tendency of fish is to move from upstream to downstream in winters and from downstream to upstream in monsoons. This movement is essential for their survival.



Qno4)

Ans b) Head Regulator;-

Regulator constructed at the off taking point are called head regulator when it is constructed at the head of main canal 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 siet into off taking or main canal

→ To serve as a meter for measuring discharge of water.