



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)  
Dundigal, Hyderabad-500043

## CIVIL ENGINEERING

### TUTORIAL QUESTION BANK

<b>Course Title</b>	<b>ENVIRONMENTAL ENGINEERING</b>				
<b>Course Code</b>	ACE015				
<b>Programme</b>	B.Tech				
<b>Semester</b>	VII	CE			
<b>Course Type</b>	Core				
<b>Regulation</b>	IARE - R16				
<b>Course Structure</b>	<b>Theory</b>			<b>Practical</b>	
	<b>Lectures</b>	<b>Tutorials</b>	<b>Credits</b>	<b>Laboratory</b>	<b>Credits</b>
	3	1	4	3	2
<b>Chief Coordinator</b>	R. Suresh Kumar, Assistant Professor				
<b>Course Faculty</b>	Ms. K. Anusha Hadassa, Assistant Professor, Mr. R. Suresh Kumar, Assistant Professor				

### COURSE OBJECTIVES:

<b>The course should enable the students to:</b>	
I	Outline the different sources of water and its per capita demand.
II	Describe the basic characteristics of water and study the procedure for determination
III	Design the water supply lines, water collection and different distribution networks.
IV	Construct and design waste water treatment units such as oxidation ponds, sludge digestion tanks, soak pits etc.

### COURSE OUTCOMES (COs):

CO 1	Describe population forecasts, design period, water demand, types of demand, factors affecting fluctuations, fire demand, storage capacity, water quality and testing. Drinking water standards
CO 2	Determine Layout and general outline of water treatment units, sedimentation, uniform settling velocity, principles, design factors, surface loading, jar test, optimum dosage of coagulant, coagulation, flocculation, clarifier design, coagulants, and feeding arrangements. Filtration.
CO 3	Understand Conservancy and water carriage systems, sewage and storm water estimation, type of concentration, storm water over flows combined flow characteristics of sewage, cycles of decay, decomposition of sewage, and examination of sewage.
CO 4	Explore Lay out and general outline of various units in a waste water treatment plant, primary treatment design of screens, grit chambers, skimming tanks-sedimentation tanks-principles and design of biological treatment, trickling filters, standard and high rate.
CO 5	Construction and design of oxidation ponds, sludge digestion tanks, factors effecting, design of digestion tank, sludge disposal by drying, septic tanks working principles and design-soak pits. Ultimate disposal of waste water, self-purification of rivers, sewage farming.

## COURSE LEARNING OUTCOMES (CLOs):

ACE015.01	Understand the concept and importance of Protected water supply.
ACE015.02	Estimate the Population for the design period by using different forecasting methods.
ACE015.03	Calculate and Understand the water demand, types of demand, factors affecting fluctuation
ACE015.04	Calculate the fire demand, storage capacity, water quality and its testing
ACE015.05	Understand the concept of Drinking water standards. Comparison from quality and quantity and other considerations.
ACE015.06	Understand the intakes, infiltration galleries, confined and unconfined aquifers.
ACE015.07	Understand the, distribution systems, requirements, methods and different layouts.
ACE015.08	Understand the Layout and general outline of water treatment system
ACE015.09	Explain sedimentation, uniform settling velocity principles, design factors, surface loading.
ACE015.10	Understand jar test, optimum dosage of coagulant, coagulation, flocculation, clarifier design, coagulants, and feeding arrangements.
ACE015.11	Evaluate Filtration theory, working of slow and rapid gravity filters, multimedia filters, design of filters, troubles in operation comparison of filters.
ACE015.12	Understand disinfection, types of disinfection, theory of chlorination chlorine demand and other disinfection.
ACE015.13	Different treatment methods. Distribution systems, types of layouts of distribution systems, design of distribution systems.
ACE015.14	Analyze Hardy Cross and equivalent pipe methods
ACE015.15	Understand service reservoirs, joints, valves such as sluice valves, air valves, scour valves and check valves water meters, laying and testing of pipe lines, pump house
ACE015.16	Explain Conservancy and water carriage systems, sewage and storm water estimation.
ACE015.17	Understand type of concentration, storm water over flows combined flow.
ACE015.18	Understand characteristics of sewage, cycles of decay, and decomposition of sewage, examination of sewage, B.O.D. and C.O.D. equations.
ACE015.19	Analyze the design of sewers, shapes and materials, sewer appurtenances manhole, inverted siphon, catch basins, flushing tanks, ejectors, pumps and pump houses, house drainage
ACE015.20	Understand different components requirements, sanitary fittings, traps, one pipe and two pipe systems of plumbing, ultimate disposal of sewage, sewage farming, and dilution..
ACE015.21	Understand and analyze Lay out and general outline of various units in a waste water treatment plant, primary treatment design of screens, grit chambers, skimming tanks-sedimentation tanks-principles
ACE015.22	Evaluate the design of biological treatment, trickling filters, standard and high rate.
ACE015.23	Construction and design of oxidation ponds, sludge digestion tanks, factors effecting, design of digestion tank, sludge disposal by drying
ACE015.24	Understand the septic tanks working principles and design-soak pits. Ultimate disposal of waste water, self-purification of rivers, sewage farming

## TUTORIAL QUESTION BANK

UNIT-I				
WATER QUALITY, DEMAND AND SUPPLY				
Part - A (Short Answer Questions)				
S No	QUESTIONS	Blooms Taxonomy Level	Course Outcomes	Course Learning Outcomes (CLOs)
1	Discuss the various parameters for deciding the design period of components in water supply projects?	Remember	CO 1	ACE015.01
2	Enumerate the various methods for population forecast. On which Factors increase in population depends?	Understand	CO 1	ACE015.01
3	What is Design period in water supply projects? Describe the life span for various components	Remember	CO 1	ACE015.01
4	Explain the following: (i) Storage capacity of reservoir (ii) Fire demand?	Remember	CO 1	ACE015.01
5	Classify the demands of a city or town. Describe briefly the water demand?	Understand	CO 1	ACE015.01
6	Discuss Water meters of displacement type and velocity type?	Remember	CO 1	ACE015.01
7	Explain Arithmetical increase method of population and geometrical increase method of population?	Remember	CO 1	ACE015.01
8	Write a note on drinking water quality standards in India?	Remember	CO 1	ACE015.01
9	State the importance of treating water for public supply?	Understand	CO 1	ACE015.01
10	Write short note on the maintenance of purity of waters?	Remember	CO 1	ACE015.01
11	Classify the sources of water. On which factor the quantity and reliability of water depends?	Remember	CO 1	ACE015.01
12	Compare surface and ground waters as source of water supply from the considerations of quantity and quality?	Remember	CO 1	ACE015.01
13	Explain the function of intakes. What factors are responsible for site selection of intakes?	Remember	CO 1	ACE015.01
14	What is Gravity spring and surface spring?	Remember	CO 1	ACE015.02
15	Define Deep well and tube well?	Understand	CO 1	ACE015.02
16	Write short notes on, Well development?	Understand	CO 1	ACE015.02
17	Differentiate between confined and unconfined aquifers?	Remember	CO 1	ACE015.01
18	How distribution systems are classified? Explain any one in detail?	Remember	CO 1	ACE015.01
19	What is the requirement of a good distributed system?	Remember	CO 1	ACE015.02
20	What is Dead end or tree system?	Remember	CO 1	ACE015.02
Part - B (Long Answer Questions)				
1	Write short note on the maintenance of purity of waters?	Understand	CO 1	ACE015.03
2	Write short note on, (a) MPN (b) Sampling of water?	Understand	CO 1	
3	Describe the different microorganisms commonly found in water?	Understand	CO 1	ACE015.03
4	Explain "Fluctuation in water demand"?	Understand	CO 1	ACE015.03
5	Write a note on drinking water quality standards in India?	Understand	CO 1	ACE015.02
6	Write an account on the common water-borne diseases?	Understand	CO 1	ACE015.02
7	Explain in brief various factors affecting the rate of demand?	Understand	CO 1	ACE015.02
8	State the importance of treating water for public supply?	Understand	CO 1	ACE015.02
9	What is B.coli index? How is it determined? (or) Write short note on B-coli index?	Understand	CO 1	ACE015.02
10	Discuss two standard tests which are employed to examine water bacteriologically?	Understand	CO 1	ACE015.02
11	What are infiltration galleries and infiltration wells? Explain with the help of neat sketches?	Understand	CO 1	ACE015.02
12	Explain the meaning of yield of a well and mention the factors on which it depends?	Understand	CO 1	ACE015.02
13	Describe the various types of wells?	Understand	CO 1	ACE015.02

14	Differentiate between shallow and deep wells which of them would prefer for use in public water supply?	Understand	CO 1	ACE015.01
15	What do you understand by chlorination? Explain its action in killing bacteria.	Understand	CO 1	ACE015.01
16	What are infiltration galleries and infiltration wells? Explain with the help of neat sketches?	Understand	CO 1	ACE015.03
17	Describe the various methods of distributing of water and discuss advantages and disadvantages?	Understand	CO 1	ACE015.03
18	What are the methods available for supplying water to consumers?	Understand	CO 1	ACE015.03
19	Explain how you would determine the yield from a deep well?	Understand	CO 1	ACE015.03
20	Classify the sources of water. On which factor the quantity and reliability of water depends.	Understand	CO 1	ACE015.03

**Part - C (Problem Solving and Critical Thinking Questions)**

1	Explain the function of Intakes. What factors are responsible for site selection of intake	Understand	CO 1	ACE015.03
2	Explain in detail about water demands and its variations.	Understand	CO 1	ACE015.04
3	How does water quality criteria differs for industrial supplies from those for domestic municipal supplies?		CO 1	ACE015.04
4	What are factors affecting fluctuations – fire Demand – storage capacity	Understand	CO 1	ACE015.04
5	Enumerate the various surface sources of water, and discuss and compare the quality and quantity of water supplies that may be available from these sources.	Understand	CO 1	ACE015.04
6	In two periods each of 20 years, a city has grown from 40,000 to 1, 60,000 and then 2, 80,000. Determine (i) saturation population (ii) equation of logistic curve and (iii) expected population after the next 15 years.	Understand	CO 1	ACE015.04
7	Discuss the test is used to differentiate between Agrobacteria aerogenes.	Understand	CO 1	ACE015.04
8	What are the methods used in industries for the recycling of the water.	Understand	CO 1	ACE015.04
9	What are wells according to the aquifer tapped?	Understand	CO 1	ACE015.04
10	Describe the wells according to type of construction and according to the condition of flow. In a recuperation test, the following results were obtained, Initial depression head = 8 m Final depression head = 5m Time of recuperation = 2 hours Diameter specific capacity of well and yield under a head of 3 m.	Understand	CO 1	ACE015.04

**UNIT-II**

**WATER TREATMENT AND DISTRIBUTION**

**Part – A (Short Answer Questions)**

1	Draw the layout of water treatment plant, indicate the various process used?	Remember	CO 2	ACE015.05
2	What are the requirements of good water meters?	Remember	CO 2	ACE015.05
3	What are the objectives of water treatment process?	Understand	CO 2	ACE015.05
4	Explain the Fill and draw type settling tank?	Understand	CO 2	ACE015.05
5	Explain the Continuous flow type settling tank?	Understand	CO 2	ACE015.05
6	In an ideal settling tank, 16% of 30 mm diameter particles are removed having specific gravity of 1.20. Temperature at the time of removal in 200 C. What will be the size of the particles for which the tank is actually designed? Assume the specific gravity of these particles same as that of 30 mm diameter particles?	Remember	CO 2	ACE015.05
7	List the factors which affect the dosage of coagulants and explain the procedure to determine the optimum dose of coagulant by Jar test apparatus?	Understand	CO 2	ACE015.06
8	Explain the Fill and draw type settling tank?	Remember	CO 2	ACE015.06
9	Mention the chemical reactions when the following are used as coagulants : (a) Sodium aluminate (b) Ferrous sulphate and lime (c) Magnesium carbonate?	Understand	CO 2	ACE015.06
10	Write short notes on Coagulation?	Understand	CO 2	ACE015.06
11	Write short notes on Flocculation?	Understand	CO 2	ACE015.06
12	Why turbidity in water is considered objectionable	Remember	CO 2	ACE015.06
13	What is the importance under laying the determination of total solids in a water sample	Remember	CO 2	ACE015.06
14	What is the principle involved in the determination of the PH value of a sample?	Understand	CO 2	ACE015.07

15	Describe in brief various important tests conducted for chemical examination of water	Understand	CO 2	ACE015.07
16	What is the most accurate method of determining hardness of a water sample? Discuss its importance	Understand	CO 2	ACE015.07
17	Write a note on coliform index. How do you determine it	Remember	CO 2	ACE015.07
18	Write a note on bacteriological analysis of water	Understand	CO 2	ACE015.07
19	Write a note on common impurities found in water	Remember	CO 2	ACE015.07
20	What are the role does sand, gravel play in filterers?	Understand	CO 2	ACE015.07
<b>Part - B (Long Answer Questions)</b>				
1	Discuss in detail the usual coagulants which are employed for the treatment of water?	Understand	CO 2	ACE015.08
2	Differentiate between discreet partials and flocculent partials of sedimentation?	Understand	CO 2	ACE015.08
3	Explain various types of sedimentation tanks based on shapes with neat sketches?	Understand	CO 2	ACE015.08
4	Explain the aspects which influence design and performance of sedimentation tanks ?	Understand	CO 2	ACE015.08
5	Explain the principle of sedimentation and derive the equation for uniform setting velocity in terms of specific gravity of a particle?	Understand	CO 2	ACE015.08
6	What are the feature of fill and draw settling tanks.	Understand	CO 2	ACE015.08
7	Explain in detail alum or Aluminium Sulphate and sodium aluminate	Understand	CO 2	ACE015.09
8	Mention the chemical reactions when sodium aluminate and ferrous sulphate and lime are used as coagulants.	Understand	CO 2	ACE015.09
9	write the determinations of optimum dose of coagulant by jar-test Apparatus	Understand	CO 2	ACE015.09
10	Draw a neat sketch of conical plug solution feeding device.	Understand	CO 2	ACE015.09
11	What is conical plug solution feeding Device	Understand	CO 2	ACE015.09
12	Differentiate between the B-Coli and E-Coli	Understand	CO 2	ACE015.09
13	What is meant by coagulation? Explain the common coagulants used	Understand	CO 2	ACE015.09
14	Describe various methods of application of coagulants	Understand	CO 2	ACE015.09
15	Describe with the help of sketches a slow sand filter. Explain its working	Understand	CO 2	ACE015.09
16	Describe a simple process for carrying out deflouridation of water suitable for rural population of the country	Understand	CO 2	ACE015.09
17	What do you understand by treatment of water? Why is it necessary	Understand	CO 2	ACE015.09
18	Name various disinfection methods and explain any one of them in detail	Understand	CO 2	ACE015.09
19	What is the balancing tank? How will you determined its capacity	Understand	CO 2	ACE015.09
20	What are the different methods of analyzing a given distribution system?	Understand	CO 2	ACE015.09
<b>Part - C (Problem Solving and Critical Thinking Questions)</b>				
1	The population of a town is 1,00,000 and the average per capita demand is 135 liters/day/capita. Design the coagulation cum Sedimentation tank for the water work, supplying water tank to the town. The maximum demand may be taken as 1.5 times the average demand. Assume the detention periods of 5 hours and 30 minutes for setting tank and floc chamber respectively. Also assume the flow rate as 900 litres/hour/m <sup>2</sup> of plan area?	Understand	CO 2	ACE015.10
2	A private estate uses a Pressure filter to treat 500 cu.m./day of turbid water. If filter operates from 04.00 pm to 08.00 am every day, find the size of pressure filter. Also find the approximate HP of the pump that supplies water to pressure filter under pressure.	Understand	CO 2	ACE015.10
3	In a ideal setting tank, 16 % of 30 mm diameter particles are removed having specific gravity of 1.20. Temperature at the time of removal in 200 C. What will be the size of particles for which the tank is actually designed? Assume the specific gravity of these particles same as that of 30 mm diameter particles.	Understand	CO 2	ACE015.10
4	If rectangular sedimentation tank is treating 2.5x10 <sup>6</sup> litres /day. The size of the tank is 17.5x5.5x3.5 m. If 80p.p.m (parts per million ) suspended solids are present in the water, assuming the 75% removal in the basin and the average specific gravity as 2.0 determine the following, (a) Average flow of water through tank (b) Detention time (c) Over flow rate?	Understand	CO 2	ACE015.10

5	What do you understand by an equivalent pipe? How do you determine its length when the pipes are (i) in series (ii) in parallel?	Understand	CO 2	ACE015.10								
6	Describe the various methods of distributing water and discuss the advantages and disadvantages of each	Understand	CO 2	ACE015.10								
7	What is service reservoir Give its importance in a distribution system? Draw the neat sketch of an elevated tank and show on all its component parts	Understand	CO 2	ACE015.10								
8	Design a rectangular sedimentation tank to supply water for a population of 50,000 with an assured average supply of 135 lpcd. Detention time of the tank is 4 hours. Assume data needed suitably.	Understand	CO 2	ACE015.10								
9	The population of the past three successive decades of a city is given below. Estimate the population of the city for the year 2021 by decreasing rate of growth method.	Understand	CO 2	ACE015.10								
	<table border="1"> <thead> <tr> <th>Census</th> <th>year Population</th> </tr> </thead> <tbody> <tr> <td>1981</td> <td>47050</td> </tr> <tr> <td>1991</td> <td>54500</td> </tr> <tr> <td>2001</td> <td>61000</td> </tr> </tbody> </table>	Census	year Population	1981	47050	1991	54500	2001	61000			
Census	year Population											
1981	47050											
1991	54500											
2001	61000											
10	Write a note on the layout of distribution systems which are commonly used in India.	Understand	CO 2	ACE015.10								

### UNIT-III

#### SEWAGE TREATMENT DISPOSAL

##### Part - A (Short Answer Questions)

1	With the help of neat sketch describe the construction and working of slow sand filters?	Remember	CO 3	ACE015.11
2	What is the most accurate method of determining hardness of a water sample?	Remember	CO 3	ACE015.11
3	Explain rapid sand filter a neat sketch?	Remember	CO 3	ACE015.11
4	Explain pressure filter with a neat sketch and mention its advantages and disadvantages?	Understand	CO 3	ACE015.11
5	Write short notes on Dual media filters?	Remember	CO 3	ACE015.11
6	Write short notes on Mixed media filters?	Remember	CO 3	ACE015.11
7	Compare and contrast between slow sand filter and rapid gravity filters?	Understand	CO 3	ACE015.11
8	Distinguish between the pressure filters and toughing filters?	Understand	CO 3	ACE015.11
9	Distinguish between the High velocity wash and low velocity wash?	Remember	CO 3	ACE015.11
10	Design five slow sand filter beds from the following data for the waterworks of a town population 75,000, per capita demand =135 litres/day /capita.	Understand	CO 3	ACE015.11
12	What is a distribution system? What are general requirements that are to be satisfied by the distribution system?	Understand	CO 3	ACE015.12
13	Explain the classification of distribution system?	Remember	CO 3	ACE015.12
14	What are the various on which the design of distribution system depend?	Remember	CO 3	ACE015.12
15	What are the condition that are be fulfilled for any closed network of pipes in the distribution system?	Understand	CO 3	ACE015.12
16	Explain the routine maintenance of distribution systems. What pressure is usually adopted for various pipes?	Remember	CO 3	ACE015.12
17	Write the Hazen William's formula for flow of water through pipe?	Remember	CO 3	ACE015.12
18	Describe the laying process of water supply lines?	Understand	CO 3	ACE015.12
19	Write short notes on pump house structure?	Remember	CO 3	ACE015.12
20	Explain Direct Dumping system with diagram	Remember	CO 3	ACE015.12

##### Part – B (Long Answer Questions)

1	Describe the various method of dechlorination?	Understand	CO 3	ACE015.13
2	Explain about method of chlorination?	Understand	CO 3	ACE015.13

3	Write short notes on the following, (a) Pre-chlorination and double chlorination (b) Chlorine demand (c) Chlorine compounds?	Understand	CO 3	ACE015.13
4	(a)How does jar test carries out? What are the points to be noted in this test? (b)State the procedure of starch –iodide test?	Understand	CO 3	ACE015.13
5	What do you understand by filtration? Explain theory of filtration?	Understand	CO 3	ACE015.13
6	Discuss any four methods of disinfection of water?	Understand	CO 3	ACE015.13
7	Design a rapid sand filter unit for 4.5 MLD with all its principal components?	Understand	CO 3	ACE015.13
8	What do you understand by filtration? Explain theory of filtration?	Understand	CO 3	ACE015.13
9	Discuss slow sand filters and explain	Understand	CO 3	ACE015.13
10	Discuss any four methods of disinfection of water?	Understand	CO 3	ACE015.13
11	Draw a neat diagram of elevated tank and show all its component ports and appurtenances	Understand	CO 3	ACE015.13
12	What is the Bio filter? State its principle of action what are the advantages over the standard rate filter	Understand	CO 3	ACE015.13
13	Write a Hazen William's formula for flow of water through pipe.	Understand	CO 3	ACE015.14
14	What is the different appurtenance used in a distributed system? Explain?	Understand	CO 3	ACE015.14
15	What are the different methods used for the detection of water from the under. Ground water mains? Explain any two?	Understand	CO 3	ACE015.14
16	What are the requirements of good water meter? Discuss the advantages?	Understand	CO 3	ACE015.14
17	What is the different appurtenance used in a distributed system? Explain?	Understand	CO 3	ACE015.14
18	What is different method used for the analysis of flow in pipe network. Explain, (a) Hardy-cross method and (b) Equivalent pipe method?	Understand	CO 3	ACE015.14
19	Explain the pipe system?	Understand	CO 3	ACE015.14
20	What are the requirements of good water meter?	Understand	CO 3	ACE015.14

**Part – C (Problem Solving and Critical Thinking)**

1	Describe classification of distribution systems	Understand	CO 3	ACE015.15
2	Explain one line and two line distribution curves in detail.	Understand	CO 3	ACE015.15
3	Discuss the procedure for starch Iodine Test.	Understand	CO 3	ACE015.15
4	Design five slow sand filter beds from the following data for the water works of a town population 125,000, per capita demand = 135 liters/per/ capita. Rate of filtration = 250 litres/ hour/m <sup>2</sup> . Assume maximum demand as 1.5 times the average demand. Out of five units, one is to be kept standby and used while repairing other units.	Understand	CO 3	ACE015.15
5	Design a rapid sand filter unit for 4.5 MLD with all its principal components.	Understand	CO 3	ACE015.15
6	For the network shown in the figure, flow rate in each pipe and head at each node A =100 m. Use Hazen Williams equation for calculation of head loss cH for all pipes is 100?	Understand	CO 3	ACE015.15
7	Design slow sand filter beds for 2,00,000 population with an average per capita supply of 200 lpcd. Assume relevant data required. Keep one unit as stand by.	Understand	CO 3	ACE015.15
8	How the water consumed by the customers measured? Describe any suitable device for the same. Discuss on the policy of metering the water supply systems?	Understand	CO 3	ACE015.15
9	What is a service reservoir? Given its importance in a distribution system? Draw a neat diagram of an elevate tank and show all its component ports and appurtenances?	Understand	CO 3	ACE015.15

**UNIT-IV**

**WASTE WATER TREATMENT**

**Part – A (Short Answer Questions)**

1	Explain the method of sewage collection	Remember	CO 4	ACE015.16
2	Explain about aquifers and list out their relative merits and demerits.	Remember	CO 4	ACE015.16
3	Define the terms sewage and sewerage?	Remember	CO 4	ACE015.16
4	Compare conservancy and water carriage system of sanitation?	Remember	CO 4	ACE015.16
5	Differentiate between separate and combined systems of sewerage suitable to a town. List their merits and demerits?	Remember	CO 4	ACE015.16
6	Write down advantages and disadvantages of combined systems of sewage?	Understand	CO 4	ACE015.16

7	Define the terms, (i) BOD (ii) Sullage (iii) Sewage (iv) Aerobic Bacteria (v) Time of Concentration?	Remember	CO 4	ACE015.16
8	State the factors on which the storm water flow of an area depends?	Understand	CO 4	ACE015.16
9	Explain the term concentration and its significance in design of storm sewers?	Understand	CO 4	ACE015.16
10	Explain the different principles that should be considered while designing a house drainage system?	Understand	CO 4	ACE015.16
11	Draw a typical house drainage plan of a residential building?	Understand	CO 4	ACE015.17

**Part – B (Long Answer Questions)**

1	What is the foundation of storm water regulator in sewerage systems? Draw a neat sketch of “leaping weir storm regulator.	Understand	CO 4	ACE015.17
2	What is the foundation of storm water regulator in sewerage systems? Draw a neat sketch of “leaping weir storm regulator.	Understand	CO 4	ACE015.17
3	(a) Explain BOD and derive the expression for it? (b) Explain COD and derive the expression for it?	Understand	CO 4	ACE015.17
4	Draw a neat diagram of circular pipes Sewer Section and Explain.	Understand	CO 4	ACE015.17
5	Explain the classification of traps?	Understand	CO 4	ACE015.17
6	What are the different parameters that are considered in the Sewer design?	Understand	CO 4	ACE015.17
7	What are the different sewers sections explain with neat diagrams?	Understand	CO 4	ACE015.17
8	Explain the following with neat sketches, (a) Manholes (b) Inverted siphon (c) Catch Basin?	Understand	CO 4	ACE015.17
9	Write short notes on the various materials used in sewer construction?	Understand	CO 4	ACE015.18
10	Distinguish between the loss of head and negative head?	Understand	CO 4	ACE015.18

**Part – C (Problem Solving and Critical Thinking)**

1	What are the primary treatment of waste water and also strpts involved in the design of the screen chamber?	Understand	CO 4	ACE015.19
2	What are the different parameters that are considered in the sewer design?	Understand	CO 4	ACE015.19
3	What do you understand by „Dry weather flow „? Discuss in brief various factors affecting the dry weather flow?	Understand	CO 4	ACE015.20
4	Explain the different principles that should be considered while designing a house drainage system	Understand	CO 4	ACE015.20
5	Draw a typical house drainage plan of a residential building.	Understand	CO 4	ACE015.20
6	Design a horizontal flow type grit chamber for a proposed sewage treatment plant expected to treat 60,000 m <sup>3</sup> / day respectively. The flow through velocity is to be controlled by a proportional weir?	Understand	CO 4	ACE015.20
7	Design a primary sedimentation for treating 1 MLD of waste water. Make suitable assumptions.	Understand	CO 4	ACE015.20

**UNIT-V**

**DESIGN AND WORKING OF TREATMENT UNITS**

**Part - A (Short Answer Questions)**

1	Write treatment measures of a drainage line?	Understand	CO 5	ACE015.21
2	Discuss about laying and testing of pipe lines.	Understand	CO 5	ACE015.21
3	Write short notes on (a) Screens (b) Grit chambers (c) Sedimentation tanks	Remember	CO 5	ACE015.21
4	Design a circular sedimentation tank to treat 1 MLD of domestic waste water treatment plant. Make suitable assumptions?	Understand	CO 5	ACE015.21
5	Design a primary sedimentation for treating 1 MLD of waste water. Make suitable assumptions?	Remember	CO 5	ACE015.21
6	List out methods for removal of dissolved inorganic impurities from waste water?	Remember	CO 5	ACE015.21
7	Explain the activated sludge process with a flow diagram?	Remember	CO 5	ACE015.22
8	Give advantage and disadvantages of ASP?	Understand	CO 5	ACE015.22

9	Differentiate between activated sludge process and trickling filter?	Understand	CO 5	ACE015.22
10	Explain the trickling filter process with a flow diagram?	Understand	CO 5	ACE015.22
11	Discuss how the symbiotic relationship between algae and bacteria is useful in the treatment of sewage in an oxidation pond?	Understand	CO 5	ACE015.23
12	Which is the most suitable low cost method of sewage treatment in tropical countries? Discuss its working principle and advantages?	Remember	CO 5	ACE015.23
13	Draw a neat sketch of the layout of an oxidation and explain the working and functions of various component works?	Understand	CO 5	ACE015.23
14	Explain the construction and design of sludge digestion tank with a neat sketch?	Remember	CO 5	ACE015.23
15	What are the advantages and disadvantages of stabilization (oxidation) Ponds?	Understand	CO 5	ACE015.23
16	Design and sketch an oxidation pond of population 30,000 in a tropical country like India, assuming necessary data. Determine detention time also?	Remember	CO 5	ACE015.23
17	Present a note on the characteristics of sludge. Why are proper methods of disposal necessary?	Understand	CO 5	ACE015.23
18	What are the conditions that increase the efficiency of sludge digestion? How are these incorporated in a sludge digestion unit?	Remember	CO 5	ACE015.22
19	Discuss anaerobic sludge digestion. Explain the effect of temperature and pH?	Understand	CO 5	ACE015.22
20	State the objectives of sludge digestion?	Remember	CO 5	ACE015.22
<b>Part - B (Long Answer Questions)</b>				
1	Write an account an effluent treatment?	Understand	CO 5	ACE015.22
2	Compare process design consideration in aerated lagoons and oxidation ditches?	Understand	CO 5	ACE015.23
3	Write an account on floating surface Aerator	Understand	CO 5	ACE015.23
4	Design a horizontal flow type grit chamber for a proposed sewage treatment plant expected to treat 60,000 m <sup>3</sup> /day respectively. The flow through velocity is to be controlled by a proportional weir?	Understand	CO 5	ACE015.21
5	Explain the operational problems of trickling filter and their remedies?	Understand	CO 5	ACE015.21
6	Write down the summary of reactions during Anaerobic Treatment	Understand	CO 5	ACE015.21
7	List out the methods for removal of dissolved inorganic impurities from waste water.	Understand	CO 5	ACE015.21
8	Explain the activated sludge process with a flow diagram	Understand	CO 5	ACE015.23
9	Explain the operational problems of trickling filter and their remedies.	Understand	CO 5	ACE015.23
10	Give the advantages and disadvantages of ASP	Understand	CO 5	ACE015.23
11	Discuss how the symbolic relationship between algae and bacteria is useful in the treatment of sewage in an oxidation pond.	Understand	CO 5	ACE015.23
12	Explain the design considerations and working principles of septic tank with sketch?	Understand	CO 5	ACE015.23
13	Write are the advantages and disadvantages of septic tanks?	Understand	CO 5	ACE015.24
14	What are the conditions that increase the efficiency of sludge digestion? How are these incorporated in a sludge digestion unit?	Understand	CO 5	ACE015.24
15	Discuss anaerobic sludge digestion. Explain the effect of temperature and pH?	Understand	CO 5	ACE015.24
16	Present a note on the characteristics of sludge. Why are proper methods of disposal necessary?	Understand	CO 5	ACE015.24
17	Explain the design procedure of digestion tank with neat sketch	Understand	CO 5	ACE015.24

18	What are the conditions that increase the efficiency of sludge digestion? How are these incorporated in sludge digestion unit?	Understand	CO 5	ACE015.23
19	Septic tanks working principles and design- Soak pits, Which is the most suitable low cost method of sewage treatments in tropical countries? Discuss its working principle and advantages.	Understand	CO 5	ACE015.23
20	Draw a neat sketch of the layout of an oxidation ditch and explain the Working and functions of various components works.	Understand	CO 5	ACE015.24
<b>Part – C (Problem Solving and Critical Thinking)</b>				
1	Explain about dead end system with neat sketch? What are the advantages and disadvantages of dead end system?	Understand	CO 5	ACE015.24
2	Design and sketch an oxidation pond of a colony of population 40,000 in a tropical country like India, assuming necessary data. Determine detention time also.	Understand	CO 5	ACE015.24
3	Explain the design considerations and working principles of septic tank with neat sketch.	Understand	CO 5	ACE015.24

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