

**ENVIRONMENTAL ENGINEERING -I**  
**UNIT 1**  
**PLANNING FOR WATERSUPPLY SYSTEM**

**1. What are the methods of population forecasting?**

1. Arithmetic increase method
2. Geometric increase method
3. Method of varying increment (or) Incremental increase method
4. Decreasing rate of growth method
5. Simple graphical method
6. Comparative graphical method
7. Master plan method (or) zoning method
8. The logistic curve method

**2. Define design period.**

The future period for which a provision is made in the water supply scheme is known as design period.

**3. What are the factors governing the design period?**

The factors governing design period are,

- a. Design period should not exceed the life period of the structure.
- b. If the funds are not sufficient, the design period has to be decreased.
- c. The rate of interest on borrowing and the additional money invested.

**4. What are various types of water demand?**

- a. Domestic water demand,
- b. Industrial,
- c. Institution and commercial
- d. Demand for public use
- e. Fire demands

**5. What are the various types of water available on the earth?**

1. Surface sources such as,
  - a. ponds and lakes,
  - b. Stream and rivers
  - c. Storage reservoirs
  - d. Ocean.
2. Sub surface sources,
  - a. Spring
  - b. Infiltration galleries
  - c. Infiltration wells
  - d. Wells and tube wells

**6. What is hydrologic cycle?**

Water is lost to the atmosphere as vapor from the earth. Which is then precipitated back in the form of rain, snow, hail dew, sleet or frost etc. This process is known as hydrologic cycle.

**7. What are rivers? What are the types of river?**

Rivers are the most important sources of water for public water supply schemes. Rivers are of two types, they are: a. Perennial Rivers. b. Non perennial rivers.

**8. What is jack well?**

The various infiltration wells are connected by porous pipes to a sump well called jack well.

**9. What are springs?**

The natural out flow of ground water at the earth surface is called as springs.

**10. What are the types of springs?**

- a. Gravity springs.
- b. Surface springs.
- c. Artesian springs.

**11. What are artesian springs?**

The pervious layer which contains water combined between two impervious layers are called artesian springs.

**12. What are the different types of wells?**

- a. Open wells,
  1. Shallow wells.
  2. Deep wells.
- b. Tube wells.

### **13. What is artesian spring?**

The pervious layer which contains water combined between two impervious layers is called artesian spring.

### **14. What are the factors governing the selection of a particular source of water?**

The factors governing are as follows

- a. the quantity of available water
- b. The quality of available water
- c. Distance of the source of supply
- d. General topography of the intervening area
- e. Elevation of the source of supply.

### **15. What are the factors affecting per capita demand?**

The factors affecting per capita demand are,

- a. Climatic condition.
- b. Habit of people.
- c. Size of city.
- d. Cost of water.
- e. Industry.
- f. Pressure in water tank.
- g. Quantity of water.
- h. System of sanitation.
- i. Supply of system.

### **16. What are the factors governing design period?**

The factors governing design period are,

- a. Design period should not exceed the life period of structure.
- b. If the funds are not in the sufficient the design period should has to be decreased.
- c. The rate of interest is less for the borrowing funds.
- d. The of population increases due to industries and commercial establishment.

## **UNIT II**

### **CONVEYANCE SYSTEM**

#### **1. What are various type pressure pipes?**

- a. Cast iron pipes
- b. Steel pipes
- c. Rick pipes
- d. Home steel pipes
- e. Vitrified clay pipes
- f. Asbestos cement pipes
- g. miscellaneous type of pipes.

#### **2. What are the advantages and disadvantages of cast iron pipes?**

##### **Advantages:**

- a. Moderate in cost
- b. Easy to join
- c. Strong and durable
- d. Corrosion resistant.

##### **Disadvantage:**

- a. They cannot be used for high pressures generally not used for pressures above 7kg/cm
- c. When large they are heavy and uneconomical.
- d. They are likely to break during transportation or while making connection.

#### **3. What are types of joint?**

- a. Socket and pigot joint
- B. Flanged joint
- c. Mechanical joint called dresser coupling
- d. Flexible joints
- e. Expansion joints.

#### **4. How the corrosion of metal pipes is reduced?**

The corrosion of metal pipes can be reduced by following method

- a. Protective coating
- b. selecting proper pipe material
- c. Quality of water
- d. Cathodic protection.

#### **5. What are the factors governing location of intake?**

- a. Intake structures are nearer to the treatment.
- b. Intake structures must never be located near the disposal of water.
- c. Intake structures should never be located near the navigation channel.
- d. There should be sufficient scope for future expansion.

#### **6. What are the types of intake?**

1. Simple submerge intake,
  - a. Simple concrete blocks.
  - b. Rock fill timber blocks.
2. Intake structures.
  - a. Wet intake.
  - b. Dry intake.

### **7. What are vitrified clay pipes?**

They are not generally used as pressure pipe for carrying because they are weak in tension. They are extensively used for carrying sewage and drainage at partial depth.

### **8. What are the advantages and disadvantages of RCC pipes?**

Advantages:

- a. They can resist excessive compressive load and do not collapse under normal vacuums.
- b. They are not corroded from inside by normal portable water.

Disadvantages:

- a. By means of acid they are corroded.
- b. They cannot with stand very high pressure.

### **9. What are tube wells?**

Tube wells which a long pipe or a tube is bored or drilled deep in to the ground.

### **10. What are the various methods of purification of water?**

The various methods of purification of water are,

- a. Screening.
- b. Plain sedimentation.
- c. Sedimentation aided with coagulation.
- d. Filtration.
- e. Disinfection.
- f. Aeration.
- g. softening.
- h. Miscellaneous treatments such as fluoridation, recarbonation, liming, desalination.

## **UNIT -3**

### **WATER TREATMENT**

#### **1. Define detention period.**

Detention period of settling tank may be defined as the average theoretical time required for the water to flow through tank length.

#### **2. Define coagulation.**

The process of addition and mixing the chemical is called coagulation.

#### **3. Define filtration. What are the 2 types of filter?**

The process of passing the water through the beds of such granular materials is known as filtration. The two types of filters are,

- a. Slow sand gravity filter.
- b. Rapid sand gravity filter.

#### **4. What is schmutzdecke or dirty skin?**

The harmless compound so formed, generally form a layer on the top which is called schmutzdecke or dirty skin. The layer helps in absorbing and straining out the impurities.

#### **5. Define uniform coefficient.**

It is defined as the ratio of the sieve size in mm through which 60% of the samples of sand will pass, to the effective size of the sand.

#### **6. Define sterilization.**

The chemical used in killing these bacteria are known as disinfectants and the process is known as disinfection or sterilization.

#### **7. What is chloramine?**

Chloramine is the disinfectant compounds which are formed by the reaction between ammonia and chlorine.

#### **8. What is softening?**

The reduction or removal of hardness from water is known as water softening.

**9. Define alkalinity.**

It is defined as the quantity of ions in water that will react to neutralize the hydrogen ion. It will thus represent the ability of water to neutralize acid.

**10. What is permutit?**

The most common artificial zeolite is a white colored substance called permutit manufactured from feldspar, kaolin, clay, and soda.

**11. What are the methods of removing permanent hardness?**

The methods removing permanent hardness are,

- a. Lime soda process. b. Base exchange process called zeolite process. c. Demineralization.

**12. How are aeration water carried out?**

Aeration water are carried out as follows, a. By using spray nozzles.

- b. By permitting water to trickle over the cascades. c. By air diffusion. d. By using trickling beds.

**13. Define fluoridation.**

The process of adding fluoride compounds in excess is called as the fluoridation.

**14. What are the methods of desalination?**

The methods of desalination are,

- a. Desalination by evaporation & distillation. b. Electro dialysis method. c. Reverse osmosis method. d. Freezing process. e. Solar distribution method. f. Other method.

**15. What is different system of distribution networks?**

The different system of distribution networks is,

- a. Dead end system. b. Grid iron system. c. Ring system. d. Radial system.

**16. What are various methods of distribution system?**

The various methods of distribution system are,

- a. Gravity system. b. Pumping system. c. Combined gravity and pumping system.

**17. Define fire storage?**

It is sufficient amount of water available in the reservoir for throwing it over the fire in case of fire accidents is called fire storage.

**18. Enumerate various chemical parameter of water?**

Various chemical parameter of water are,

- a. Chlorine content. b. Nitrogen content. c. Iron content. d. Manganese and other metal content.

**19. What are the two types of sewage system?**

The two types of sewage system are,

- a. Combined system:

When the drainage is taken along with the sewage then it is called as combined system.

- b. Separate system:

When the drainage and sewage are taken independently of each through two different sets of sewage is called as separate system.

**20. What are the two types of water meter?**

The two types of water meter are,

- a. Inferential meter. b. Displacement meter.

**21. Define time of concentration?**

The period after which the entire area will start contributing to the runoff is called time of concentration.

**22. List the components of sewerage system?**

The components of sewerage system are,

- a. House sewers. b. Lateral sewers. c. Branch sewers. d. Main sewers.
- e. Outfall sewers. f. Man holes.

**23. What is peak drainage disturbance?**

The method estimating the maximum rate of storm runoff is called as peak drainage disturbance.

**24. Mention some shapes of sewer pipes.**

- Circular shape • Egg shape • Horse shoe shape • Parabolic shape
- Elliptical shape Rectangular shape

**25. What are the forces acting on sewer pipes?**

- Internal pressure of sewage
- Pressure due to external load
- Temperature stress
- Flexural stress

**26. What are the materials used for constructing sewer pipes?**

- Vitrified clay • Cement concrete • Asbestos cement • Cast iron

**27. Give some qualities of the good sewer pipes.**

- Resistance to corrosion • Resistance to abrasion • Strength and durability • Light weight
- Economy and cost.

**28. What are the tests conducted in sewer pipes after laying?**

- Test for leakage(water test) • Test for straightness of alignment and obstruction

**29. Define sewer appurtenances.**

- Sewer appurtenances are those structures which are constructed at suitable interval along a sewerage system and help in its efficient operation and maintenance

**30. Mention the classification of manholes**

- Shallow manholes • Normal manholes • Deep manholes

**31. What is meant by catch basins?**

Catch basins are nothing but street inlets provided with additional small setting basins for avoiding the entry of the particles like grit, sand ,debris in to the sewer pipes

**32. Define inverted siphons.**

Inverted siphon is defined as the sewer section constructed lower than the adjacent sewer section and it runs full under gravity with pressure greater than the atmosphere.

**33. What are the various methods of ventilation for sewers?**

- Use of ventilating columns • Use of ventilating manhole covers • Proper design of sewers
- Use of mechanical devices.

**34. What are the different types of pumps used commonly for pumping the sewage?**

- Centrifugal pump • Reciprocating pump • Pneumatic ejectors (or) Air pressure pumps

**Unit -4**  
**ADVANCED WATER TREATMENT**

**1. What is the purpose of using velocity control device in a grid chamber?**

The velocity control device in a grid chamber is providing for settling the grid particles in the sewer pipes and then it is removed by an endless chain to which perforated buckets are fixed

**2. Mention the classification of treatment process of sewage.**

- Preliminary treatment • Primary treatment • Secondary treatment
- Complete final treatment

**3. State the purpose of using the skimming tanks.**

The skimming tanks are employed for removing oils & grease from the sewage and placed before the sedimentation tanks.

**4. Why baffles are provided in the sedimentation tank in sewage treatment?**

Baffles are required to prevent the movement of organic matters and it escapes along with the effluent and to distribute the sewage uniformly through the cross section of the tank and thus to avoid short circuiting

**5. What are the types of trickling filters?**

- Conventional trickling filter                      • High rate trickling filter

**6. What are the operational troubles in trickling filter?**

- Fly nuisance • Odour nuisance                      • Ponding troubles

**7. Define sludge age.**

The sludge age is defined as the average time for which particles of suspended soil remain under aeration.

**8. Define sludge volume index.**

Sludge volume index is defined as the volume occupied in ml by 1 gm of solids in the mixed liquor after settling for 30 minutes and is determined experimentally

**9. What is meant by biodegradable organic matter?**

The organic matters is decomposed by bacteria under biological action is called biodegradable organic matter

**10. What are the various tests for finding the quality of sewage?**

- Turbidity test • Colour test • Odour test • Temperature test

**11. What is meant by relative stability of a sewage effluent?**

The relative stability of a sewage effluent is nothing but the ratio of oxygen available in the effluent to the total oxygen required to satisfy its first stage BOD demand

**12. What are the methods of disposing the sewage effluent?**

- Disposal in water (dilution) • by disposal on land

**13. What are the different types of sewage treatment?**

• Contact beds    • Intermittent sand filters    • Trickling filters • Miscellaneous type of filters

**14. Define sludge digestion.**

The process of stabilization of the sewage particles are called sludge digestion.

**15. What are the stages in the sludge digestion process?**

- Acid fermentation    • Acid regression    • Alkaline fermentation

**16. What is meant by ripened sludge?**

The ripened sludge is nothing but the digested sludge is collected at the bottom of the digestion tank and it is alkaline in nature.

**17. What are the factors affecting sludge digestion and their control?**

- Temperature • pH value • mixing and stirring of raw sludge with digested sludge.

**18. What are the types of incinerators has primary designed?**

- Multiple hearth furnace • fluid bed furnace and infra red furnace.

**19. What are the methods of aeration?**

- diffused air aeration • mechanical aeration • combined aeration.

**20. What is meant by sludge concentrator unit?**

The sludge obtained in a sludge digestion plant contains too much of moisture and is therefore very bulky may be reduced in its moisture content by sending into sludge thicker unit (or) sludge concentrator unit.

**21. Give different types of thicker unit.**

- Gravity thickener • Floating thickener • Centrifugal thickener.

**22. What are the methods of disposal of septic tank effluent?**

- Soil absorption system • Biological filters • up flow anaerobic filters

**23. Define percolation rate.**

Percolation rate is defined as the time in minutes required for sewage of water through that ground by one cm.

**24. What is the soil absorption system?**

- Dispersion trench • seepage pit (or) soak pit.

**25. What are the methods of applying sewage effluents to farms?**

- Surface irrigation • free flooding • border flooding • check flooding

**26. What is meant by oxygen sag curve?**

The amount of resultant oxygen deficit can be obtained by algebraically adding the de-oxygenation and re-oxygenation curves. The resultant curve so obtained is called oxygen sag curve

**27. What is meant by sewage sickness?**

The phenomena of soil getting clogged when the sewage is applied continuously on a piece of land is called sewage sickness

**28. What are the preventive methods for sewage sickness?**

- Primary treatment of sewage • Choice of land • under drainage of soil
- Giving rest to land and Rotation of crops

**29. Define dilution factor.**

The dilution factor is defined as the ratio of the amount of river water to the amount of the sewage.

**Unit -5**

**WATER DISTRIBUTION AND SUPPLY TO BUILDINGS**

**1. What is meant by self purification?**

The automatic purification of natural water is known as self purification

**2. List various natural forces of self purification**

- Physical forces • Chemical forces

### 3. What are the factors affecting the reduction?

- Temperature • Turbulence effect of wind • Hydrographic • Available dissolved oxygen
- Rate of re-aeration

### 4. What is meant by prim lake pollutant?

The phosphorus which contains in domestic sewage as well as in the industrial waste which affect the water quality of the lake and it's called prim lake pollutant

### 5. What is meant by de oxygenation curve?

The curve which represents (or) showing the depletion of D.O with time at the given temperature.

### 6. How the river maintaining its clearness?

The turbulence in the water body helps in breaking the surface of the stream and helps in rapid re aeration from the atmosphere. Thus it helps in maintaining aerobic conditions in the stream and keeping it clear.

### 7. Name the biological zone in lakes

- Euphonic zone • Littoral zone • Benthic zone

### 8. What is meant by re -oxygenation?

In order to counter balance the consumption of D.O due to the de – oxygenation ,atmosphere supplies oxygen to the water and the process is called the re –oxygenation.

### 9. What is meant by zone of recovery?

The zone in which the river water tries to recover from its degraded conditions to its former appearance is called zone of recovery.

### 10. What is meant by sludge banks?

When the solid waste are thrown into the sea water, chemical react with the dissolved matter of sea water and resulting in some precipitation of solid waste giving a milky appearance to sea water forming the sludge banks.

## 16 MARKS QUESTIONS

1. Describe the step involved in the design of septic tank .And also explain the working of a trickling filter with neat sketch.
2. Explain the methods available and limitations of land disposal of sewage.
3. Explain the different water distribution system layouts with neat sketches.
4. Explain the principles in designing of water supply and drainage in buildings.
5. Explain the different plumbing systems with neat sketches .And also compare the plumbing systems.
6. Explain the operational principles of stabilization ponds and Oxidation ditch.
7. Explain the Streeter Phelps model and its applications. Explain also the different techniques for waste water reclamation.
8. Discuss the various principles of designing drainage system for buildings.
9. Explain the construction steps involved in laying of a sewer line.
10. Explain the design procedure of trickling filter with neat sketches.
11. The population of 5 decades from 1930 to 1970 is given below in the table. Find out the population of 1, 2, 3 decade beyond the last known decade by using arithmetic increase method

| YEAR       | 1930  | 1940  | 1950  | 1960  | 1970  |
|------------|-------|-------|-------|-------|-------|
| POPULATION | 25000 | 28000 | 34000 | 42000 | 47000 |



12. What are the factors affecting per capita demand?
13. What are intake towers? Explain in brief with neat diagram?
14. What are joints? What are the different types of joints? Explain in brief with neat diagram?
15. What are pipe appurtenances? Explain in brief with neat diagram?
16. What is sedimentation tank? What are the different types of sedimentation tanks?
17. Sketch and explain the salient points of the various types of distribution network?
18. Write the difference between slow sand and rapid sand gravity filter?
19. Explain distribution reservoirs briefly?
20. Explain the method of purification of water?
21. Explain the design of an inverted siphon?
22. Explain pumping station with neat diagram?
23. Write short notes on a. Drop man holes. b. Lamp holes. c. Cleanouts.  
d. Street inlet called gullies.
24. What are the shapes of sewer pipes? Explain in detail.
25. Design the sewer to serve a population of 36000, the daily per capita water supply allowable being 135 L, of which 80% finds its way in to the sewer. The slope available for sewer to be laid is 1 in 625 and the sewer should be designed to carry four times the dry weather flow when running full. What would be the velocity of flow in sewer when running full?