Muhammad Abdullah

ID # 7796

Section A

Irrigation Engineering

Final Exam

Ans 1

a): Anti water-logging measures:

1) Optimum use of water:
certain amount of water gives the best result. Less or more water reduce the yeild.
* cultivation should be educated so that not to use more water.

2) Reducing intensity of irrigation:
only small portion of land should recieve canal water in one particular season.
* Remaining areas can receive water in next season by rotation

3) Lining of canal and water sourse:
* It reduces sepage of water.

4) Introducing crop rotation:
High water requires that crop should be followed by one requiring less water, and then by one requiring almost no water.

5) Improving natural drainage of area:

* water should not be allowed to stay in one area.
* Natural flow is provided by bush and jungle cutting.

6) Vertical drainage or Tube wells:

* Lift irrigation should be introduced to use GW.
* Canal irrigation may be substituted by tube well irrigation.

(b) saline soils	Alkaline soils
1) saline soils are the soil that have PH in between 7 and 8.5 and an exchangable sodium percentage below 15%.	1) Alkaline soils are soils that have a PH greater than 8.5 and an exchangable sodium percentage greater than 51%

2) Exchangable sodium Percentage is Less than 15.	2) Exchangable sodium Percentage is greater than 15.
3) It has electrical conductivity of 4 or more mmhos/cm.	3) It has electrical conductivity less than 4 mmhos/cm.
4) Organic matter content is high	4) Organic matter content is low.
5) Color of the soil white or light gray	5) Color of the soil is black.

(c) Reclamation of salt affected lands

1) Salt can be leached out of the root zone through good quality irrigation water or by heavily rainfall.

2) Create good surface and internal drainage.

3) Break the compacted layer that occur near or at the soil surface.

4) By maintaining water table sufficiently below the roots.

5) Add organic matter, such as rotted hay or feedlot manure, at 10-15 tons/acre to improve soil porosity.

Ans 2:

a) Kennedys theory:

* R.G Kennedy studied straight reaches of upper Bari Doab canal which are stable for 30 years

* $V_o = CD^n$

V_o = critical velocity

C is constant depends upon quantity of silt

Kennedy Procedure for canal design:

Step 1:

Assume the trial value of D and put in equation.

$$V_0 = 0.546\, m D^{0.64}$$

Step 2:

$$Q = AV$$

$$A = Q/V$$

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

$$P = B + D\sqrt{5}/2$$

For assumed D determine B

Find $R = A/P$

Step 3:

Substitute the value of R in equation to obtain V which will be the actual velocity for assumed dimensions.

Step 4:

If the velocity worked out from the equation agrees with the obtained of Kennedeys eq Then the assumed depth is correct. Other wise repeat the procedure with changed value of D.

Ans 2

b) Given data:

Discharge (Q) = 30 m^3/sec

Cvr (m) = 1

N = 0.0225

Bed slope = 1 in 5000

Depth (D) = 2.3m

Required:

Finding velocity

Solution:

By formula

$V_K = 0.546 m D^{0.64}$

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

$V_K = 0.930$ m

Now calculating area of canal

By formula

Q = AV

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

$$A = \frac{30}{0.930}$$

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

=> Now we have to calculate B

By using formula

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

$$BD + 0.5D^2$$

=> By putting values

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

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

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

$$29.605 = 2.3(B)$$

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

Now we have to calculate wetted perimeter,

so by formula

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

$$= 12.87 + \sqrt{5}(2.3)$$

$$\boxed{P = 18.01 m}$$

Now we have to calculate hydraulic radius:

$$R = A/P$$

$$= \frac{32.25}{18.01}$$

$$\boxed{R = 1.79 m}$$

Now calculating mean velocity from chezy equation.

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

where

$$C = \frac{\frac{1}{n} + \left(23 + \frac{0.00155}{5}\right)}{1 + \left(23 + \frac{0.00155}{3}\right)\frac{n}{\sqrt{R}}}$$

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

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

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

$$V_c = 0.93$$

$$\boxed{V_c = 0.93 m}$$

Ans 3

a): 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 diffrentiated between initial regime and final regime, but this theory is only applicable to final regime.

Initial regime: When only bed slope of channel changes but the cross section remains same than also no silting or scouring take place But this is real.

* wetted perimeter remains unaffected

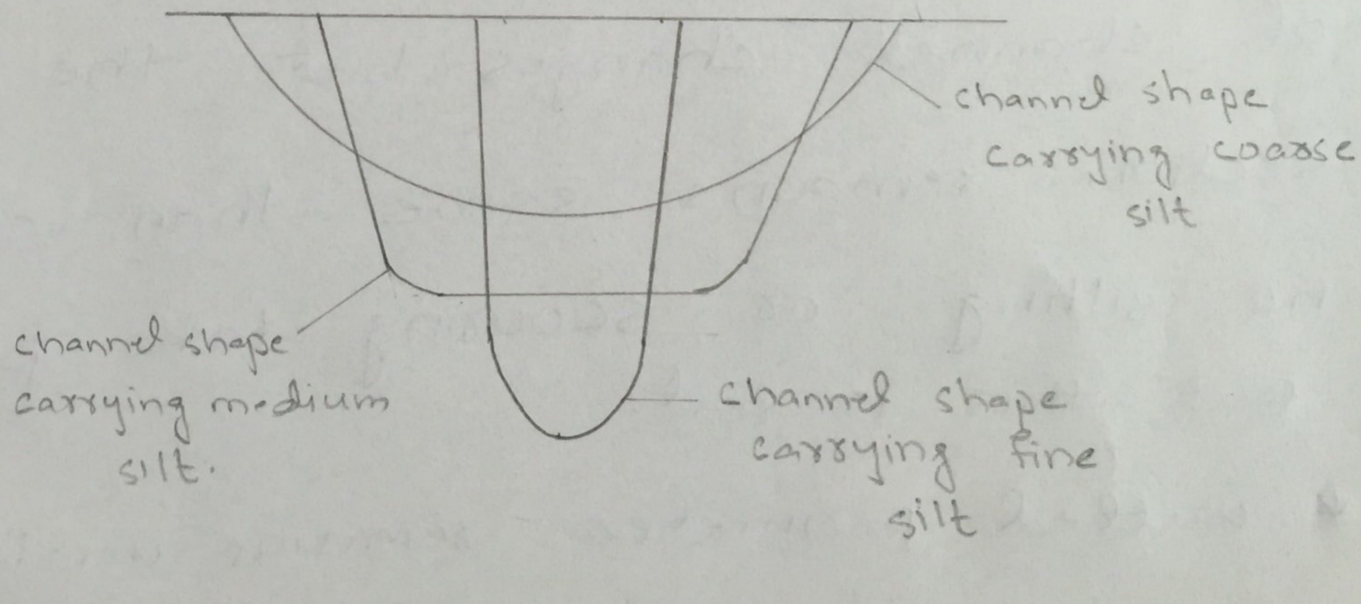
Final regime:

If all the parameters (perimeter, depth & slope) have equally free to vary and adjust according to discharge & slit grades than the channel is said to be have final regime

in such a channel:

* The coarser the silt, the flatter is the semi-ellipse.

* The finer the silt, the more nearly the section attains a semi-circle.



Ans 3

b) Given data:

$$Q = 30 m^3/sec$$

$$M = 0.56 mm$$

Solution:

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

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

$$\boxed{f = 1.3}$$

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

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

$$\boxed{V_m = 0.844}$$

$$Q = AV$$

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

$$\boxed{A = 35.54}$$

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

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

$$\boxed{P = 26.01}$$

$$R = \frac{5}{2} \times \frac{V^2}{f}$$

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

$$\boxed{R = 1.36}$$

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

$$35.54 = BD + \frac{D^2}{2} \rightarrow (1)$$

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

$$26.01 = B + 2.236D \rightarrow (2)$$

put eq (2) in (1)

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

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

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

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

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

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

using Quadratic formula

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

$D = 1.52 \rightarrow (3)$

put (3) in (2)

$B = 26.01 - 2.236(1.52)$

$\boxed{B = 22.611}$

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

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

$$\boxed{S = 0.00026}$$

Ans 4:

a) Components of headworks:

1) weir:

A weir is a structure constructed across a river to raise its water level and divert the eater into the ~~ch~~ canal. on the crest of the weir shutters are provided so that part of the raising up of water is carried out by shutter.

2) Barrage:

in the case of barrage the crest is kept at low level and the raising up of water is accomplished mainly by means of gates.

3) Divide wall:

A divide wall is a long masonary wall or groyne, which is constructed at right angles to the axies of the weir to separate the undersluices from the rest of the weir. The top width of divide wall is about 1.5m to 2.5m.

4) Fish Ladder:

Large rivers have various types of fish, many of which are migratory. Due to the construction of weir or barrage accros the river such migration of the fish will be obstructed and if no arrangement is made in the weir or barrage for this migration, large scale distruction of the fish life may take place in river.

5) Undersluices:

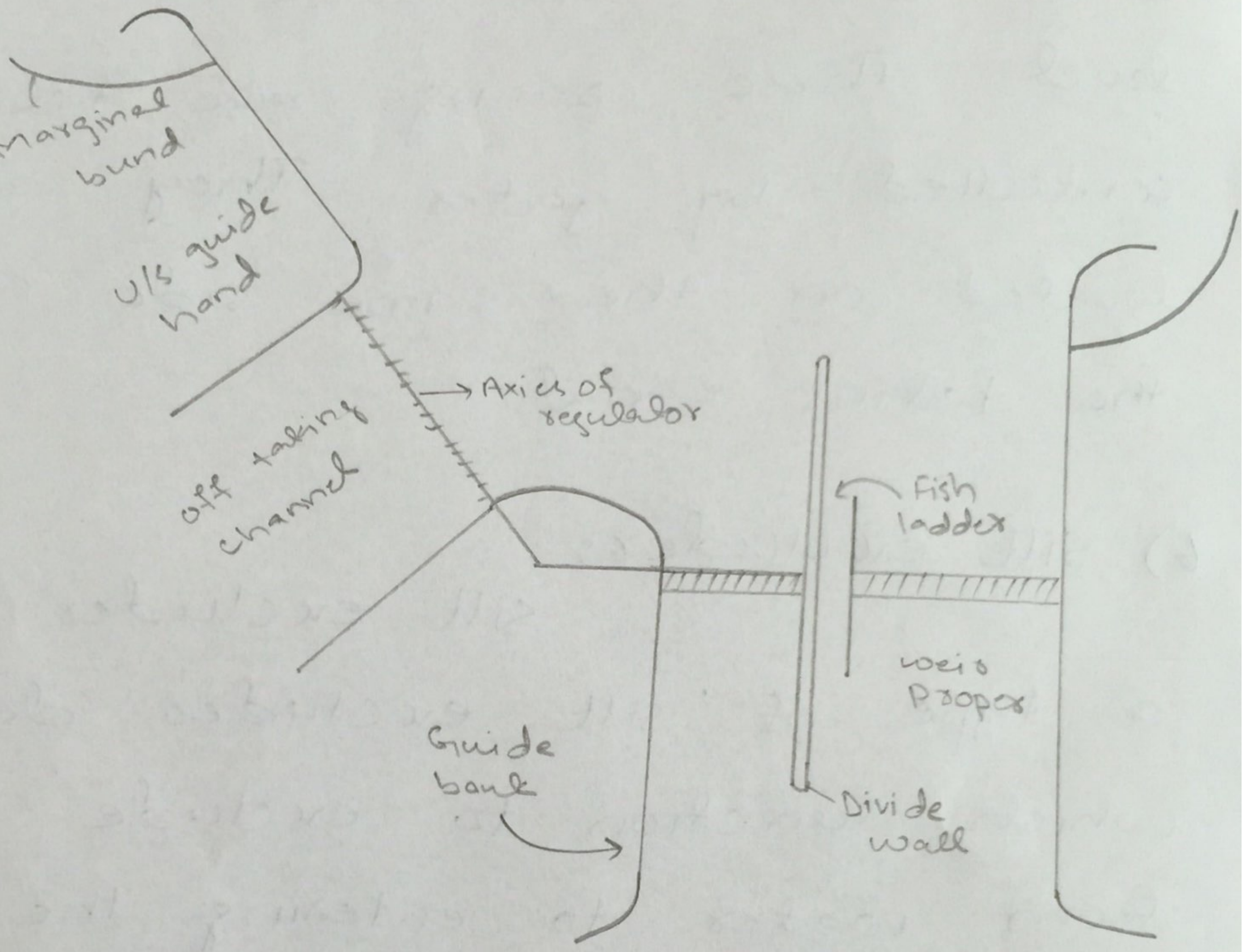
The undersluices are the opening provided in the weir wall with their crest at a low level. These openings are fully contolled by gates. They are located on the same side as off the taking canal.

6) Silt excluder:

Silt excluder are a type of silt excluder device which function to exclude silt from water to entering the canal. These devices are particularly provided on the river bed in front of the head regulator.

7) River training works:

River training works are required near the rever site to ensure a smooth an axial flow of water, and thus to prevent the river from outflanking the works due a change in its course.



Canal head Regulator

Ans 4

b) Function of canal head regulator:

Regulator constructed at the off taking point are called head regulators, when it is constructed at the main canal it is known as canal head regulators. and when it is controlled at the head of distributary, its called distributary head regulators.

Functions:

* To control the entry water either from the reserviours or from the main canal

* To control entry of silt into off taking or main canal.
* To serve as a meter for measuring discharge (Q) of water.
* To regulate the supplies into the canal.