

5.74

Water Resources and Irrigation Engineering

TWO MARKS QUESTIONS AND ANSWERS**1. Differentiate gravity flow-irrigation and left irrigation.**

Ans: The irrigation in which the water flows under gravity from the source to the field is known as gravity flow irrigation. The whole canal irrigation in India is gravity irrigation. The gravity flow irrigation is cheaper and quality of water is also good due to presence of soil content.

Lift irrigation is the other method of irrigation in which water is not transported by natural flow (as in gravity flow system) but is **lifted** with pumps or other means.

S.No.	Lift Irrigation	Gravity Flow Irrigation
1.	Water flows, not under gravity but lifted with pumps.	Water flows under gravity.
2.	Costly means of irrigation.	Cheapest means of irrigation.
3.	Working dependent on operation of machinery.	Lifting equipment is not involved.
4.	Less manurial silt in water.	Silt in water has manurial value.
5.	Higher water rates.	Lowest water rates.
6.	Complex system and by and large costly.	Simple and economical system of irrigation.

2. What is meant by perennial irrigation?

Ans: In perennial system of irrigation, constant and continuous water supply is assured to crops in accordance with crop requirements and crop period. In this system of irrigation, water is supplied through canal distribution system taking-off from above a weir, or barrage or a dam.

3. Define inundation irrigation.

Ans: Flood Irrigation or Inundation Irrigation

In this system, a canal is excavated from the bank of the river which overflows in rainy season and dried up in summer. Hence water flows to the agricultural land in rainy season only. There is no regulator at the head of the canal to control the flow of water. The bed level of the canal is designed in such a way that water can flow through the

5.75

Irrigation Methods and Management

canal only when the water level of the level rises above the canal bed. And the flow of water through the canal stops automatically when the water level of the river falls below the canal bed.

So this system of irrigation depends only on the water level of the river. Over irrigation is possible in this system since there is no regulator at the head of the canal.

4. What is the difference between direct and indirect irrigation?

Ans: Direct Irrigation

In direct irrigation system, water is directly diverted from the river into the canal by construction of diversion weir or barrage across the river without attempting to store water.

Indirect or Storage Irrigation

In this system, water is stored in a reservoir during monsoon period by construction of a dam across the river for supply into the off-irrigation canal. Indirect irrigation is adopted where the river is non-perennial or flow in the river is adequate during lean period.

5. How lift irrigation is done by man or animal power?

Ans: The lifting of water is done by the following method from the sources like ponds, lakes, rivers and open wells, etc.

- | | | |
|---------------------|----------------------|-----------|
| (i) Swinking basket | (ii) Doon | |
| (iii) Denkhi | (iv) Ratti or Pulley | (v) Mole. |

6. Write short notes on well irrigation.

Ans: It is a type of lift irrigation extracting water from the open well and tube well. An open well is a vertical hole dug in the ground to obtain the subsoil water. A tube well is a deeper well over 15 m deep and water is lifted with the help of pump set operated by electric motor or diesel engine.

The open well may be classified into two types, such as shallow open and deep open wells. Shallow well rests in a pervious stratum and draws in supply from the surrounding materials, whereas the deep open well rests on a impervious clay layer, through a bore hole made into it. Pervious formation below the clay layer contain greater quantities of ground water and greater discharge can be obtained from deep open well.

5.76 Water Resources and Irrigation Engineering

7. Mention the advantages and disadvantages of well irrigation.

Ans: Advantages of Well Irrigation

The following are the advantages of well irrigation:

1. Well is simplest and cheapest source of irrigation and the poor Indian farmer can easily afford it.
2. Well is an independent source of irrigation and it can be used as and when the necessity rises.
3. Well can be dug at any convenient place according to their requirement.
4. The farmer need not pay anything to other agencies for doing well irrigation.

Disadvantages of Well Irrigation

The following are the disadvantages of well irrigation:

1. Only limited area can be irrigated. Normally a well can irrigate 1 to 8 hectares of land.
2. Well may dry up and may be rendered useless for irrigation when excessive water is taken out.
3. When drought comes, the ground water level falls and enough water is not available in the well.
4. Tube wells can draw a lot of ground water from its neighbouring areas and make the ground dry and unfit for agriculture.
5. Well irrigation is not possible in areas of salty ground water.

8. Compare well irrigation and canal irrigation.

Ans:

S.No.	Well Irrigation	Canal Irrigation
1.	Instant source of supply	Dependent on water availability in the canal system.
2.	Supply can be drawn as per requirements.	Supply received from the canal has to be used.

Irrigation Methods and Management

5.77

S.No.	Well Irrigation	Canal Irrigation
3.	Lesser fluctuation in supply.	Higher fluctuations in supply.
4.	Well water supply is uniform in temperature and soluble mineral contents.	Canal water supply is not uniform in temperature and may pick up minerals enroute.
5.	Volumetric sale of water is possible.	Volumetric sale of water not in use as yet.
6.	Low transmit loss.	High transmit loss in long canal system.
7.	Effective antiwater logging measure.	Leads to water logging if drainage is not provided.
8.	High working expenses usually to owner's account.	Maintenance of canal system is done by canal department.
9.	Lifting equipment difficult to maintain.	No such equipment involved.
10.	High cost of irrigation.	Low cost of irrigation.

9. How irrigation tanks are classified?

Ans: Tanks are also classified based on size.

- a. **Small Tank:** 4.5 m height and 20 hectares area.
- b. **Medium Tank:** 9 m height and 21 to 500 hectares area.
- c. **Large Tank:** 12 m height and more than 500 hectares area.

Irrigation tanks are classified according to the nature of supply of water.

1. **System Tank:** The system tanks gets assured supply from nearby rivers or canal system and they may not have their own catchment.
2. **Non-system Tank or Isolated Tank or Rainfed Tanks:** These tanks depend on the runoff from their own catchment. They are not connected to any other tank.
3. **Grouped Tank or Tank in series:** These tanks consists of a series of tanks connected together such that out flow from the upper tank is stored in the lower

5.78

Water Resources and Irrigation Engineering

tank for irrigation. These tanks either receive the surplus water of the upper tank or send its own surplus into some lower tank or do both.

10. Mention the structures adopted in tank irrigation system.

Ans: A tank irrigation system consists of:

- Earthem bund or tank bund across the valley creating a storage.
- A surplus weir to dispose off flood discharge.
- Sluices to feed the channels.
- Channels from the sluices to feed the Ayacut.

11. What is the use of surplus weir?

Ans: Tanks are provided with arrangements for spilling way the excess surplus water that may enter into the tank so as to avoid the overtopping of tank bund. These surplus escape arrangement may be in the form of surplus escape weir provided in the body or at the end of the tank bund.

12. What are tank sluice?

Ans: It is an opening in the form of a culvert or a pipe running through or under the tank bund so as to supply water from tank to distributory channel below for meeting the irrigation requirements. Wing walls and other bank connections are provided at the head and tail end of the culvert. In case of medium sized sluices, masonry culvert with or without arch roots are generally constructed. The size of the culvert will depend upon the maximum quantity of water required to convey, but in no case it should be less than 0.6 m wide and 0.75 m high so as to allow a man to enter for examination and repairing purpose.

13. Discuss the merits and demerits of tank irrigation.

Ans: Merits of Tank Irrigation

- Most of the tanks are natural and do not involve heavy cost for their construction.
- Tanks are generally constructed on rocky bed and hence have longer life span.
- Fishing is carried on many tanks. This supplements both the food resources and income of the farmer.

Irrigation Methods and Management

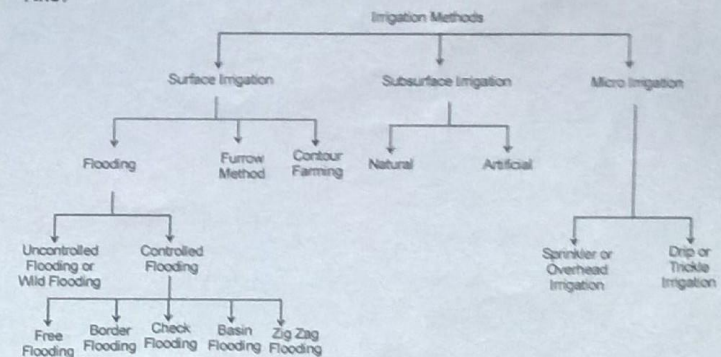
5.79

Demerits of Tank Irrigation

- Many tanks dry up during the dry season and fail to provide irrigation when it is needed the most.
- Silting of the tank bed is a serious problem and requires desilting of the tank at regular interval.
- More water is evaporated from the water spread area of tank and thus is not available for irrigation.
- Tanks cover large areas of cultivable land and the dry beds of the tanks have been reclaimed for agriculture.
- Lifting of water from tanks and carrying it to the fields is tedious process and costly exercise which discourages the use of tanks as a source of irrigation.

14. Classify irrigation methods.

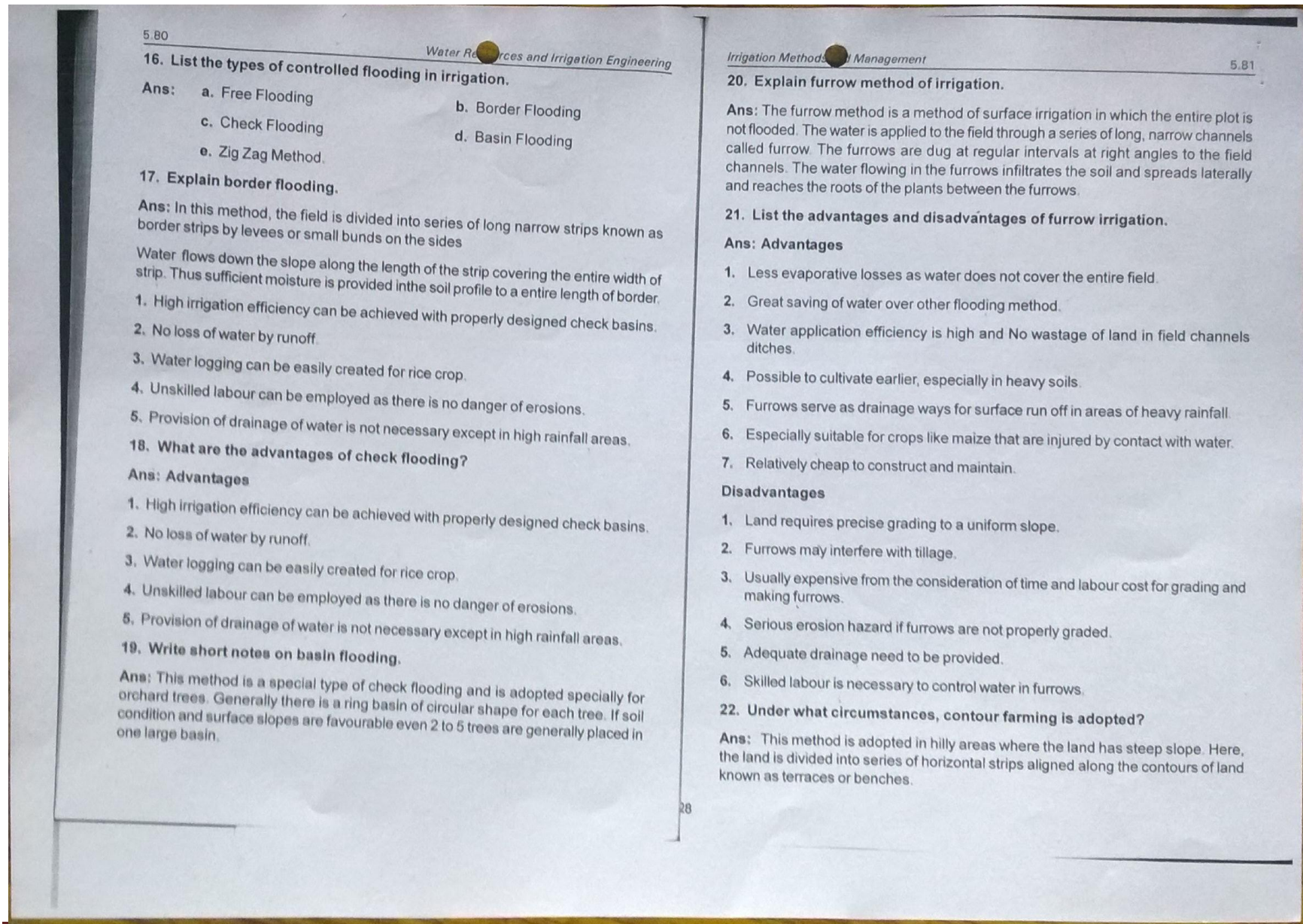
Ans:



15. Differentiate uncontrolled flooding or controlled flooding of irrigation.

Ans: Uncontrolled Flooding or Wild Flooding

This method is applicable in flood or inundation irrigation system where the land is flooded with water by inundation canal. As there is no controlling system in inundation canal, this irrigation method is known as uncontrolled flooding.



5.82

Water Resources and Irrigation Engineering

23. What is meant by subsurface irrigation?

Ans: In this type of irrigation system the application of water to the field is below the ground surface so that it is supplied directly to the root zone of the plants. Here, water does not wet the soil surface and underground water nourishes the plant roots by capillarity.

24. Define micro irrigation.

Ans: Micro Irrigation is defined as the frequent application of small quantities of water usually as discrete drops, continuous drops or tiny streams directly above or below the soil surface through sprinklers or emitters placed along a water delivery line.

25. Write short notes on sprinkler irrigation.

Ans: Sprinkler irrigation is a method of applying water in the form of spray through a network of pipes and pumps. It is a kind of an artificial rain therefore it gives very good results, but it is a costly process and requires a lot of technicalities. The sprinkler irrigation is also sometimes called overhead irrigation. It can be used for all types of soils and for different topographies and slopes.

26. When sprinkler irrigation is adopted?

Ans: This method is more useful where

- The land topography is irregular and hence unsuitable for surface irrigation.
- The land gradient is steeper and soil is easily erodible.
- The land soil is excessively permeable or highly impermeable.
- The water is available with difficulty and scarce.
- The water table is high.

27. Classify various types of sprinkler system irrigation.

Ans: Classification based on arrangement of spraying.

There are three different types or forms of sprinklers.

- Perforated pipes sprinkler system
- Fixed nozzle sprinkler system
- Rotating sprinkler system.

Irrigation Methods and Management

5.83

Classification based on Portability

Based on portability, the sprinkler irrigation system can be classified into the following types:

- Fully Permanent System
- Semi Permanent System
- Fully Portable System
- Semi Portable System.

28. Mention four advantages and disadvantages of sprinkler irrigation.

Ans: Advantages of Sprinkler Irrigation

Sprinkler irrigation has many advantages over the surface irrigation and are listed below:

- Water application efficiency is very high
- Low water loss since seepage losses occur in earthen channel of surface irrigation method are completely eliminated
- Fertilizers be uniformly applied because they are mixed with irrigation water itself and uniform application of water is possible.
- High crop yield or good quality fruits or vegetables are obtained.

Disadvantages of Sprinkler Irrigation

- High initial cost.
- Water application efficiency is poor in windy weather and high temperature.
- Higher evaporation losses in spraying water.
- Technical personnel for its operation and maintenance are required.
- Clean water is needed to avoid clogging of nozzles.

29. What is drip irrigation?

Ans: Drip irrigation also called trickle irrigation is the latest irrigation technique used at places where there is acute scarcity of irrigation water and other salt problems. This method involves dripping water onto the soil at very low rate from a system of small diameter plastic pipes fitted with outlets called emitters or drippers. Water is

5.84

Water Resources and Irrigation Engineering

applied close to the plants so that only part of the soil in which roots grow is wetted thereby minimizing the losses by evaporation and percolation.

30. Mention the components of drip irrigation.

Ans: A typical drip irrigation system has the following components

- Pump Unit
- Control head (Gate Valve, Pressure Control Valve, Filter, Fertilizer Tank)
- Main and Submain Lines
- Laterals
- Emitters or Dippers.

31. List the advantages and disadvantages of drip irrigation.

Ans: Advantages of Drip Irrigation

Drip irrigation method has various advantages. They are

- a. Saves 40-70% water when compared with the conventional methods.
- b. Loss of water through evaporation and seepage is reduced.
- c. High water application efficiency and lower labour costs.
- d. Field levelling is not necessary.
- e. Fertilizer and nutrient loss is minimized due to localized application and reduced leaching.

Disadvantages of Drip Irrigation

- a. High initial cost, but it works out much cheaper than sprinkler system considering the saving of water in drip irrigation.
- b. Drippers are susceptible to blockade.
- c. High skill is required for design, installation, operation and maintenance.
- d. The sun can affect the tubes used for drip irrigation.

32. What is the importance of irrigation scheduling?

Ans: Irrigation scheduling involves deciding when and how much water to apply to field. Good scheduling will apply water at the right time and in the right quantity in order to optimise production and minimise adverse environmental impacts. Bad scheduling means either correct quantity of water is not applied or it is not applied at

Irrigation Methods and Management

5.85

the right time, resulting in under watering or overwatering. Under or overwatering can lead to reduced yields, lower quality.

33. Mention the two instruments used for measuring soil moisture.

- Ans:**
- (i) tensiometers and
 - (ii) electrical resistance meters.

34. How frequency of irrigation is determined?

Ans: Then Frequency of irrigation (f_w) in days is given by:

$$f_w = \frac{d_w}{C_u}$$

where d_w = depth of readily available moisture in the root zone of soil

C_u = rate of consumptive use expressed in the depth of moisture lost from the soil per day.

35. What are the methods of water distribution in canal system?

- Ans:**
- a) Rational Water Distribution System or Warabandi
 - b) Intermittant Flow
 - c) Continuous Flow
 - d) Demand Based

36. What does warabandi mean?

Ans: Warabandi originated from two vernacular words Wara and bandi. The meaning of Wara is turn and bandi means fixation. Taken together, the warebandi means rotation of water supply according to a fixed schedule. "Warabandi is a system of equitable water distribution by turns according to a predetermined schedule specifying the day, time and duration of supply to each irrigation in proportion to holdings in the outlet command".

37. Define PIM.

Ans: Participatory irrigation management (PIM) refers to the participation of irrigation users – the farmers – in the management of irrigation system.

The PIM broadly refers to the formation of groups of water users/farmers in a formal body for the purpose of managing parts or whole of an irrigation system.

PART B

1. Briefly explain about lift irrigation?
2. Briefly explain about tank and well irrigation?
3. Briefly explain about flooding methods?
4. Briefly explain about sprinkler irrigation methods?
5. What are the water distribution method and explain it?