CE 8603 IRRIGATION ENGINEERING

REGULATION 2017

QUESTION BANK

UNIT-I

TWO MARKS QUESTIONS AND ANSWERS

1. **Define irrigation.**

   Irrigation may be defined as the natural or artificial and controlled supply of water for the economic growth of crops.

2. **What is irrigation engineering?**

   It is the branch of applied science, which deals about the ways and means adopted by the irrigation engineer to bring irrigation water from its source of supply to an agricultural land.

3. **What is the necessity of irrigation?**

   Irrigation becomes necessary when,

   - The rainfall is insufficient for the maturity of crops,
   - The rainfall is unevenly distributed over the base period,
   - Additional water is required to raise some commercial and cash crops and
   - A controlled distribution system is required.

4. **What are the benefits of irrigation?**

   - Increase in yield and value of crops
   - Protection from famine by giving employment,
   - Cultivation of cash and commercial crops,
   - Addition to the wealth of the country
   - Generation of hydroelectric power.

5. **What are the disadvantages of irrigation?**

   - Gives rise to disease like malaria
   - Excessive seepage causes water-logging and
   - The climate becomes cooler and makes the locality damp resulting ill-health of the public.

6. **What is the purpose of irrigation?**

   - It adds water to the soil to supply moisture to the plant.
   - It saves the crops from drying during droughts.
   - It cools soil and the atmosphere.
   - It dilutes salts in the soil.
   - It reduces soil piping.

7. Define crop ratio.

It is the ratio of the area irrigated in Rabi season to the area irrigated in kharif season.

8. What is meant by overlap allowance?

The crops of some season may overlap some period of the next crop season. When such overlapping takes place the crops of both the season require water simultaneously.

9. Define arid and semiarid regions.

The area where irrigation is a must for agriculture is known as arid region.

The area in which inferior crops can be grown without irrigation is called semi- arid region.

10. Define wilting coefficient.

It is the water content at which plants can no longer extract sufficient water from the soil for its growth. It is also called as permanent wilting point.

11. What is meant by consumptive use of water?

Evapo transpiration or consumptive use of water by a crop is the depth of the water consumed by evaporation and transpiration during the crop growth including the water consumed by the accompanying weed growth.

12. What are the factors affecting consumptive use of water?

- Evaporation.
- Mean monthly temperature.
- Growing season of crop and cropping pattern.
- Monthly precipitation in the area.
- Soil and topography.
- Wind velocity in the locality.

13. Define duty.

Duty represents the irrigating capacity of a unit of water. It is the relation between the area of a crop irrigated and the quantity of irrigation water required during the entire period of the growth of that crop.

14. Define delta.

It is the total depth of water required by a crop during the entire period the crop is in the field.

15. Define crop period.

Crop period is the time, in days, that a crop takes from the instant of its sowing to that of its harvesting.

16. What are the factors affecting duty?

- Methods and systems of irrigation.
- Mode of applying water to the crops.
- Methods of cultivation.
- Types of crop.
- Base period
- Climatic condition of the area.

17. What are the methods for improving duty?

- Preparation of field before sowing.
- Leaching of soil to reduce alkalinity.
- Addition of fertilizers to increase water-holding capacity.
- Rotation of crops.
- Canal lining.

18. What is the gross command area and culturable command area?

Gross command area: It is the total area lying between the drainage boundaries, which can be irrigated by a canal system.

Culturable command area: The area on which the crops can be grown satisfactorily is known as Culturable command area.

19. Define saturation capacity and field capacity.

Saturation capacity is the amount of water required to fill all the pore spaces between the soil particles by replacing all the air held in the pore spaces.

Field capacity is the moisture content of the soil after free drainage has removed most of the gravity water.

20. Define base period.

Base period for a crop refers to the whole period of cultivation from the time when irrigation water is first issued for preparation of the ground for planting the crop, to its last watering before harvesting.

SIXTEEN MARK QUESTIONS

1. Explain the necessity and scope of irrigation

2. Discuss in detail the benefits and ill-effects of irrigation

3. Define duty and explain in detail the various factors affecting duty. How can duty be improved? Explain.

4. A watercourse has culturable commanded area of 2600 hectares, out of which the intensities of irrigation for perennial sugar-cane and rice crops are 20% and 40% respectively. The duty for these crops at the head of watercourse is 750 hectares/cumec and 1800 hectares/cumec respectively. Find the discharge required at the head of watercourse if the peak demand is 20% of the average requirement.

5. The base period, intensity of irrigation and duty of various crops under a canal system are given in the table. Find the reservoir capacity if the canal losses are 20% and reservoir losses is 12%.

6. Define the following:

G.C.A., C.C.A., Kor depth, kor period, outlet factor, capacity factor, nominal duty, open discharge, rabi and kharif crops. (NOV / DEC 2006)

7. What do you understand by crop rotation? What are its advantages?

8. Find the capacity of a soil for the following data:

Root zone depth = 2 m

Existing water content = 5%

Dry density of soil = 1.5 g/cm^3

Water applied to the soil = 500 m^3

Area of plot = 1000 sq.meters.

Water loss due to evaporation = 10%

9. After how many days will you supply water to soil (clay loam) in order to ensure efficient irrigation of the given crop, if

(i) Field capacity of soil = 27%

(ii) Permanent wilting point = 14%

(iii) Density of soil = 1.5 g/cm^3

(iv) Effective depth of root zone = 75 cm

(v) Daily consumptive use of water for the given crop = 11mm

10. A water course has a culturable commanded area of 1200 hectares. The intensity of irrigation for crop A is 40% and for B is 35%, both the crops being Rabi crops. Crop A has a Kor period of 20 days and crop B has Kor period of 15 days. Calculate the discharge of the water if the depth for crop A is 10 cm and for B it is 16 cm.

UNIT – II

TWO MARKS QUESTIONS AND ANSWERS

1. What do you mean by flow irrigation?

Flow irrigation is the type of irrigation in which the supply of irrigation water available is at such a level that it is conveyed on to the land by the gravity flow.

2. Define lift irrigation.

Lift irrigation is practiced when the water supply is at too low a level to run by gravity on to the land. In such a circumstances water is lifted up by mechanical means.

3. Define perennial irrigation

In this perennial irrigation system, the water required for irrigation is supplied in accordance with the crop requirements throughout the crop period.

4. Define inundation irrigation

Inundation irrigation is carried out by deep flooding and thorough saturation of the land to be cultivated, which is then drained off prior to the planting of the crop.

5. Define direct irrigation.

In this system, water is directly diverted to the canal without attempting to store the water. For such a system, a low diversion weir or diversion barrage is constructed across the river.

6. What do you meant by storage irrigation?

In this system, a solid barrier, such as a dam or storage weir is constructed across the river and water is stored in the reservoir or lake so formed.

7. Define combined irrigation.

In this system, the water is first stored in the reservoir formed at the upstream side of the dam, and this water is used for power generation. The discharge from the powerhouse is fed back in to the river, to the downstream side of the dam. Thus, sufficient quantity of flow is again available in the river.

10. What do you mean by uncontrolled and controlled flooding?

In the controlled flooding, water is spread over the land, with proper methods to control the depth of application.

In the uncontrolled flooding, water is spread of r flooded on a rather smooth flat land, without much control or prior preparation.

11. What are the basic requirements for adaptation of any irrigation method?

1. The method should be such that uniform water distribution with as small as 6 cm water depth applications can be made for light irrigations.
2. At the same time, it should afford heavy uniform application of 15 to 20 cm water depth.
3. It should allow the use of large concentrated water flows for reduction of conveyance losses, and labour cost.
4. It should be suitable for use with economic conveyance structure.

12. What do you mean by free flooding?

In free flooding method, the field is divided into a number of small sized plots which are practically level. Water is admitted to these plots at the higher end and the supply is cut off as soon as the lower part of the plot has received the sufficient depth of water.

13. Where contour laterals are applicable?

Contour laterals are applicable for steeper terrain. The field is cut by relatively dense network of small counter laterals, the spacing of which depends upon the prominent grade of the field between two adjacent ditches or laterals, the uniformity of slope and the soil type.

14. Write about the advantages of furrow irrigation.

1. In the furrow irrigation, water contacts only 1/5 to ½ of the land surface, thereby reducing pudding and crusting of the soil. Evaporation losses are also reduced.
2. It is specially suitable for those crops (like maize) they are injured by contact with water.
3. Labour requirements in land preparation and irrigation are very much reduced.
4. There is no wastage of land in field ditches.

15. Under which favourable conditions the sub-surface irrigation is practiced?

- Impervious sub-soil at reasonable depth (2 to 3 m) or higher water table.
- Permanent soil such as loam or sandy loam in the root zone of the soil.
- Uniform topographic conditions.
- Moderate slopes.
- Good quality irrigation water

16. Where sprinkler irrigation is more useful?

1. The land cannot be prepared for surface methods.
2. Slopes are excessive
3. Topography is irregular.
4. Soil is erosive.
5. Soil is excessively permeable or impermeable.

17. Write about the advantages of sprinkler irrigation.

1. Erosion can be controlled.
2. Uniform application for water is possible.
3. Irrigation is better controlled; light irrigation is possible for seedlings and plants, which are young.
4. Land preparation is not required.
5. Crop damage from frost can be reduced.

18. Write about the limitations of sprinkler irrigation.

- ❖ Wind may distort sprinkler pattern.
- ❖ A constant water supply is needed for commercial use of equipment.
- ❖ Water must be clean and free from sand.
- ❖ The power requirement is high.

19. Write about the advantages of drip irrigation

- ❖ Less requirement of irrigation water.
- ❖ Water supply at optimum level.
- ❖ Water logging is avoided.
- ❖ High yield.
- ❖ Cultivation of cash crops.

20. Write about the disadvantages of drip irrigation

- ❖ High initial cost.
- ❖ Danger of blockade of nozzles.
- ❖ Change in spacing of nozzles due to change in the crops may result in frequent replacement of trickle lines.
- ❖ Shallow root depth of the crops, especially for fruit trees may result in instability of the crop or tree which may topple during high winds.

SIXTEEN MARK QUESTIONS

1. Write a note on sub-surface irrigation, state clearly the conditions under which this method is suitable. What are the essential requirements for a successful sub-surface irrigation?

2. Describe border strip method of irrigation. Derive the expression for the time required to cover a given area by this method, for a given rate of discharge and the rate of infiltration of water in the soil.

3. Find the time required to cover an area of 0.1 hectares when a tube well is discharge at the rate of 0.03 cumecs for irrigating Rabi crops. Average depth of flow is expected to be 7.5 cm. Average infiltration rate for the soil may be taken as 5 cm / hr. and also find maximum area that can be irrigated by the available discharge of 0.03 cumecs.

4. Explain in detail about sprinkler method of irrigation and how far it is suitable in Indian conditions.

5. Write a note on drip irrigation. Write about the advantages and disadvantages of drip irrigation system.

6. Define surface irrigation. Why it is widely practiced method of irrigation? What are the advantages and disadvantages of the method?

7. Write a note on free flooding and contour laterals.

8. Describe check flooding and basin flooding.

9. Write about zigzag method and contour farming.

10. Describe furrow method of irrigation.

UNIT-III

TWO MARK QUESTIONS AND ANSWERS

1. **Define diversion headwork.**

   Any hydraulic structure, which supplies water to the off-taking canal, is called a headwork. A diversion headwork serves to divert the required supply in to the canal from the river.

2. **Write about the purposes of diversion headwork.**

   - It raises the water level in the river so that the commanded area can be increased.
   - It regulates the intake of water in to the canal.
   - It controls the silt entry in to the canal.
   - It reduces fluctuations in the level of supply in the river.
   - It stores water for tiding over small periods of short supplies.

3. **Define weir.**

   The weir is a solid obstruction put across the river to raise its water level and divert the water in to the canal. If a weir also stores water for tiding over small periods of short supplies, it is called a storage weir.

4. **What are the component parts of diversion headwork?**

   - Weir or barrage
   - Divide wall or divide groyne
   - Fish ladder
   - Head sluice or canal head regulator
   - Canal off-takes
   - Flood banks
   - River training works.

5. **Define dam.**

   A dam is a hydraulic structure constructed across a river to store the supply for a longer duration and release it through designed outlets.

6. **What are the types of dam?**
   - Solid gravity dam (masonry, concrete, steel and timber)
   - Arch dams
   - Buttress dams
   - Earth dams
   - Rockfill dams
   - Combination of rockfill and earth dams

7. **Define gravity dam.**

   A gravity dam is a structure so proportioned that its own weight resists the forces exerted upon it. It requires little maintenance and it is most commonly used.

8. **What are the forces acting on a gravity dam?**
   - Water pressure
   - Weight of dam
   - Uplift pressure
   - Pressure due to earthquake
   - Ice pressure
   - Wave pressure
   - Silt pressure

9. **What is meant by arch dam?**

   An arch dam is a dam curved in plan and carries a major part of its water load horizontally to the abutments by arch action. The part of the water load depends primarily upon the amount of curvature. The balance of the water load is transferred to the foundation by cantilever action.

10. **What are the forces acting on arch dam?**
    - Water pressure
    - Weight of dam
    - Uplift pressure (negligibly small)
    - Pressure due to earthquake
    - Ice pressure
    - Silt pressure

11. **What are the various types of earth dam?**

    Depending upon the method of construction, earth dam can be divided into,
    - Rolled fill dam
    - Hydraulic fill dam

12. What are the types of failure that occur during construction of earth dam?

- Hydraulic failures : 40%
- Seepage failure : 30%
- Structural failure : 30%

13. Define tank.

They are small storage meant for irrigating the local area. They may receive their supply from their own catchments. They may also have supply from a nearby river.

14. Define tank sluice.

These are outlets that extend from the upstream face of a bund to the downstream face. They are provided to discharge the stored water either for irrigation or for any other purposes.

15. How will you select a site for a tank sluice?

The site to be selected should be such that,

- The sluice commands the ayacut.
- The sill level of the sluice is above the bed level of existing canal.
- Good natural ground is available at the sill level.
- It involves minimum cutting
- It ensures the safety of the dam itself.

16. Define spillway.

A spillway is the overflow portion of dam, over which surplus discharge flows from the reservoir to the downstream. A spillway is therefore called as surplussing work, designed to carry this flood water not required to be stored in the reservoir, safely to the river lower down.

17. Write about the advantages of earth dam?

- They can be designed and constructed to suit the soil available in the locality and the foundation conditions.
- They can be constructed rapidly with relatively unskilled labour.
- They are cheaper than other types.
- They can be subsequently raised in height without much difficulty.

18. Write about the disadvantages of earth dam?

- They are not suitable for greater heights.
- They cannot be used as overflow dams.
- They are not suitable for deep gorges.
- They are not suitable in places of heavy rainfall.
- They require heavy maintenance cost and constant supervision.

19. Write about the functions of scouring sluices.

- To preserve a clear and defined river channel approaching the regulator.
- To control the silt entry in to the canal.
- To scour the silt deposited in the riverbed above the approach channel.
- To help in passing low floods without dropping the shutters of main weir.
- To provide additional waterway for floods, thus lowering the flood levels.

20. Under what conditions gravity dam can be adopted?

- Good rock is available for foundation.
- A narrow gorge exists to reduce cost and length of dam.
- Construction materials are available closely in plenty.
- A good site for the surplus weir exists.

SIXTEEN MARK QUESTIONS

1. Write in detail about the component parts of diversion works.

2. Write about the types of weirs on permeable foundation.

3. Write in detail about the tank surplus works.

4. What are the causes of failure of earth dams and its remedies?

5. Write about the factors affecting the selection of type of a dam.

6. Write about the favourable conditions, advantages, disadvantages, pressure distribution and elementary profile of a masonry dam.

7. Write about the criteria for safe design of earth dam.

8. Describe the forces acting on a gravity dam.

9. What are the types of dams and what are the comparative merits and demerits of carious types of dams?

UNIT-IV

TWO MARKS QUESTIONS AND ANSWERS

1. Classify the rivers.

According to the topography of river basin it is classified as:

- Upper reaches in the hilly region
- Lower reaches in the alluvial plain

Rivers in alluvial plain are further classified as:

- Meandering type
- Aggrading type
- Degrading type

2. What are the causes of meandering?

A primary cause of meandering is the excess of total charge during floods, when excess of turbulence is developed.

It results from the local bank erosion and consequent over loading deposition by the rivers of the heavier sediments having along the bed.

3. What are the objectives of river training works?

- High flood discharge may pass safely and quickly through the reach.
- Sediment load including bed and suspended load may be transported efficiently.
- To make the river course stable and reduce the bank erosion to minimum.
- To provide a sufficient draft for navigation as well as good course for it.
- To fix direction of flow through certain defined reach.

4. Classify the river training works.

- High water training
- Low water training
- Mean water training

5. Define groyne.

Groynes are structures constructed transverse to the river flow and extend from the bank in to the river up to a limit.

***6.* Classify the groynes.**

Classification according to material of construction.

- ❖ Permeable groyne
- ❖ Solid impermeable groyne.

Classification according to its height below high water.

- ❖ Submerged groyne.
- ❖ Non-submerged groyne.

Classification according to the function it serves.

- ❖ Attracting groyne.
- ❖ Deflecting groyne.
- ❖ Repelling groyne.
- ❖ Sedimentary groyne.

***7.* Give an equation for silt factor.**

$f = 1.76\sqrt{d}$

where, f = silt factor

d = mean particle diameter.

***9.* Give Kennedy's critical velocity equation.**

$$V_o = 0.55\ m\ D^{0.64}$$

Where, V_o = critical velocity (m/s)

m = critical velocity ratio (C.V.R)

D = depth of water over bed portion of a channel in meters.

***10.* Define critical velocity.**

The critical velocity in a channel has the mean velocity, which will just keep the channel free from silting or scouring.

***11.* What is meant by regime channel?**

The channel will be in regime if it flows in coherent unlimited alluvium of the same character as that transported and the silt grade and silt charge are all constant.

12. **What is meant by contour canal?**

A channel aligned nearly parallel to the contours of the country is called a contour canal. When the canal takes off from a river in a hilly area, it is not possible to align the canal on the watershed as the watershed on the top of the hill may be very high and the areas that need irrigation are concentrated in the valley. The canal is aligned roughly parallel to the contours of the country.

13. **What is a ridge canal?**

A ridge canal or a watershed canal is aligned along a watershed and runs for most of its length on a watershed. When the watershed takes a sharp loop, the canal should be aligned straight to save considerable idle length.

14. **Give the Lacey's equation for wetted perimeter.**

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

Where, P = Wetted perimeter. (m)

Q = Discharge (m^3 / s)

15. **Give the Lacey's equation for bed slope of a canal.**

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

Where, S = Bed slope.

f = Silt factor

Q = Discharge (m^3 / s)

16. **Write about the significance of Lacey's theory.**

- Lacey's theory assumes that the velocity of flow depends on the hydraulic mean depth, not on the depth.
- For a given discharge and given silt charge bed width, depth of flow and bed form is fixed.
- For channel in final regime, velocity, hydraulic mean depth, wetted perimeter, discharge, bed slope and N are closely related to one another.
- There is only section and only one longitudinal bed slope at which the channel will carry a particular discharge with particular silt grade.
- The eddies generated from the sides are considered.

17. **When the channel is said to be in regime?**

- The channel is said to be in regime, when the following conditions are satisfied.
- The channel is flowing in unlimited incoherent alluvium of the same character as that transported.
- Silt grade and silt charge is constant.
- Discharge is constant.

SIXTEEN MARK QUESTIONS

1. How are canals generally classified? Describe them briefly

2. Explain the various considerations for alignment of a canal.

3. Why are canal falls necessary? Describe with sketch briefly the various types of canal falls.

4. What are the types of cross drainage works? Describe them briefly with sketches.

5. Define Lacey's regime theory and its design procedure of channel. Also list the defects in Lacey's theory.

6. Write the design procedure for Kennedy's theory for the channel.

7. Design an irrigation channel to carry 40 cumec of discharge with B / D ratio as 2.5. The critical velocity ratio is 1.0. Assume suitable value of rugosity co-efficient and use Kennedy's method.

8. Compare Kennedy and Lacey's silt theories.

9. What is the necessity of river training works? Describe different types of river training works

10. What is meant by guide banks? What are their functions and effects?

UNIT V

TWO MARKS QUESTIONS AND ANSWERS

1. **What is meant by Productivity?**

   Productivity is defined as the ratio of output and input. The output can be water delivered, area irrigated, yield, or income, and the input can be water in the root zone, at the farm gate at the outlet or at upstream points in the system including the point of diversion or storage. Improved water supply influences the adoption of high – yielding agricultural practices by farmers, which justify the productivity criterion of performance.

2. **Define equity.**

   Equity in canal irrigation systems implies equality, fairness, and even-handed dealing in matters of allocation and appropriation of irrigation water. There can be several ways to decide the equality of supplies to different farmers. Two of them, practiced throughout the world, are the methods of prior appropriation and of proportionate equality.

3. **Write about the conjunctive use of water.**

   Conjunctive use means the water lifted from below the ground is used in conjunction with canal waters. It results in the coordinated, combined, and creative exploitation of ground water and surface water so as to minimize the dislocation caused by nature's inconsistent rainfall pattern. Such coordinated use of surface and ground waters results in increased amount of available water, smaller surface distribution system, smaller drainage system, reduced canal linings, greater flood control, and smaller evaporation losses.

4. **What is meant by short – term stability?**

   The short – term or interseasonal stability refers to the variations in productivity and equity between irrigation seasons, and is a function of climate, water supply, storage and control, system management, and other factors such as pests, diseases, and availability of labour and other inputs. It can be measured by comparing performance between seasons.

5. Define long – term stability.

The long – term stability is defined as "environmental stability" and "durability" and refers to the prevention or minimizing of adverse physical changes such as waterlogging, leaching of nutrients form soils, salinity, erosion, silting, the 'mining' of ground water, and infestations with weeds.

6. Write about the main components of soil reclamation.

The main components of soil reclamation works are as follows

- Isolation of land areas according to their categorization and leveling and bunding of the affected land as per the category.
- Provision of drainage (surface or subsurface or vertical) network to remove leaching water and to keep the water table to a safer level.
- Breaking up of impervious subsoil layer in alkali soils by deep ploughing.
- Adding suitable chemicals (such as gypsum, sulphur, etc.) depending upon the results of chemical tests of the affected soil.

7. Why a proper plan for operation & maintenance of irrigation system is necessary?

A proper plan for operation and maintenance is, therefore, necessary to

- Achieve stipulated levels of project services including maintenance at minimum achievable cost.
- Achieve optimum use of canal water.
- Provide detailed operation and maintenance guidelines during various anticipated scenarios of water availability, including equitable water distribution upto the tail-end of the system, and
- Effect efficient coordination of staff, equipment, physical and financial resources and related disciplines, active involvement of farmers etc.

8. What are the main objectives of canal lining?

The following are the main objectives of canal lining:

- To canal seepage.
- To prevent water-logging.
- To increase the capacity of canal.
- To increase the command area.
- To protect the canal from the damage by flood.

- To control the growth of weeds.

9. What are the factors to be considered during the selection of particular type of lining?

The selection of particular type of lining depends on the following factors,

- Imperviousness.
- Smoothness.
- Durability.
- Economy.
- Site condition.
- Life of project.
- Availability of construction materials.

10. How can the water losses be controlled?

The following are the measures that are generally taken to control the water losses from the reservoir.

1. *Measure to Reduce Evaporation Loss*
   - **a)** The reservoir should be constructed of less surface area and more depth.
   - **b)** Tall trees should be grown on the windward side of the reservoir which act as wind breakers and hence the rate of evaporation will be reduced.
   - **c)** The reservoir basin should be surrounded by plantation or forest area so that cooler environment exists within the reservoir area.
   - **d)** Certain chemical like cetyl alcohol is spread over the reservoir surface. It forms a thin film on water surface reducing evaporation.
2. Measure to Reduce Absorption Loss
   - **a)** The weeds and plants at the periphery of the reservoir should be removed completely.
   - **b)** The weeds from the surface of the reservoir should be removed.
3. *Measure to Reduce Percolation Loss*
   - **a)** Geological investigations should be carried out to locate the zones of pervious formations, cracks and fissures in the bed and periphery of the reservoir basin.
   - **b)** Suitable treatments should be adopted to stop the leakage of water through these zones.
   - **c)** Soil stabilization methods should be adopted if the basin is composed of permeable bed soil.

11. **What is meant by water logging?**

In agricultural land, when the soil pores within the root zone of the crops get saturated with the subsoil water, the air circulation within the soil pores gets totally stopped. This phenomenon is termed as water logging. The water logging makes the soil alkaline in character and the fertility of the land is totally destroyed and the yield of crop is reduced.

12. **State the effects of water logging?**

The following are the effects of water logging:

- Stabilization of soil
- Lack of aeration
- Fall of soil temperature
- Growth of weeds and aquatic plants
- Diseases of crops
- Difficulty in cultivation
- Restriction of root growth

13. **Write the methods used for controlling water logging?**

The following measures may be taken to control water logging:

- Prevention of percolation from canals
- Prevention of percolation from reservoirs
- Control of intensity of irrigation
- Economical use of water
- Fixing of crop pattern
- Providing drainage system
- Improvement of natural drainage
- Pumping of ground water
- Construction of sump well

14. **Define 0n-farm water management.**

It can be defined as manipulation of water within the borders of an individual farm, a farming plot or field.

Example: in canal irrigation system, OFWM starts at the farm gate and ends at the disposal point of the drainage water to a public watercourse, open drain or sink.

15. **What do you meant by water user association (WUA)?**

It is a self-managing group of farmers working together to operate and maintain their irrigation and drainage network, to ensure fair and equitable water distribution, and to increase crop yield.

16. **What are the problems of irrigation management without participatory management?**

- Inadequate water availability at the lowest.
- Poor condition / maintenance of the system.
- Lack of measuring devices and control structures.
- Inadequate allocation fro operation and maintenance.
- Lack of incentives fro saving water.
- Poor drainage.

SIXTEEN MARKS QUESTIONS

1. Discuss the inadequacies of present – day canal irrigation management in India.

2. Describe the common criteria for judging the performance of an irrigation system.

3. Describe the evaluation of performance of canal irrigation systems.

4. What are the methods adopted for improving canal irrigation management? Explain in detail.

5. Why should lining be provided in canals? What are the merits and demerits of canal lining?

6. Write the different types of canal lining. Explain them.

7. How can water be lost from a reservoir? How can the losses be controlled?

8. What kinds of participation are necessary for irrigation management activities?

9. What is meant by percolation pond? Draw a neat sketch of a percolation pond.

10. What is the need fro WUA?

11. What is the need fro optimization of water use?