

**MOHAMED SATHAK A J
COLLEGE OF ENGINEERING**

**DEPARTMENT OF CIVIL
ENGINEERING**

QUESTION BANK

**EN8491-WATER SUPPLY
ENGINEERING**

Regulation – 2017

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QUESTION BANK

(As per Anna University 2017 Regulation)

SUBJECT CODE/NAME: EN8491-WATER SUPPLY ENGINEERING

SEM/YEAR: V/III

UNIT I - <u>SOURCES OF WATER</u>			
Public water supply system -Planning - Objectives -Design period - Population forecasting - Water demand -Sources of water and their characteristics -Surface and Groundwater- Impounding Reservoir- Development and selection of source - Source Water quality - Characterization -Significance-Drinking water quality standards			
PART A			
Q.NO	QUESTIONS	BT LEVEL	COMPETENCE
1.	Define potable water.	BT-1	Remembering
2.	List out the various reasons for water demand encountered in recent Times.	BT-1	Remembering
3.	Define design period.	BT-1	Remembering
4.	Name the drinking water quality standards for any four physic-Chemical parameters.	BT-1	Remembering
5.	What are the components of water supply system?	BT-1	Remembering
6.	Outline the various sources of water.	BT-2	Understanding
7.	Compare and contrast between carbonate and non-carbonate hardness.	BT-2	Understanding
8.	Explain the factors influencing the design period.	BT-4	Analyzing
9.	Write the maximum acceptable limit of the following for the public drinking water. i. Color ii. pH iii. Chlorides iv. Sulphates.	BT-5	Evaluating

10.	Write in brief about the recharge of ground water.	BT2	Understanding
11.	What is water demand? State its types	BT3	Applying
12.	Define per capita demand. How is per capita demand for water Calculated?	BT4	Analyzing
13.	Define BOD	BT5	Evaluating

PART B

1.	i. Describe a few lines about water demand. (3) ii. In two periods each of 20 years a city has grown from 50000 to 110000 and 160000. Tell the population expected in the next 20 years and also the saturation population. (10)	BT-1	Remembering																		
2.	Identify the daily water demand of the city in 2031, if the per capita water demand is 135 Lpcd and the city population records is as given below. <table><tr><td>Census</td><td>1950</td><td>1965</td><td>1980</td><td>1995</td><td>2010</td></tr><tr><td>Year</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Population</td><td>25000</td><td>52000</td><td>94000</td><td>164000</td><td>247000</td></tr></table>	Census	1950	1965	1980	1995	2010	Year						Population	25000	52000	94000	164000	247000	BT-1	Remembering
Census	1950	1965	1980	1995	2010																
Year																					
Population	25000	52000	94000	164000	247000																
3.	The population of a town as per census records is given below. Calculate the population in the year 2020 and 2035 using arithmetical increase method and incremental increase method. Estimate the water demand at 135 LPCD for the year 2035. <table><tr><td>Census</td><td>1935</td><td>1955</td><td>1975</td><td>1995</td><td>2015</td></tr><tr><td>Year</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Population</td><td>39250</td><td>54390</td><td>68010</td><td>83630</td><td>99850</td></tr></table>	Census	1935	1955	1975	1995	2015	Year						Population	39250	54390	68010	83630	99850	BT-1	Remembering
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4.	i. Discuss the factors to be considered in fixing the design period for water supply components. (8) ii. Discuss about the drinking water quality standards as per BIS. (5)	BT-2	Understanding
5.	i. Briefly discuss about the various types of aquifer's with neat sketch. (7) ii. What are the factors influencing the population forecasting? (6)	BT-2	Understanding
6.	i. Discuss the factors that affect the rate of water demand (7) ii. Explain about fire demand-its characteristics and the method of estimating it (6)	BT-3	Applying
7.	Describe the different sources of water and their characteristics with respect to Turbidity, Hardness, Chloride and Microbiology.	BT-1	Remembering
8.	i. Classify the different types of springs. (5) ii. With neat sketch, explain how water is drawn from infiltration galleries. (8)	BT-4	Analyzing
9.	Summarize various sources of water and give a brief account of the characteristics of water.	BT-2	Understanding
10.	Explain the different methods used for prediction of future population of a city, with reference to the design of a water supply system.	BT-4	Analyzing

PART C

1.	i. Discuss about the water quality standards available to characterize the drinking water quality. (5) ii. Explain the chemical characteristics of water (10)	BT-2	Understanding
2.	Briefly discuss about the various physico-chemical test on water and write their limitation for domestic and industrial purpose.	BT-1	Remembering
3.	Enumerate and explain the characteristics of surface water and ground water and state their environmental significance.	BT-4	Analyzing

UNIT II - CONVEYANCE FROM THE SOURCE

Water supply -intake structures -Functions -Pipes and conduits for water- Pipe materials - Hydraulics of flow in pipes -Transmission main design -Laying, jointing and testing of pipes - appurtenances - Types and capacity of pumps -Selection of pumps and pipe materials.

Q.N O	QUESTIONS	BT LEVEL	COMPETENCE
1.	Define intake.	BT-1	Remembering
2.	List functions of intake structures.	BT-1	Remembering
3.	List out the various joint's in cast iron pipes.	BT-1	Remembering
4.	Name the types of intake according to their position.	BT-1	Remembering
5.	How the corrosion of metal pipes is reduced?	BT-2	Remembering
6.	Predict the factors controlling the choice of materials for water conduits.	BT-4	Analyzing
7.	Illustrate the properties of Ductile Iron pipes.	BT-3	Applying
8.	Compare gravity conduits with pressure conduits.	BT-4	Analyzing
9.	What are the advantages and limitations of RCC pipes?	BT-6	Evaluating
10.	Write down the formulae to find out head loss caused by pipe friction.	BT-5	Creating
11.	Define pipe appurtenances and identify their role.	BT-1	Remembering
12.	Highlight the criteria required for the pipe materials in the water supply system.	BT-1	Remembering
13.	Explain the various pipe appurtenances used in water conveyance system.	BT-4	Analyzing
14.	Mention the basis for the selection of types and capacity of pumps.	BT2	Understanding
15.	What is meant by economic diameter of a pumping main?	BT-4	Analyzing

PART B

1.	i. List out the important considerations which govern the selection of site of an intake structure? (6) ii. Describe the salient features of river intake with the aid of a neat sketch. (7)	BT-1	Remembering
2.	What are the basic requirements of a pipe joint? Describe the various pipe joints with neat sketches.	BT-1	Remembering
3.	Discuss about the wet and dry intake tower to draw water from the reservoir.	BT-2	Understanding
4.	Classify the types of intakes. Also explain the working of a reservoir intake with a neat sketch.	BT-2	Understanding
5.	i. List the requirements of a good piping material. (6) ii. Quantity of water required by a town is 20,000m³/day. The pumps are working against a total head of 40m, for 8 hours. Total length of the main is 20km, $f=0.075$. Design the size of the main using Darcy-Weisbach formula. Assume any other data required. (7)	BT-5	Evaluating
6.	i. List the factors to be considered in the selection of Pipe material for water transmission and describe it briefly. (6) ii. Explain the methods of transmission main system. (7)	BT-1	Remembering
7.	What are the different types of pipe materials used in the water transmission?	BT-1	Remembering
8.	Summarize few lines about the functioning of a jet pump with a neat sketch.	BT-2	Understanding
9.	Illustrate the different types of pipe appurtenances used in water supply project.	BT-3	Applying
10.	Explain the different types of pumps used in water supplies with a neat sketch.	BT-4	Analyzing
11.	i. Prepare the key features of testing and laying of pipeline. (8) ii. Explain the principle operation of a centrifugal pump with neat sketch. (5)	BT-6	Creating

PART C

1.	Mention the points which should be taken into consideration in deciding the location of an intake for the water supply of a large town, the source being a perennial river. Draw a neat sketch of a canal intake and explain the salient features.	BT-6	Creating
2.	i. Explain briefly the steps involved in water supply pipe line installation. (9) ii. Write brief notes on laying pipe lines and testing of pipelines. (6)	BT-2	Understanding
3.	Give a detailed account on the selection of pumps and pipe materials suitable for the conveyance system.	BT-3	Applying

UNIT - III WATER TREATMENT

Objectives - Unit operations and processes - Principles, functions design of water treatment plant units, Aerators of Flash mixers, Coagulation and flocculation -Clariflocculator-plate and tube settlers-Pulsator clarifier-Sand filters-Disinfection - Residue management-Construction, Operation & Maintenance aspects .

PART A

Q.NO	QUESTIONS	BT LEVEL	COMPETENCE
1.	Define: Detention time and surface over flow rate.	BT 1	Remembering
2.	Explain the term coagulation.	BT 5	Evaluating
3.	List out advantages of rapid sand filter.	BT 1	Remembering
4.	Mention the advantages of chlorine, as disinfectant.	BT 1	Remembering
5.	State the function of sedimentation tanks.	BT 1	Remembering
6.	Write the nature of any four coagulants.	BT 6	Creating
7.	Differentiate between unit operation and unit process.	BT 2	Understanding
8.	Discuss the significances of velocity gradient in flocculator design.	BT 2	Understanding
9.	Differentiate between sterilization and disinfection.	BT 2	Understanding
10.	Describe the tests to be done to find the residual chlorine in water.	BT 2	Understanding
11.	Illustrate the mechanism of disinfection process.	BT 3	Applying
12.	Discover the factors which depends the dose of coagulants.	BT 3	Applying
13.	Show the layout plan of water treatment plant.	BT 3	Applying
14.	Compare the objectives of Screen chamber and Grit chamber.	BT 4	Analyzing
15.	What are Flocculators?	BT2	Understanding

PART B

1.	i. Develop the design for a rectangular sedimentation tank for 5 MLD flow. (7) ii. Draw and label the parts of the rectangular sedimentation tank(Longitudinal section) indicating the various zones. (6)	BT 1	Remembering
2.	Estimate the volume of a clariflocculator for a proposed water treatment plant with a capacity of 80 ML/d and draw a neat sketch of the unit.	BT 2	Understanding
3.	i. Estimate the settling velocity of a particle of 0.06 mm diameter having specific gravity of 2.65 in temperature of 20°C. Take kinematic viscosity as $1.007 \times 10^{-6} \text{ m}^2/\text{sec}$. (7) ii. Write the design principles of flash mixer and flocculator.(6)	BT 2	Understanding
4.	Explain about slow sand filter and rapid sand filter with suitable diagram and also write their advantages over them.	BT 4	Analyzing
5.	Show the design of a slow sand filter for a town of population 60000 persons,provided water supply rate of 160 Lpcd. Take filtration rate as 2.5 litersperminute, m^2 , L/B ratio as 2, maximum demand as 1.8 times average demand.	BT 1	Remembering
6.	Describe Chlorination and its types. Explain the various process or methods.	BT 4	Analyzing
7.	i. Calculate the average chlorine required per day to treat 150MLD of water. Also calculate the storage required for 60 days. Assume an average chlorine dosage of 5mg/l. (7) ii. Illustrate the various unit operations and unit processes involved in water treatment. (6)	BT 3	Applying
8.	i. Design a flash mixer for a proposed water treatment plant with a capacity of 25 ML/d and draw a neat sketch of the unit. (7) ii. Prepare a short note on “Break Point Chlorination”. (6)	BT 5	Evaluating
9.	A new township is to have a population of 6,00,000 and 90 Lpcd of water supply. Find the rapid sand filter unit with details of under drainage and water washingincluding gutter arrangement. Limit the maximum spent backwash water as 3.5%.	BT 1	Remembering
10.	What is disinfection? Identify the factors affecting disinfection? Examine the conventional and modern methods which are used to disinfect water.	BT 6	Creating

PART C

1.	i Calculate how many kg of bleaching powder with 25% available chlorine is required daily to treat 5MLD of water with 3mg/L of chlorine? (6) ii With a neat sketch explain briefly about pulsator clarifier.(9)	BT 3	Applying
2.	Show the mechanism of sand filtration. Draw a neat sketch of filter unitsand explain its working principle.	BT 1	Remembering
3.	Explain about the practices adopted in Residue management.	BT 4	Analyzing

UNIT IV - ADVANCED WATER TREATMENT

Water softening - Desalination -R.O plant- demineralization -adsorption-Ion exchange- Membrane Systems-R.O Reject management- Iron and manganese removal- Defluoridation- Construction, Operation & Maintenance aspects-Recent advances-MBR process

PART – A

Q.NO	QUESTIONS	BT LEVEL	COMPETENCE
1.	Define reverse osmosis.	BT 1	Remembering
2.	Show the methods of removing temporary and permanent hardness.	BT5	Evaluating
3.	Define Zeolite process.	BT 1	Remembering
4.	What is meant by adsorption isotherm?	BT 1	Remembering
5.	List any four effects of hardness in water	BT 1	Remembering
6.	How do you regenerate softener?	BT 1	Remembering
7.	Distinguish between physical adsorption and chemical adsorption	BT 2	Understanding
8.	Differentiate between demineralization and desalination.	BT 2	Understanding
9.	Describe about the term water softening.	BT 2	Understanding
10.	What are the recent advances in water treatment process?	BT 2	Understanding
11.	What is the principle of Demineralization by Ion-exchange?	BT 3	Applying
12.	Define Defluoridation.	BT 3	Applying
13.	Examine how to remove iron and manganese from water.	BT 3	Applying
14.	What are Membrane Bioreactors?	BT 5	Evaluating
15.	Define RO reject management.	BT4	Analyzing

PART – B

1.	Explain the various methods of removing excess Iron and Manganese from Ground water.	BT 4	Analyzing
2.	Describe in detail about the principle and mechanism of desalination process.	BT 1	Remembering
3.	Elaborate, how are defluoridation and demineralisation carried out in the advanced water treatment process.	BT 1	Remembering
4.	i. Describe the types of hardness present in water. (5) ii. Discuss about the Ion exchange method of water softening with a sketch. (8)	BT 2	Understanding
5.	Explain the methods of removing temporary and permanent hardness from water.	BT 2	Understanding
6.	Explain the Zeolite process for the removal of permanent hardness from water.	BT 4	Analyzing
7.	i. Why and what pretreatment is required in the feed water to RO plant? (8) ii. Explain the techniques adopted in RO reject management. (5)	BT 1	Remembering
8.	Explain in detail with neat sketches about the Membrane Bioreactor(MBR) process.	BT 3	Applying
9.	Recommend the various techniques involved in defluoridation.	BT 5	Evaluating

PART C

1.	Explain the different methods of Water Softening.	BT 4	Analyzing
2.	With neat sketches explain desalination by Electrodialysis method and RO process.	BT 1	Remembering

UNIT V - WATER DISTRIBUTION AND SUPPLY

Requirements of water distribution -Components -Selection of pipe material-Service reservoirs - Functions - Network design -Economics - -Analysis of distribution networks -Computer applications- Appurtenances - Leak detection. Principles of design of water supply in buildings -House service connection - Fixtures and fittings -Systems of plumbing and types of plumbing.

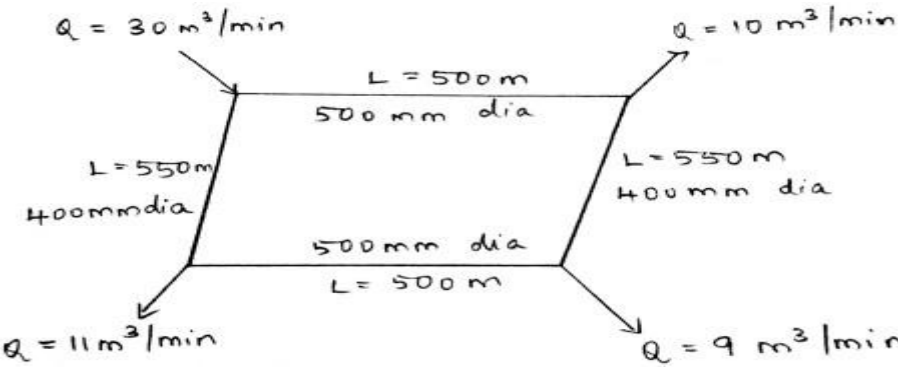
PART A

1.	What is an equivalent pipe?	BT 1	Remembering
2.	How will you calculate the service capacity of the reservoir?	BT6	Creating
3.	Mention the important components needed for the water distribution to buildings.	BT 1	Remembering
4.	Where the ring system of water distribution system is adopted?	BT 1	Remembering
5.	What are the requirements of water distribution system.	BT 1	Remembering
6.	Name the appurtenances used in water distribution system.	BT 1	Remembering
7.	Describe about air valves. Mention the different types of air valves.	BT 2	Understanding
8.	Extend a few lines on ferrule in water service connection.	BT 2	Understanding
9.	Predict the factors which control water supply to buildings.	BT 2	Understanding
10.	Discuss the methods available to find the leakages in pipelines.	BT 2	Understanding
11.	Explain Hardy Cross method of pipe network analysis.	BT 4	Analyzing
12.	Examine the prime functions of service reservoirs.	BT 3	Applying
13.	What is a surface reservoir?	BT3	Applying
14.	Analyze how to identify leakage in pipe lines.	BT 4	Analyzing
15.	List out the components of service connection pipe.	BT5	Evaluating

PART B

1.	What are the functions of service reservoir? Briefly outline the design aspects of service reservoir.	BT 1	Remembering
2.	Draw a sketch and label the parts of a water supply service connection from the street main to a residential building and state the functions of each fitting.	BT 1	Remembering
3.	What is the role of computer applications in the water distribution system?	BT 1	Remembering
4.	Discuss with neat sketches the various types of layout of distribution system and state their advantages and disadvantages.	BT 2	Understanding
5.	Classify the different plumbing systems with neat sketches. Also compare them for their cost, efficiency, easiness, etc.	BT 4	Analyzing
6.	Discuss in detail about i. Waste water detection method.(7) ii. Various pipe fitting with neat sketches.(6)	BT 2	Understanding
7.	Explain with neat sketches about the appurtenances, fixtures and fittings in water distribution system.	BT 4	Analyzing
8.	Summarize few lines about leak detection and explain its methods. How to maintain the drinking water pipe line system.	BT 6	Creating
9.	Discuss Hardy-cross method and Equivalent pipe method to analyse complex pipe network.	BT 2	Understanding

PART C

1.	Explain about the analysis of distribution networks in water distribution and supply to buildings.	BT 4	Analyzing
2.	Design the pipe network shown below and tabulate the flow values in each of the pipe. 	BT 6	Creating

