Name : M. Saleem

ID : 7859

Section : B

Semester : "6"

Subject : Irrigation engineering

Submitted to : Dr. Jahangir Durrani

Question No 1.

Part "a"

Water logging:-

water logging is Presents the situation whereby the underground water comes on the surface of land and in certain cases it gathers on the ground level of lands it may assume the shape of streams.

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.

By introducing crop rotation:

High water requiring crop should be followed by one requiring less water, and the by on requiring almost no water

improving natural drainage of area:-

water should not be allowed to stay in one area

- natural flow is provided by bush and jungle cutting.

Pumping or tubewells or vertical Drainage :-

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

Question No. 1

"Part 'b'"

Saline soils	Alkaline Soils
① By Principle of osmosis, the Pure water from root flows outwards in a plant die due to lack of water. Such soil is unreproductive and is called saline soils.	① if the salt efflorescence contines for a larger period, a base exchange reaction with clay takes place, thus sodiumizing the clay, making it impermeable, illaented and highly unProductive. Such soils are called alkaline soils.
② They have Less PH	② They have high PH
③ It is basic in nature	③ They ~~have~~ are more basic
④ It ~~HP~~ PH is 7 - 8.5	④ Dominating compound is Sodium carbonate.
⑤ Dominating compount is Sodium salts	

Question No 1

Part c

Ans :- The salt affected lands are reclaimed by the following processes.

(i) By efforescence and how to avoid :-

The efforescence is avoided 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 (surface and subsurface) must be provided to lower the water table in saline soils.

ii) Leaching :-

In this process

* The land is flooded with water.

* Alkaline salts will be dissolved in water.
* Percolation to the ground water.
* Drained by sub surface drains.

⇒ High salt resistant crops like rice are grown on leached soil / 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 leaching.

⇒ Sodium sulphate is formed which is leached out easily.

Question No 7

Part No "a"

Procedure of designing irrigation canal:-

The following steps are the procedure of designing irrigation canal:-

Step 1 :-

Assume the trial value of D and put in equation 1 and determine $V_o = 0.546 m D^{0.64}$

Step 2 :-

In equation (1) : $Q = AV$

$A = Q/V$

$A = BD + D^2/2$

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

=> For assumed D determine B

=> Find $R = A/P$

Step 3 :-

Substitute the value of R in equation (2) (Kutters and chezy Equation)

to obtain V_1 which will be the actual velocity for assumed dimensions.

step 4:-

if the velocity worked out from equation (8) agrees with that of obtained with the equation (3) (Kennedeys equation) Then the assumed depth is correct otherwise repeat the Procedure with changed value of D.

Assumptions of Kennedy's theory:-

(i) vertical component of eddies support the silt particles

(ii) The silting power of channel depends upon its velocity which controls the eddies.

(iii) The silt transporting power depends upon its depth.

(iv) The silt transporting power of a channel is independent of bed width.

Question No 7

Part "b"

Given data :-

Discharge (Q) = 30 m^3/sec

Cvr (m) = 1

N = 0.0225

Bed slope = 1 in 5000

Depth (D) = 7.3 m

Solution :-

Finding velocity by formula

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

$$= 0.546\ (1)(7.3)^{0.64}$$

$$\boxed{V_K = 0.930\ m}$$

Now calculating area of canal

By formula

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

$$A = 30/0.930$$

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

Now we have to calculate B. by formula

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

=> By Putting value

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

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

$$32.25 - 2.645 = 2.3(B)$$

$$\boxed{B = 12.87\ m}$$

Calculate wetted Perimeter.

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

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

Now calculate hydrulic radius

$$R = A/P$$

$= 32.25 / 18.01$

$$R = 1.79\,m$$

Now calculate mean velocity from Chezy equation.

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

where

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

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

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

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

$$v_c = 0.93$$

$$v_c = 0.93\,m$$

"Question no 3"

"Part a"

Difference between initial and final regime

According to Kennedy, a channel is regime (No silting, No scouring) but according to Lacey even though channel with no silting or scouring may actually be not in regime.

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

· Initial Regime:-

when only bed slope of channel changes 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 ~~stitl~~ silt grades then the channel is said to have final regime.

Question No 3

"Part "B"

Given

$Q = 30\ m^3/sec$

$n = 0.56$

Solution:-

$f = 1.76\ n^{0.5}$

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

$\boxed{f = 1.3}$

$$v_m = \left[\frac{Qf^2}{140}\right]^{1/6}$$

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

$\boxed{v_m = 0.844}$

$Q = AV$

$A = Q/V = 30/0.844$

$A = 35.55$

$P = 4.75\sqrt{Q}$

$P = 26.00$

$R = S/\gamma \times \frac{V^2}{f} = S/\gamma \left(\frac{(0.844)^2}{1.3}\right)$

$R = 1.36$

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

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

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

$26.01 = B + 2.236D$ — (ii)

Put (i) and (ii)

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

$35.54 = 26.01D - 1.736D^2$

$-\frac{1.736}{a} + \frac{26.01}{b} - \frac{35.54}{c} = 0$

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

By Quadratic equation

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

$$\boxed{D = 1.5Y}$$

Put in equation (ii)

$$B = 26.01 - 2.236(1.5Y)$$

$$\boxed{B = 22.611}$$

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

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

$$\boxed{S = 0.00026}$$

Question No 4

"Part a"

Components of a diversion headwork:-

① Weir :-

In such case weir is constructed across the river to raise the water level surplus water pass over the crest of weir. Adjustable shutters are provided on the crest to raise the water level to some reaquried height

② Under sluices :-

Also known as scouring sluices. The under sluices are the openings provided at the base of the ~~opening~~ weir or barrage. These openings are provided with adjustable gates. Normally the gates are kept closed.

③ 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. on The upstream side the wall is extended just to cover the canal head regulator and on the downstream side is extended to launching apron.

④ Fish ladder:-

The fish ladder is provided just by the side of the divide wall for the free movement of fishes. Rivers are important source of fishes.

⑤ canal head regulator:-

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

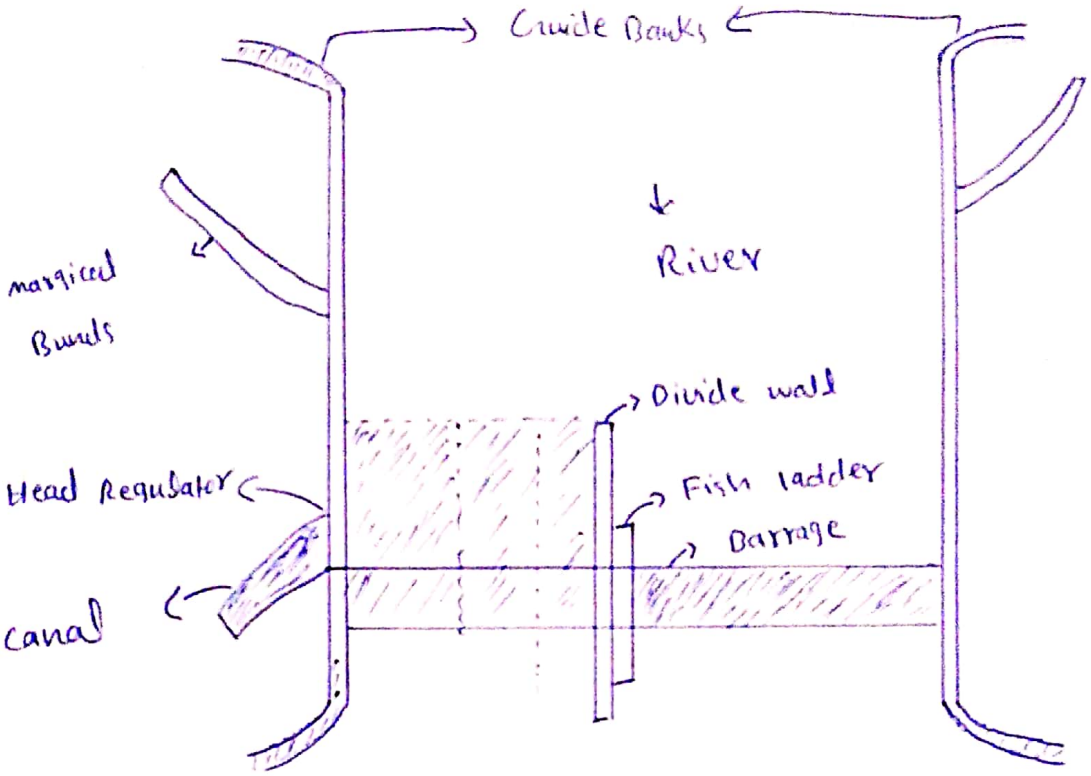

Diagram showing components of Headworks

Question No 4

"Part "b"

Function of Head regulator:-

① To control the entry of water either from the reservoir or from the main canal.

② To control the entry of silt into off taking or main canal.

③ To serve as a meter for measuring discharge of water

④ To regulate the supplies into the canal

⑤ To indicate the discharge passed into the canal from design discharge formula and observed head of water on the crest.

(6) To control the silt entry into the canal.