

**UNIT I****Chapter 1 : Sources, Quantity and Quality of Water 1-1 to 1-59**

**Syllabus :** Sources of Water : Surface and Subsurface sources of water, Intake Structures, Definition and types, Factors governing the location of an intake structure, Types of intakes.

Quantity of water : Need to protect water supplies, flow diagram of water supply scheme, function of units, Demands of water, Factors affecting rate of demand, Variations of water demands, Forecasting of population, Methods of forecasting of population, (Simple problems on forecasting of population), Design period, Estimating of quantity of water supply required for city or town.

Quality of Water : Need for analysis of water, Characteristics of water- Physical, Chemical and Biological, Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, E coli, B coli index, MPN, Sampling of water, Water quality standards as per I.S. 10500.

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1.6.2	Case Study .....	1-34
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1.7.6	Maharashtra Pollution Control Board Norms .....	1-49
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1.9	MSBTE Questions and Answers .....	1-54

**UNIT II****Chapter 2 : Purification of Water 2-1 to 2-40**

**Syllabus :** Purification of Water : Screening- Types of screens, Aeration- objects and methods of aeration, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, types of sedimentation tanks.

Clariflocculator, Filtration-theory of filtration, classification of filters: slow sand filter, rapid sand filter, pressure filter, construction and working of slow sand filter and rapid sand filter. Disinfection: Objects, methods of disinfection, Chlorination- Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance, orthotolidine test, Flow diagram of water treatment plants.

Miscellaneous Water Treatments : Water softening, Defluoridation techniques

Advanced Water Treatments : Electrolysis, Reverse Osmosis.

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2.1.3	Aeration .....	2-4
2.2	Sedimentation .....	2-7
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2.2.2	Types of Sedimentation .....	2-8



2.2.3	Theory of Sedimentation .....	2-8
2.2.4	Stoke's Law .....	2-8
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2.11.3	Preventive Measures to abate Water Pollution of Bore Wells .....	2-36
2.12	MSBTE Questions and Answers .....	2-36

### UNIT III

#### Chapter 3 : Conveyance and Distribution of Water

**3-1 to 3-22**

**Syllabus :** Conveyance : Types of Pipes used for conveyance of water, choice of pipe material, Types of joints and Types of valves- their use, location and function on a pipeline.

Distribution of water : Methods of distribution of water- Gravity, pumping, and combined system, Service reservoirs-functions and types , Layouts of distribution of water- Dead end system, grid iron system, circular system, radial system ; their suitability, advantages and disadvantages.

3.1	Conveyance of Water .....	3-1
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3.3	Types of Joints .....	3-6
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### UNIT IV

#### Chapter 4 : Domestic Sewage and System of Sewerages

**4-1 to 4-39**

**Syllabus :** Building Sanitation : Necessity of sanitation, Necessity to treat domestic sewage, Definitions-Sewage, sullage, types of sewage. Definitions of the terms related to Building Sanitation-Water pipe, Rain water pipe, Soil pipe, Sullage pipe, Vent pipe, Building Sanitary fittings-Water closet- Indian and European type, flushing cistern, wash basin, sinks, Urinals. Traps-types, qualities of good trap. Systems of plumbing-one pipe, two pipe, single stack, choice of system principles regarding design of building drainage, layout plan for



building sanitary fittings (drainage plan), inspection and junction chambers, their necessity, location, size and shape. Maintenance of sanitary units.

Systems of Sewerage and Sewer Appurtenances : Types of Sewers, Systems of Sewerage, Design of sewers, self cleansing velocity and non scouring velocity, Laying, Testing and maintenance of sewers. Manholes and Drop Manhole-component parts, location, spacing, construction details, Sewer Inlets, Street Inlets.

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4.3	Recycling and Reuse of Domestic Waste	4-2
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4.17	Non Scouring Velocity	4-25
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4.22	Drop Manhole	4-31
4.23	Inlets	4-32

4.24	Junction Chambers	4-33
4.25	MSBTE Questions and Answers	4-34

## UNIT V

### Chapter 5 : Characteristics and Treatment of Sewage

5-1 to 5-34

**Syllabus :** Analysis of sewage : Characteristics of sewage, B.O.D., C.O.D. and its significance. Aerobic and anaerobic process, Maharashtra Pollution Control Board Norms for the discharge of treated sewage, Objects of sewage treatment and its flow diagram.

Treatment of sewage : Screening, Grit removal, Skimming, Sedimentation of sewage, Sludge digestion, Trickling filters, Activated sludge process, Disposal of sewage, Oxidation pond, Oxidation ditch. Septic tank (details and design criteria), Recycling and Reuse of domestic waste.

5.1	Analysis of Sewage	5-1
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5.3	BOD (Biochemical Oxygen Demand)	5-2
5.3.1	Method to Determine BOD	5-2
5.4	Chemical Oxygen Demand (COD)	5-3
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5.6	Aerobic Process and Anaerobic Process	5-4
5.7	Maharashtra Pollution Control Board Norms	5-5
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5.8	Treatment of Sewage	5-10
5.9	General Layout and Flow Diagram of Sewage Treatment Plant	5-10
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5.12	Grit Chamber	5-13
5.13	Skimming	5-14
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5.17	Sludge Digestion	5-16
5.18	Trickling Filters	5-17



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5.19	Activated Sludge Process .....	5-19	5.27	Recycling and Reuse of Domestic Waste .....	5-29
5.20	Disposal of Sewage or Sludge .....	5-20	5.27.1	Purpose of Recycle and Reuse of Domestic Waste .....	5-29
5.21	Septic Tank .....	5-23	5.27.2	Types of Wastewater Recycle and Reuse .....	5-30
5.22	Methods of Disposal of Septic Tank Effluent .....	5-24	5.28	MSBTE Questions and Answers .....	5-30
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5.25	Oxidation Ditch .....	5-28			
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