IQRA NATIONAL UNIVERSITY
IRRIGATION ENGINEERING

Final Term Examination
(Summer 2020)

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Q. 1:-

(a) Define water logging. What are the causes of water logging?

Ans:- Land is said to be water logged when its productivity is affected by high water Table (WT).

- High WT causes satwation of root zone.
- It leads ill aeration which causes the decay of nitrifying bacteria.
- This reduces the crop yield.

Causes of water logging:

1) Intensive Irrigation: If max. area of land is irrigated, Percolation of water takes place. This causes the rise of WT.
Extensive irrigation (irrigation spread over wider regions) to be followed to avoid water logging.

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2) Seepage of water from adjoining high lands.

3) Seepage of water through canal reservoirs.

4) Impervious obstruction: water seeping below the soil moves horizontally. It may find obstruction and WT may rise.

5) Excessive Rains:
- Causes temporary water logging.
- No drainage causes permanent.

(1) (b) What is efflorescence? Define leaching process.

Ans:- By maintaining the water table sufficiently below roots.

efflorescense is a crystalline deposit of salts that can form when water is present in or brick, concrete, stone, stucco or other building surface. It has a white or greyish tint and consists salt deposits left behind when water evaporate

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Leaching Process:

In this process;

1) Land is flooded with water
2) Alkaline salts will be dissolved in water.
3) Percolation to the ground water
4) Drained by sub surface drains

- High salt resistant crops like rice are grown on leached land for 1 or 2 seasons.
- Then ordinary crops like wheat or cotton are grown.
- Then the land is said to have reclaimed.
- Sodium sulphate is formed which is leached out easily.
- When Sodium carbonate is present in the soil, gypsum is added before leaching.

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Q2:

(a) Explain the procedure of designing irrigation canals by Kennedy theory.

Step #1

Assume the trial value of D and put in eqn. 1

$V_o = 0.546 m D^{0.64}$

Step #2

In eqn. 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. Other wise repeat the procedure with changed value of D.

(2)(b) Differentiate b/w initial regime and final regime according to lacey's theory.

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 grade then the channel is said to have final regime.

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Q3

(a) Differentiate between storage headworks and diversion headworks.

Storage head works

- Dam is constructed across a river valley to form storage reservoir, 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.

Diversion headwork

- Weir or barrage is constructed across a perennial river to raise water level and to divert the water to canal, is known as diversion head work.

- Flow of water in the canal is controlled by canal head regulator.

(3) (b) What are the objectives of diversion headworks? Briefly describe the points necessary for site selection of diversion headwork.

Objectives of diversion headwork:

- It raises the water level on its upstream side.
- It regulates the supply of water into canals.
- It controls the entry of silt into canals.
- It creates a small pond (not reservoir) on its upstream and provides some pondage.
- It helps in controlling the fluctuation of water level in river during different seasons.

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Site selection for diversion head work:

- The river section at the site should be narrow and well-defined.
- The river should have high, well-defined, in erodible and non-submersible banks so that the cost of river training works is minimum.
- The canals taking off from the diversion head works should be quite economical and should have a large commanded area.

Q 4: Write notes on the following:

(d) **Balancing depth:**

For a given cross-section of channel, there can be only one depth, for which a balance between cutting and filling will occur. This depth is known as balancing depth.

(c) **Under sluices:**

Also known as scouring sluices. The under sluices are the openings provided at the base of the weir or barrage.

- These openings are provided with adjustable gate. Normally, the gates are kept closed.
- The suspended silt goes on depositing in front of the canal head regulator.

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(b) Silt excluders

- Silt excluders are those works which are constructed on the bed of the river, upstream of the head regulator.
- The cleaner water enters the head regulator and silted water enters the silt excluder.

(a) Canal head regulator

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

- It consists of a number of piers which divide the total width of the canal into a number of spans which are known as bays.
- The piers consist of number tiers on which the adjustable gates are placed.