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Section A

Semester 6th

Subject irrigation engineering

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Section A

Q No 1

Explain Anti water logging measures?

Ans:-

Contro of cannal Seepage:-

Cannal Seepage is major Sourse of water losses and Logging in irrigation Areas and it can be control by.

-> lining of canal with impervious meterial like clay concrete to control Seepage.

Convert water system from ~~than~~ cannal to piped System.

Redueing intensity of irrigation:-

The most important aspect to avoid water logging is to provideed the The water to thus Small portion. of land where necessary.

Applying where ~~necessary~~ only the required amount the water so that all water applied is used by plant use efficied irrigation methed i-e drip irrigation.

Rotation of Crop:-

It mean that we should plant crop in t Such way that it prevent the land from waterlogging.

Coop which used larg amount of ~~wate~~ water should be follower by Those plants which used less water or no water.

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2No1b

Ans:- Differentiate between Saline and alkaline Soils.

Soline Soil:-

By the princip of Osmosisi pure water from roots flow outwood in plant are due to lack of wate such Soil is un productus. and called Soline Soil. Soline Soil appearence is a black crusty core over the Surface of earth.

Alkaline Soil:-

If the Salt efforescece continues for a longer period a base exchange reaction with clay take place thus Sudiumgiy the clay making.
it impermeable illaeruted and highly un productive Such Soil are called alkaline Soils.
It is white in appearince as while patchles appear over earth Surface.

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Q No 1c

How do you reclaim Salt effected lands?

Ans:

following are the major aspect to reclaim Salt effected lands.

The practice of crop reversal is necessory to reduce the establishment of Solfor efforscor.

An effiesent drainage (Surface & o Surface) must be provioded to lower the water table in Soline Soils.

High Salt resistant crops like rice are grown leached land for 1 or 2 Seasons.

land Should be flooded with water so that alkaline So it will disolled water.

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Q2a

Q No 2a: Explain the procedure of designing of an irrigation canal by kennedy's theory.

Ans:- Kennedys theory:-

-> R.G Kennedys studied straight reaches of upper Bari Doab cannal which are stable 30 years.

-> $V_o = CD^n$

Where V_o is critical velocity (non-Silting or non Scouring)

C is constant depend upon quantity of silt.

Sediment is kept in suspension solely by the vertical component of eddies.

-> Weight of sediment vertically act downwards.

-> vertical component of eddies acts upwards

-> Result the sediment is in suspension

-> $V_o = 0.84 D^{0.64}$ FPS System

-> $V_o = 0.546 D^{0.64}$ MKS System, D is depth.

-> $V_o = 0.546m D^{0.64}$ where $M = V/V_o$ = Critical velocity ratio (C.V.R) depend upon Silt grade.

-> V = critical velocity for all size of Sediment V_o is V_{cr} for upper Bari Doab only.

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Kennedy procedure for cannal design.

Step 1:- Assume the trial value of D and put in eq ① and determine

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

Step 2:- in eq 1 : $Q = AV$

$$A = Q/V$$

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

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

for assumed D determin B

Find $R = A/P$.

Step 3:- Substitute the value of R in eq ② (kutters and charzys eq) to obtain V which will be the actual velocity for assumed dimensions.

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 change value of D.

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Q No 2b: Design an irrigation channel by Kennedy's theory to carry a discharge of 30 Cummec with Cu(m) of 1 and N as 0.0225 and bed slope of 1 in 5000 Assume the depth(D) as 2.3m.

Given Data.

Discharge (Q) = $30 m^3/sec$

Cu, (m) = 1

Bed Slop = 1 in 5000

N = 0.0225

Depth = 2.3m

Solution.

finding velocity.

$V_K = 0.546 m D^{0.64}$

$= 0.546 (1)(2.3)^{0.64} =$ **V_K 0.93**

Now. calculating Area of canal

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

$A = 30/0.930$ **Area = 32.25 m^2**

Now we have to calculat B by using formula.

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

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By putting values:

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

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

$32.25 - 2.645 = 2.3(B)$

$29.605 = 2.3B$

$B \Leftarrow 12.87\,m$

Now we have to calculat wetted perimeter

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

$= 2.87 + \sqrt{5}(2.3) = P = 18.01\,m$

we have to calculat Hydralic Radius

$R = A/P$

$= 32.25/18.01 \quad = R = 1.79\,m$

Now calculting mean velocity from chezy equation.

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

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

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

$C = 49.56$

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

$V_c = 0.93\,m$

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Q No 3a Differentiate between initial regim and final regime in accordance to laceys theory.

Ans:: initial Regime::
when only bed slope of channel channge but the cross section remains same than also no silting or scouring take place But this is rare.

-> bed slop of a channel varies
-> cross-section or wetted primeter remains unaffected.

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 channal is said to have final regime.
all the variables such a perimeter depth slope etc are equally free to very and achieve perement stability called final Regime.

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Q No 3b

Design a regime channel by laceys theory for discharge of 30 cumecs and mean diameter of silt particle of 0.56mm.

Given Data

$Q = 30\ m^3/sec$

$m = 0.56\ mm$

Solution.

$$\text{Silt Factor} = 1.76 \times m^{0.5}$$

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

$$\boxed{f = 1.3}$$

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

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

$$\boxed{V_m = 0.844}$$

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

$$A = 35.54$$

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

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

$$\boxed{P = 26.01}$$

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

$$\boxed{R = 1.36}$$

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See Hint A

$A = BD + D^2/2$

$35.54 = BD + \frac{D^2}{2}$ —— ①

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

$26.01 = B + 2.236D$

$B = 26.01 - 2.236D$ —— ②

Put eq ② in eq ①

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

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

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

$35.54 = 26.01D - 1.736D^2$

$-\frac{1.736D^2}{a} + \frac{26.01D}{b} - \frac{35.54}{c} = 0$

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

By Quadratic eq

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

$D = 1.52$

Put in eq ②

$B = 26.01 - 2.236(1.52)$

$B = 22.611$

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

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

$S = 0.00026$

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Q No 4C: Explain the component of headworks with neat diagram.

Ans weir or barage

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. 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 level at different time barrage is constructed Barrage is an arrangement of adjustable gates or shutter at different tires over the weir.

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under sluices:
also known as scouring sluices the under sluices are the opening provided at the base of the weir or barrage these opening are provided with adjustabul gates Normally the gates ar kept closed the suspendend silt goes on despositing in front of the canal head regulator when the silt depositing becomes appreciable the gates are opend and the deposited silt is loosned with an agitator mounting on boat The gates are them closed but at the period of flood the gate are kept opened.

Divid wall:
The divid 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 cannal head regulator and on the downstream side it is extended up to the launching apron.

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The functions of the divid wall..
are flowing to form a still water pocket in front of the canal head so that the suspended silt can be settled down which then later be cleaned through the ~~scour~~ scouring sluices from time. it resists the overturning effect on the weir or barrage caused by the pressure of the impounding water.

Fish ladder:.
The fish ladder is provided just by the side of the divid wall for the free movement of fishs Rivers are important source of fishes the tendency of fish is to move from downstream to upstream in monsoons this movement is essential for their survival Due to construction of weir or barrage this movement gets obstructed and is deterimental to the fishes.

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canal head regulator:.
A structure which is constructed at the head of the cannal to regulat flow water is know as canal head regulator it consist of a number of piers which divide the total width of the canal in number of spans which are know as bays
The piers consist of number tiers on which the adjustable gates are placed The again some piers are constructed on the down stream sid of the canal head to support the roadway.

Function of canal Head Regulator.
it regulates the supply of water entering the cannal it controls the entery of silt in the canal it prevents the rivers flood from enter the canal.

Silt regulation works:.
The entry of silt into a canal which take off from a head work can be reduced by constructed certain special work called silt cortrol work.

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Silt excluders:-

Silt excluder are those work which are constructed on the bed of the river upstream of the head regulator The cleared water enters the head the silt excluder in this type of work the silt is therefore removed from the water before in enters the canal.

Silt Ejectors:-

Silt ejectors also called Silt extractor are the devices which extract the silt from the canal wate after the silted water has travelled a certain distance in the off take canal those work are therefore constructed on the the bed of the canal and little distance downstream from the head regulator.

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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 the river from outflanking the works due to a change in its course the river training work required on a cannal headwork are.

Guide bank

When a barrage is constructed across a river which flow through the alluvial soil the guid banks must be constructed on both the approaches to protect the structure from erosion Guide bank serves the following purposes. it controls the velocity of flow near the structure.

marginal Bunds.

The marginal Bunds are earthen embankment which are constructed parallel to the river bank on one or both the banks according to the condition the top width is generally 3 to 4 m. the side slop on the river side is generally 1.5:1 and that on the country side is 2:1.

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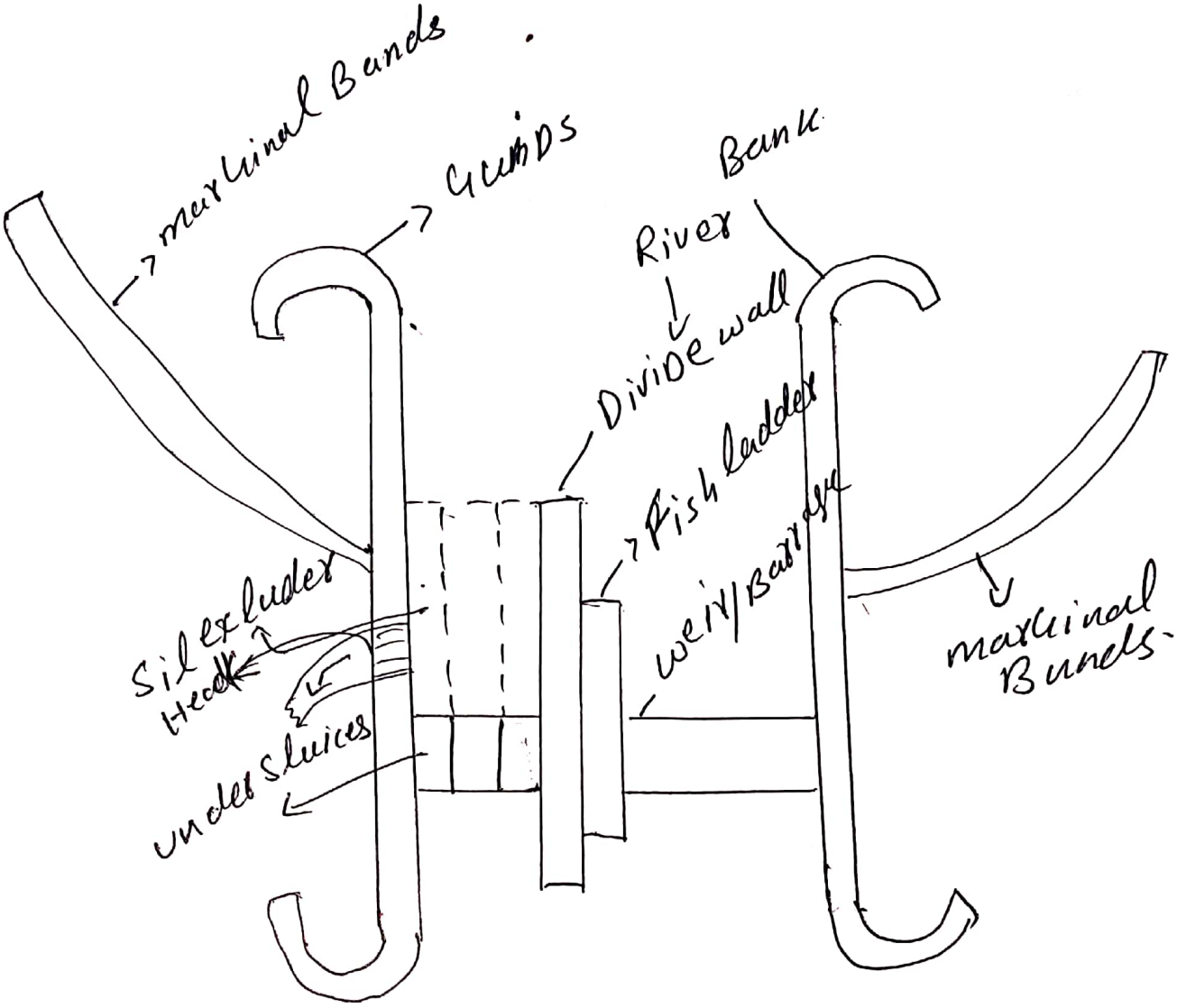

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NO4b water are the function of Head regulators?

Aus:- Function of Head regulators:..

-> it regulates the supply of water entering the cannal

-> it control the entry of silt in the cannal

-> it preven the river floods from entering the cannal

The functions of canal head regulator are to regulate the supplies in the canal to in dicate the discharge passed into the cannal from design discharge formula and observed head of water on the crest to control the silt entry in the canal.