FINAL PAPER

SUBJECT : IRRIGATION ENGINEERING

SECTION : B

MODULE : 6th

SUBMITTED BY : NASRULLAH, 7870

SUBMITTED TO : Dr. JAHANGIR DURRANI

DATE : 23/ JUNE /2020.

#01

Q1 (a) Explain anti-water logging measures?

Ans: Following are the anti water logging measures:

i: Linning of Canals and water courses:

Linning of canals makes the water align through the proper channel reduces major losses to greater extent.

- It also seepage of water.

ii: Reducing intensity of Irrigation:

- Small portion of land should recieve Canal water in one particular season.
- The remaining areas of land can recieve water in next season by crop rotation.

02:

iii: **Introduction to 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 & than by cotton.

iv: **Optimum Use of water:**

- Proper amount of water gives good results; less or more water effects the yield. Cultivation should be educated so that there is optimum use of water.
- Revenue should be charged on the basis of quantity of water rather than area of land.

03:

v: **Improving Natural drainage of Area:**

- Water should not be allowed to stay in one area.
- Natural flow is provided by bush and Jungle cutting.

vi: **Dumping of tubewells:**

- Lift irrigation should be introduced to use ground water.
- Canal irrigation may be substituted by tube well irrigation.

vii: **Adaptation of Sprinkler methode of Irrigation:** There should be no percolation losses from water courses.

- Only determined amount of water is supplied to land.

Scanned with CamScanner

#04:

b: Differentiate between Saline and Alkaline Soils?

Saline Soil:	Alkaline Soil:
• By principle of osmosis Pure water from roots flow outwards in a plant die due to lack of water such soil is unproductive and is called saline soil.	• If the salt efflorescence continuous for a longer periode, a base exchange reaction with clay takes place, thus sodiumizing the clay, making it impermeable.
• Saline soil appearance is as a black crustly core over the surface of earth.	illearated and highly unproductive such soil are called alkaline soil. • It is white in appearance as white patches, appear over earth's surface.

Scanned with CamScanner

05:

Q: How do you reclaim salt effected lands?

Ans: Following are the major aspects to reclaim salt effected lands:

- Maintain the water table sufficiantly below the roots.
- An efficiant drainage (surface & Surface) must be provided to lower the water table in saline soils.
- The practice of crop reversal is necessary to reduce the establishement of salts or efforescence.
- Land should be flooded with water so that alkaline salts will be dissolve in water.
- High salt resistant crops like rice are grown on leached land for 1 or 2 seasons.

Scanned with CamScanner

06:

Q2: ⓐ: Explain the procedure for designing of irrigation Canal by Kennedey's theory?

Ans: Following are the steps require for designing an irrigation Canal using Kennedy's theory:

Step # 01: Assume the trial value of D and put it in equation ($Q = AV$) and determine:

$$V_o = 0.546\, mD^{0.64}$$

As equation ① is $Q = AV$

Thus: $A = \frac{Q}{V}$

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

$$P = B + D5^{1/2}$$

For assumed D determine B, Find $R = \frac{A}{P}$

Scanned with CamScanner

#07:

Step No 03: Substitude the value of R in Kutter's and chazy's equation, to obtain v which will be the actual velocity for assumed dimensions.

Step # 04: If the velocity worked out for kutter's and chazy's equation agrees with that of obtained with the kennedy's equation than the assumed depth is correct. otherwise repeat the procedure with the changed value of D.

Scanned with CamScanner

#08:

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

Sol: Given Data:

$$D = 2.3\,m$$

$$Q = 30 \text{ cumecs}$$

$$C.V.R = m = 1$$

$$N = 0.0225$$

$$S = 1/5000 = 0.0002.$$

As we know that:

$$Q = AV$$

$$A = \frac{Q}{V} = \frac{30}{V} \quad \text{---} \quad (1)$$

Thus, Using formula to compute "V":

Scanned with CamScanner

#09:

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

$$V_o = 0.546\,(1)\,(2.3)^{0.64}$$

$$\boxed{V_o = 0.935\ m/sec}$$

Put this value in eq (1) we get:

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

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

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

$$\boxed{B = 12.77\ m}$$

Put this value in below equation:

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

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

$$\boxed{P = 17.9\ m}$$

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

Substituting the value of "R" in kutter's and Chazy's equations:

$$V = C(RS)^{1/2} \quad \text{——} \quad (9)$$

Scanned with CamScanner

#10:

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

$$C = \frac{\frac{1}{1} + \left(23 + \frac{0.00155}{0.0002}\right)}{1 + \left(23 + \frac{0.00155}{0.0002}\right) \frac{1}{\sqrt{1.76}}} = 49.526.$$

Put the Value in eq (9).

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

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

This is equal to the Vo thus no more trials required.

Scanned with CamScanner

#11:

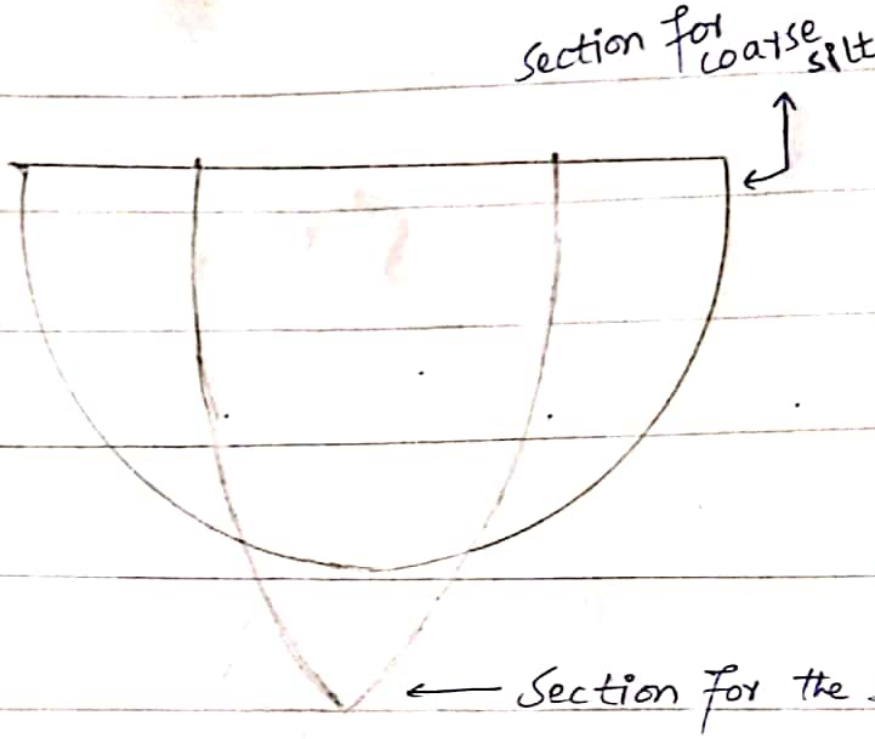
Q3: ⑨ Differentiate between initial regime and Final regime accordance to Lacey's theory?

INITIAL REGIME	FINAL REGIME.
• When only bed slope of channel changes but the cross section remains same then there will be no silting and scouring.	• If all the parameters (perimeter, depth and slope) have equally free to vary and adjust according to discharge and still grades than the channel is said to have the final regime.
• Cross sections or wetted perimetre remains uneffected.	• In final regime the cross section assumes semi ellipse shape.
• It is a quick process and occurs with in short span of time.	

P.T.O

Scanned with CamScanner

#12:



Q3: b: **Given data:** 30 cameCs, $d = 0.56\,mm = [m]$.

By formula: Silt factor $= f = 1.76 \times m^{0.5} = 1.76(0.56)^{0.5}$

$$\boxed{f = 1.3}$$

$$\rightarrow \left[\frac{Qf^2}{140}\right]^{1/2} = \left[\frac{30 \times (1.3)}{140}\right]^{1/2} = \boxed{Vm = 0.844\,mm/s}$$

$$\rightarrow Q = AV = A = \frac{Q}{V} = \frac{30}{0.844} \Rightarrow \boxed{A = 35.54\,mm^2}$$

$$P = 4.75\sqrt{Q} = 4.75\sqrt{30} \Rightarrow \boxed{P = 26.01}$$

$$R = \frac{5}{2} \times \frac{V^2}{f} = \frac{5}{2}\frac{\times 0.844^2}{1.3} \Rightarrow \boxed{R = 1.36\,mm}$$

Scanned with CamScanner

13:

As we know that:

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

$$P = B + D\sqrt{5} \quad ; \quad 26.01 = B + 2.236D \quad \text{— (2)}$$

Thus $$B = 26.01 - 2.236D \quad \text{— (3)}$$

Put eq (3) in (1)

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

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

$$35.54 = 26.01D - 1.736D^2$$

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

Using quadratic formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$D = 1.52$ put in eq (2) we get

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

$$\boxed{B = 22.611 \text{ mm}}$$

Now

$$S = \frac{f^{5/3}}{334 Q^{1/6}} = \frac{(1.3)^{5/3}}{334(30)^{1/6}} \Rightarrow \boxed{S = 0.00627}$$

Scanned with CamScanner

#14:

Q4: Explain the Components of Headworks with neat diagrame?

Ans: Following are the components of headworks:

- Weir or barrage
- Undersluices
- Divide wall
- Fish ladder
- Canal head regulator
- Silt excluders / Silt Prevention devices.
- River training works.

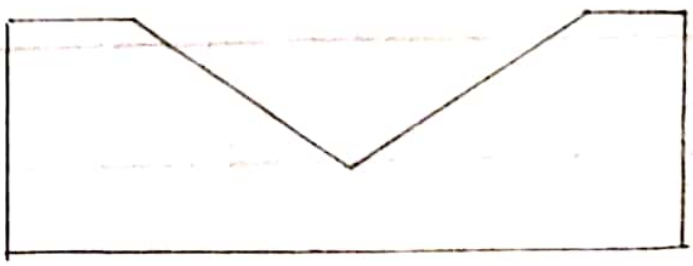
1: **Weir and Barrage:** Normally the water level of any perennial river is such that it cannot be diverted to the irrigation canal. The bed level of canal may be higher than the existing water level

Scanned with CamScanner

#15:

of the river. In such cases weir is constructed across the rivers 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 required height.

- When the water level on the upstream 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. at different tires over the weir.



weir.

D.T.O

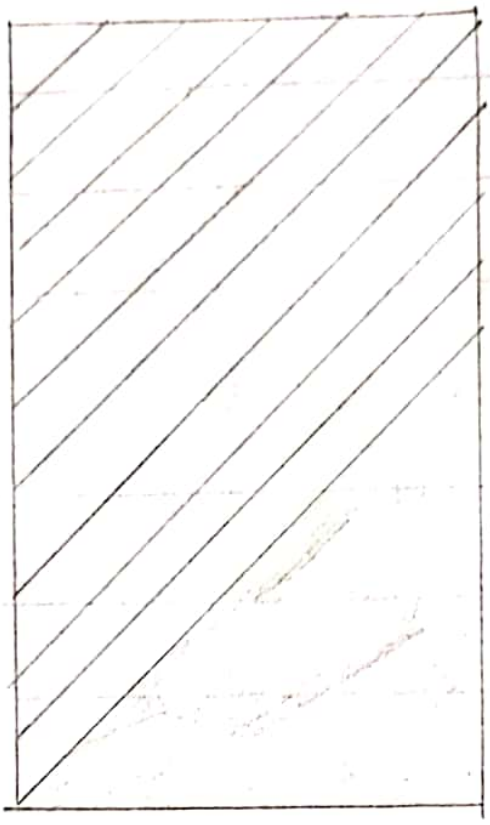
Scanned with CamScanner

16.

Under sluices:

It is also known as scarring sluices. The under sluices are the opening provided at the base of the weir or barrage. These opening are provided at adjustable gates, Normally the gates are kept closed. The suspended silt goes on depositing infront of the canal head regulator. When the silt deposition becomes appreciable the gates are opened and the deposited silts loosened, with an igitation mantaining on a boat. The muddy water flares towards the downstream through the scouring slives. The gates are than closed but at the periode of flood the gates are kept opened.

Scanned with CamScanner

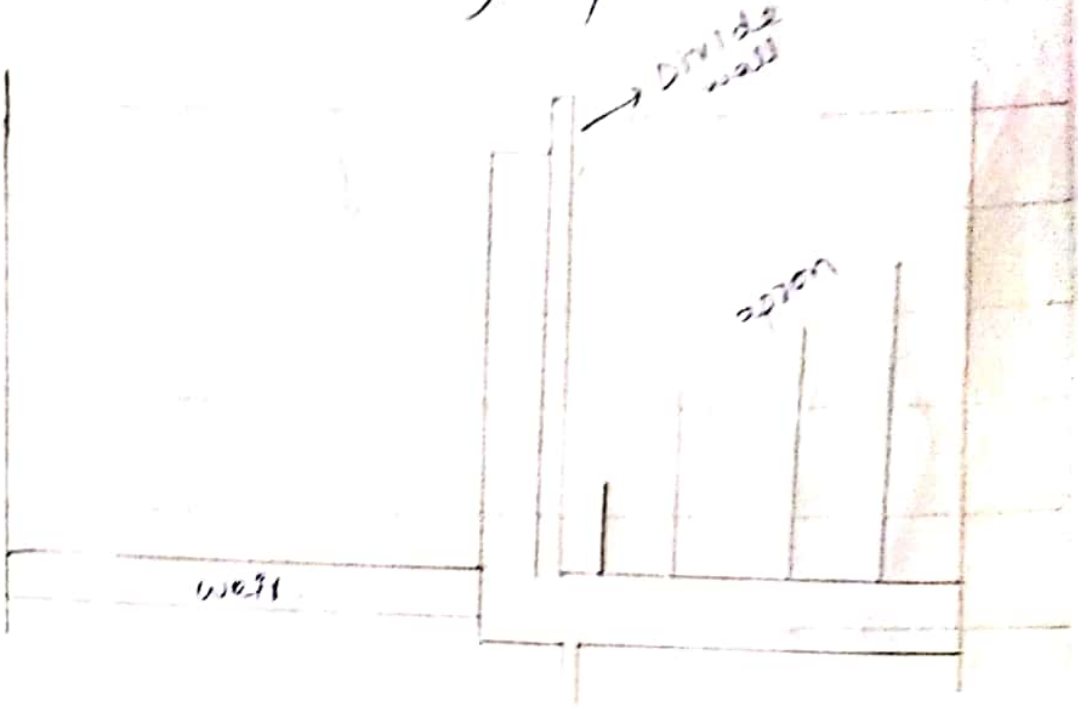


3: DIVIDE WALL:

The divide wall is a long wall constructed at right angles in the weir or barrage, it may be constructed with stone masonary or cement concrete. on the upstream side the wall is extended just to cover the canal head regulator and in the downstream side it is extended

Scanned with CamScanner

up to the launching apron



4. **Fish ladder:** It is provided just by side of the divide wall for the free movement of the fishes. Rivers are important source of fishes. The tendency of fish is to move from upstream to down stream in winters and from downstream to upstream in summer. This movement is essential for their survival. Due to construction of weir or barrage

Scanned with CamScanner

18:

This movement gets obstructed and it is detrimental to fishes.

- In the fish ladder the fabble walls are constructed in a zigzag manner so that the velocity of flow with in the ladder does not exceed
  - 3m/sec.
- The width length and height of the fish ladder depend on the nature of the river and the type of the weir or barrage.

Scanned with CamScanner

19:

5: **Canal head regulator:** A structure which is constructed on the head of the canal to regulate flow of water and is known as canal head regulator. It consist of number of piers which divide the total width of the canal into a number of spains which are known as bays. The piers consist of number of tiers on which the adjustable gates are placed. The gates are operated from the top by suitable mechanical device A platform is provided on the top of the pierse from the facility of operating the gates.

Scanned with CamScanner

20

Silt Regulation works: The entry of silt into a canal which take off from headworks can be reduced by constructed certain special work called silt control works. these work may be classifying into the following two types. (a) silt excluders.
(b) silt ejections.

(a) Silt excluders: Silt excluders are those work which are constructed on the bed of the river upstream of the head regulator. The clearer water enters the head regulator and silted water enters the silt excluders. In this type of work the silt is therefore remove from water before enters canal.

Scanned with CamScanner

20)

Silt Regulation works: The entry of silt into a canal which take off from Headworks can be reduced by constructed certain special work called silt control works. these work may be classifying into the following two types. (a) silt excluders.

(b) silt ejections.

(a) Silt excluders: Silt excluders are those work which are constructed on the bed of the river upstream of the head regulator. The clearer water enters the head regulator. and silted water enters the silt excluders. In this type of work the silt is therefore remove from water before enters canals.

Scanned with CamScanner

Ans:

Silt ejectors: Silt ejectors are also called silt extractors. are those device which extract the silt from the canal. water after the silted water has travelled a certain distance in the off take canal. These works are constructed on the bed of the canal. and little distance downstream from the chead regulator.

Scanned with CamScanner

7: 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 preventing the river from the outflanking the works due to change in it's coarse. Their river training works required on a canal head regulator are

(a) Guide banks.
(b) marginal bunds
(c) spurs.

Q4(b): What are the functions of Head regulator?

Ans: The major function is to regulate the supply of water entering the canal. It control the entry of silts in the canal.

- It prevent the river flood from entering the canal.

Scanned with CamScanner