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FINAL TERM

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Section: "B"

Semester: "6th"

Subject: Irrigation Engineering

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Question No 1

Part: A

Question: Explain Anti-water-logging measures.:

Answer: Anti water logging measures.

1: Lining of canals and water course:

* It is to reduce seepage of water.

2: Reducing intensity of Irrigation:

* only small portion of land should recive canal water in one particular season.

* Remaining area can recive water in next season by rotation.

3: By introducing crop rotation:

* High water requiring crop should be

followed by one requiring less water.

* And also 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.

5: Improving natural drainage of area:

* What should not be allowed to stay in one area.
* Natural flow is provided by bush & Jungle cutting.

6: Vertical drainage:

* Life irrigation should be introduce to use GW.
* Canal irrigation may be substitute by tube well irrigation.

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Part: B

Question: Differentiate between saline and alkaline soil.

Saline soil	Alkaline soil
* Mainly Cl^- & SO_4^{2-} of Na^+ and also Cl^-, SO_4^{2-} and HCO^- of Ca^{2+} and Mg^{2+} in small amount.	* Mainly CO_3^{2-} of Na^+ but also CO_3^{2-} of K^+, Ca_2^+ and Mg^{2+} in small amount.
* Soluble salt concentration is equall to or more than 0.1%.	* Soluble salt concentation is less than 0.1%.
* Exchangable sodium percentage is less than 15%.	* Exchangable sodium percentage is greater than 15%.
* In rainy season some natural vegetation is grown.	* No any natural vegetation except some grass.

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* Can be reclaimed by mechanical methods upto some extent.	* Use of amendments is must.
* Easy to manage because physical condition of soil is good.	* Such soil can be managed because physical condition is not so good.
* O.M. or humans is always found in soil.	O.M. or humans or even absent.

Part : C

Question: How do you reclaim salt affected land?

Answer: Reclamation of salt Affected Land:

In the arid regions of the world, and along coastal areas subject to periodic inundation by sea water, soil may have such a high content of soluble salt that production of economic plants is not possible. The salts found in soil are generally the chlorides, carbonates, bicarbonates and sulfates of sodium with lesser amount of potassium, magnesium and calcium salts.

The salt in soil dissolves in the soil water and damage plant growth by preventing the plants from getting needed water from the soil

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Since the energy required to remove a given quantity of water from a salt solution increases as the salt concentration of the solution increases.

Question No 2

Part A

Answer:

KENNEDYS THEORY:

* R.G Kennedy study straight reaches of upper Bari Doab canal which are stable for 30 years.
* $V_0 = CD^n$

where V_0 is critical velocity (non-silting or non-scouring).
C is constant depends upon quantity of silt.

Kennedy procedure for canal design:

Step 1: Assume the trial value of D and put in eqn 1. (Q = AV) and determine $V_0 = 0.546mD^{0.64}$

Step : 2

In equation. 1 $Q = AV$

$A = Q/V$

$A = BD + D^2/2$

$P = B + D\,5^{1/2}$

For Assumed D determine B

Find $R = A/P$

Step : 3

Substitute the value of R in eqn 2 (Kutters and chazys Eqn.) 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 Eqn: 3 (Kennedeys Eqn.). Then the assumed depth is correct. otherwise repeat the procedure with changed value of D.

Part B

Solution:

$A = Q/V = \frac{30}{V} \longrightarrow (1)$

Now using formula to calculate "V"

$V_0 = 0.546 m D^{0.64}$

$V_0 = 0.546 (1)(2.3)^{0.64}$

$\boxed{V_0 = 0.935 m/s}$

Put the value in eq (1)

$A = \frac{30}{0.935} = 32.01 m^2$

Now

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

$32.01 = B(2.3)^2 + \frac{2.3^2}{2}$

$\boxed{B = 12.77m}$

Put the value in below equation

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

$P = 12.77 + 2.3\sqrt{5}$

$\boxed{P = 17.9m}$

Now

$$R = \frac{A}{P} = \frac{32.01}{17.9} = 1.76$$

Substituting the value of "R" in Kutter's Md chagy equation.

$$V = C(RS)^{\frac{1}{2}} \longrightarrow (2)$$

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

$$= \frac{\frac{1}{1} + \left(23 + \frac{0.00155}{0.0002}\right.}{1 + \left(23 + \frac{0.00155}{0.0002}\right)\frac{1}{\sqrt{1.75}}}$$

$$\boxed{C = 49.526}$$

Put the value in eqn (2)

$$V = 49.526(1.76 \times 0.0002)^{\frac{1}{2}}$$

$$\boxed{V = 0.93\ m/sec}$$

Question # 03

Part A

Answer:

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 silt grades then the channel is said to have final regime.
* In final regime the cross section assumes semi-ellipse shape.

Part B

Given data:

$Q = 30$ cumec

(M) Silt factor = 0.56mm

Solution:

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

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

$f = 1.3$

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

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

$$\boxed{V_m = 0.844}$$

$Q = AV$

$$A = \frac{Q}{V} = \frac{30}{0.844}$$

$$A = 35.54\ m^2$$

now

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

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

$$P = 26.01$$

now for 'R'

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

$$R = 1.36$$

$$B = 26.01 - 2.236[1.52]$$

$$B = 22.611$$

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

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

So

$\boxed{S = 0.00026}$ Ans

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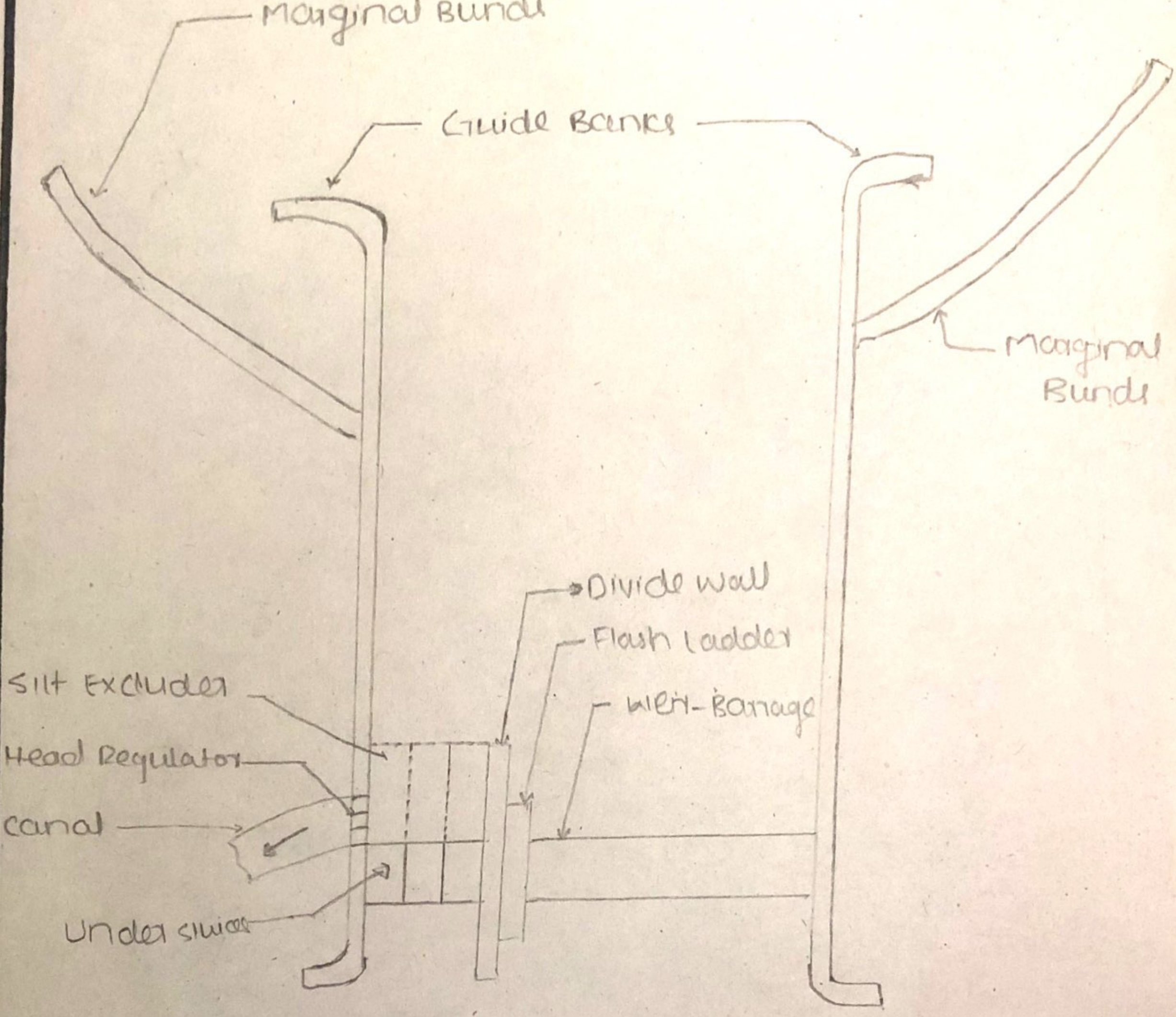
Question No 04 Part A

Answer:



Introduction:

* Any hydraulic structure which supplies water to the off-taking canal is called a headwork.
Headwork may be divided into two.

Components of Headworks:

1: Storage Headwork.
2: Diversion Headwork.

1: STORAGE HEADWORK:

Dam is constructed across a river valley to form storage reservior, known as storage head works.
Water is supplied to the canal from this reservoir through canal regulator. These serves for multipurpose function like hydro-electric power generation, flood control, fishery.

2: DIVERSION HEADWORK:

Weir or barrage is constructed across a perennial river to raise water level and to divert the water to canal, as known as diversion headwork. Follow of water in the canal is controlled by canal head regulator.

Components of a diversion Headwork.

* **Weir**: Normally the water level of any perennial river is such that it cannot be diverted to the irrigation canal. The bed level of the canal may be higher than the existing water level of the river.

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 arrangement of adjustable gates or shutters at different tires over the weir.

Under sluices: Under sluices are gate controlled openings in the weir with crest at low level. They are located on the same side as off-take canal. If two canal take off on either side of the river it would be necessary to provide undersluices on either side.

Divide Wall: The divide wall is a masonry or concrete wall constructed at right angle to the axis of the weir. The divide wall extend on the up stream side beyond the begining of the canal head regulator: and on the downstream side: it extend upto the end of the loose protection of the under-sluices.

Fish ladder: A fish ladder, also known as a fishway, fish pass or fish steps. is a structure on or around artificial and natural barriers to facilitate diadromous fishes natural migration as well as movements of patamodoromous species.

* Canal head regulator
* Silt excluders
* River training work.

Part B

Answer:

Functions of canal Head Regulators:
It regulates the supply of water entering the canal. It controls the entry of silt in the canal. It prevents the river-floods from the canal.

Silt Regulation works:

The entry of silt into a canal, which take off from a head works, can be reduced by constructed certain special works, called silt control works. These works may be classified into the following two types.

(a) Silt Excluders

(b) Silt Ejectors

River training works: River training works are required near the weir site in order to ensure a smooth and an axial flow of water and thus to prevent a river from outflanking the works due to a change in the course. The river training works required on a canal headworks are:

(a): Guide Banks
(b): Marginal Bunds
(c): Spurs or groynes

The End