Module 1

Chapter 1 : Water Supply and Quality of Water 1-1 to 1- 20

1.1 Water supply : Water supply systems, water resources, types of intake structures, distribution systems of water and distribution layouts.

1.2 Quality of water : Introduction to pure water: potable, wholesome, palatable, distilled, polluted and contaminated water, drinking water standards and characteristics of water, water borne diseases.

Module 2

Chapter 2 : Water Treatment 2-1 to 2-52

2.1 WTP : Typical layout of WTP, Aeration, Types of Aeration systems, sedimentation, types of settling, tube settlers, design of sedimentation tank.

2.2 Coagulation and flocculation : Principle of coagulation, flocculation, Clari flocculator, coagulants aids.

2.3 Filtration : rapid sand filters, operation, cleaning and back-washing, Entire design of rapid gravity filter with under drainage system. Pressure filter : Construction and operation

2.4 Disinfection : Different methods of disinfection, chlorination and chemistry of chlorination, chlorine demand, free and combined chlorine, various forms of chlorine, types of chlorination. Numerical to calculate quantity of required chlorine doses.

2.5 Advanced and Miscellaneous Treatments : Water softening by lime soda process and by base exchange method, Reverse Osmosis, Activated carbon, Membrane filtration, Removal of Iron and Manganese.

Module 3

3.1 Building water supply : Water demands, Per capita Supply, Service connection from main, Water meter.

3.2 Building drainage : basic principles, traps-types, location and function, Systems of Plumbing, anti siphonic and vent pipes.

3.3 Rainwater harvesting : Need for rainwater harvesting, Annual potential, Roof-top rain water harvesting. Numerical on annual rainwater harvesting potential.

Module 4

4.1 Sewage : Introduction to domestic sewage, and storm water, System of sanitation, Physical and chemical haracteristics, decomposition of sewage, BOD, COD, numerical on BOD. MPCB norms for disposal of sewage effluent.

4.2 Sewerage system : Systems of sewerage and their layouts: Separate, Combined and partially combined system, merits and demerits, self-cleaning velocity and non-scouring velocity, Sewer- Shape, hydraulic design of sewers, Laying and testing of sewers, manhole-location, necessity, types and drop manhole, ventilation.

Module 5

5.1 Treatment processes : Objective, methods of treatment, flow sheets showing Preliminary, Primary, Secondary and Tertiary treatment. Primary treatment : Screening, Grit removal, Oil and Grease removal, settling tank. Secondary Treatment Methods: Trickling filter-Principle, Process description and Design of trickling filter. Activated sludge process (ASP) - Principle, Process description, Recirculation of sludge, (numerical), Sludge volume index.

5.2 Introduction to Biological Treatment : Aerated lagoons, Oxidation ponds, oxidation ditches.

Self-purification of natural waterbodiess : Oxygen economy, Disposal of treated effluent. Disposal of Raw and treated sewage on land and water, DO sag curve.

5.3 Rural and Low-cost sanitation : Septic Tank and Soak Pit –Operation, suitability and Design.

Module 6

6.1 Air pollution : Composition of air, Quantification of air pollutants, Air quality standards, Effect of air pollution on Environment, Introduction to Air pollution control devices.

6.2 Noise pollution : Basic concept and measurement, Effects of noise, and control methods, and numerical on sound level.

6.3 Municipal Solid Waste Management : Sources, storage, treatment, disposal,5R Principles.

❑❑❑