

## WATER SUPPLY AND SEWAGE SYSTEM

**Paper Code: ETEN-311**

**Paper: Water Supply and Sewage System**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>4</b>

### **INSTRUCTIONS TO PAPER SETTERS:**

**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

*Objective: The course will deal with planning for water supply and distribution projects, sewage collection and treatment projects. Students will be introduced to the designing of pumping stations, intake structures etc. The students will also be exposed to waste water disposal into rivers, lake and estuaries.*

### **UNIT – I**

Water Requirements: Need to protect water supplies, Various types of water demands, Factors affecting consumption of water, variations in demand, Per capita demand, Total requirements of water for a town or a city, Coincident draft, Effect of variations in demand on the design capacities of different components of a water supply scheme, Design periods, Population forecasting methods, Water Quality standards for municipal or domestic supplies, Water quality standards for industrial supplies.

Classification of sources of water, Surface sources: Reservoir planning, Storage capacity and yield, Zones of underground water, Movement of ground water and its velocity, Groundwater yield, Specific yield and specific retention, Aquifers and their types, Locating a well, Construction of well, Tube wells and Rainey wells.

**[T1,T2][No. of Hours: 11]**

### **UNIT – II**

Water lifting arrangement, Source selection in hilly and rural areas, Appropriate treatment technology for rural water supplies.

Intakes: Factors governing the location of intakes, Types of intakes including simple submerged intakes, Wet and dry intake towers.

Conduits: Gravity conduits such as canals, Flumes, Aqueducts and pressure conduits, pipe materials and their joints, Corrosion of metal pipes, Laying of pipes and pipe appurtenances such as gate valves, Air valves, Blow off valves, Pressure relief valves, Check valves, Manholes, Insulation joints, Anchorages etc. Testing of pipe lines, Head loss through pipes and pipe fittings, Disinfection of pipelines before use.

**[T1,T2][No. of Hours: 11]**

### **UNIT – III**

Distribution system planning. Types of distribution reservoirs including surface reservoirs and elevated reservoirs, Types of fire hydrants and their requirements, Types of water meters and their requirements Wastage of water in distribution system. Materials for service pipes, Service connection. Principles, Design, Concepts and Suitability of Disinfection

Types of sewage and types of sewerage systems, Components of sewerage system, Future forecasts and estimating design sewage discharge. Estimating the peak runoff.

**[T1,T2][No. of Hours: 11]**

### **UNIT – IV**

Provision of free board in sewers and Storm water drains Hydraulic formulas for determining flow velocities in sewers and drains, Maximum and minimum velocities to be generated in sewers.

Shapes of sewer pipes, Forces acting on sewer pipes, Sewer materials, Laying and testing of sewer pipes.

Sewer Appurtenances: Man holes, Drop man holes, Lamp holes, Clean outs, Street inlets, Called gullies, Catch basins, Flushing tanks, Grease and oil traps, Inverted siphons, Storm water regulators.

Maintenance, Cleaning and Ventilation of sewers.

Types of pumps and pumping stations for water supply and Sewerage system, Factors affecting the selection of particular type of a pump, Head power and efficiency of pumps, Economic diameter of pumping mains.

Plumbing systems, Sewerage plans for building and design of sewer, Sanitary fittings and other accessories.

Wastewater disposal into rivers, lake and estuaries.

**[T1,T2][No. of Hours: 12]**

**Text Books:**

- [T1] Nathanson J.A., “Basic Environmental Technology, Water Supply, Waste Management and Pollution Control”, PHI (P) Ltd., New Delhi..
- [T2] CPHEEO,” Manual on Water Supply and Treatment and Sewerage and Sewage Treatment”, Ministry of Urban Development, New Delhi.

**Reference Books:**

- [R1] Christian K., “Wastewater Treatment, Concept and Treatment”, PHI (P) Ltd., New Delhi..
- [R2] Garg S.K., “Environmental Engineering (Vol. 1), Water Supply Engineering”, Khanna Publishers.,New Delhi.
- [R3] Garg S.K., “Sewage Disposal and Air Pollution Engineering (Vol. II)”, Khanna Publishers., New Delhi.
- [R4] Punamia B.C., Jain A., Jain A., “Water Supply Engineering”, Laxmi Publications., New Delhi.
- [R5] Bhattacharya S.K., “ Urban Domestic Water Supply in Developing Countries”, CBS Publishers and Distributers (P) Ltd., New Delhi.