SYLLABUS - EXECUTIVE (CIVIL & ENVIRONMENTAL ENGINEER)

- **SURVEYING**

Principles of surveying, measurement of distance, chain surveying, working of prismatic compass, compass traversing, bearings, local attraction, plane table surveying, theodolite traversing, adjustment of theodolite, Levelling, Definition of terms used in levelling, contouring, curvature and refraction corrections, temporary and permanent adjustments of dumpy level, methods of contouring, uses of contour map, tachometric survey, curve setting, earth work calculation total station and its important features.

- **SITE INVESTIGATION AND SUB- SOIL EXPLORATION**

Methods of sub soil exploration, Open test pit, Tube Test pit, Tube borings, Auger Boring. Wash Boring. Advantages, Disadvantages, Percussion drilling Diamond drilling, Rotary Drilling and Advantages /Disadvantages of each method, standard Penetration Test, Sampling, Preservation of Samples. Interpretation of geo- technical parameters C,O, E.

- **COMPACTION OF SOIL**

Laboratory compaction tests, standard proctor Compaction, tests, modified proctor Test. Theory of Compaction. Hogentoeler's Lubrication Theory, Factors affecting compaction, Effect of Compaction on the properties of Soil, Selection of passes for rollers and field trial, type of rollers, Field control of compaction, Determination of density in the field, Sand Replacement Method, Core Cutter Method, Rubber Ballon Method, Water Replacement Method, Consolidation, Difference Between Compaction and Consolidation.

- **CONSTRUCTION OF FOUNDATIONS:**

Soil classification, Bearing capacity, Determination of bearing capacity, Types of Foundation-Spread Foundations, Raft or Mat, Foundation, stepped Foundation, Pile Foundations, Friction piles, End Bearing Piles, frication cum End Bearing piles, Cast-in-situ concrete piles, Group of Piles, Pile cap, Causes of foundation Failure, Excavation of Foundations, Timbering of Foundation Trenches, Components of Well Foundation Pile load test, Sonic test on Piles. Pile Integrity test, Deep Excavation. Slope Stability, Liquefaction.

- **CEMENT CONCRETE AND REINFORCED CEMENT CONCRETE CONSTRUCTION**

Properties of cement, Principles of setting and hardening of cement, Fine Aggregate, Coarse Aggregate, General Qualities for food Aggregates, Water Cement Ratio and its impact on concrete strength, Workability, Slump Test, Admixtures, Mix Design, Recommended slump for various types of structural components
, Compressive strength of concrete, and methods of testing, Transporting concrete, placing of concrete, compacting concrete, construction joints, curing of concrete and methods of testing, transporting concrete, placing of concrete, compacting concrete, construction joints, curing of concrete, placing concrete under water, use of tremie, reinforced cement concrete, its properties and advantages, various types of Form work for concrete structures, Fundamentals of Form Design, Deflection of forms, arrangements of form work, bending moments & shear force in columns, simply supported and cantilever beams, one and two ways RCC slabs, Admixtures R.M.C, fixity of junction of slab/beam with wall /column with reinforcement detailing to achieve required fixity, Weathering , Common repair techniques of cracks , spalling Delamination, Efflorescence Corrosion, Carbonation depth, Corrosion mapping and Sulphate Attack.

- **RCC DESIGN**

RCC Design: RCC beams-flexural strength, shear strength, bond strength, design of singly reinforced and double reinforced beams, cantilever beams, T-beams, lintels, One way and two way slabs, isolated footings, Reinforced brick works, columns, staircases, retaining wall, water tanks.

- **ENVIRONMENTAL ENGINEERING**

Introduction: Importance of water supply, need for protected water supply, objectives of water supply system, role of agencies, water supply and sanitation development in India, Quantity water: Estimating requirements, design period, per capita consumption, fluctuation in rate of consumption, numerical problems,

1. Sources of water supply: Major (surface and underground) water sources, quality and quantity of water in surface and underground sources, selection of suitable sources of water supply, necessity &determination of the capacity of storage reservoir by Mass curve method

2. Intakes and Conveyance of water: intakes, types of intakes, location and requirement of an intake, types of conduits, pipe material, various types of pipe joints, laying of pipes, hydrostatic test

3. Quality of Water: Impurities in water and their importance, collection of water samples, physical chemical and bacteriological analysis of water, standards of quality for domestic water supply

4. Sedimentation: Sedimentation aided with coagulation, various coagulants, mechanism of coagulation and floc formation, stage in coagulation, design of sedimentation tank

5. Filtration: Theory of filtration, types of filters, working and comparison of slow and rapid sand filter, sectional elevation and plan of slow sand filter and rapid sand filter, pressure filter, Disinfection of water: Necessity of disinfection, requirements of good disinfectant, methods of disinfection, theory of disinfection by chlorine, chlorine demand, different practices of chlorination, sketch of chlorinator, use of bleaching power

6. Storage of clear water and its distribution: Layout of water distribution systems along with their advantages and disadvantages, design of distribution system, causes, detection and prevention of wastage of water

7. Flow in sewers: Quantity of sanitary and storm water, variations in flow of sewage and their importance, dry weather flow, types of sewer, condition of flow in sewers, self cleansing and limiting velocities in sewers

8. Construction and Maintenance of Sewers: Sewer appurtenances, materials for sewer, laying of sewers, joints and Testing of sewer joints, maintenance, operation and precaution before entering a manhole

9. Characterization and Examination of Sewage: Physical, chemical and biological characteristics of sewage, physical, chemical and biological examination of sewage including pH, BOD and allied numerical problems

10. Disposal of Sewage: Methods of disposal, the conditions for adopting different methods, dilution methods, standards of dilution, self purification of natural streams, permissible loads and limits of pollution to be discharged into inland surface water and public sewer, disposal by land treatment method, treatment standards for sewage effluents, effluent irrigation and sewage farming, sewage sickness and it's preventive measures

11. Treatment of Sewage: Definitions of preliminary, primary, secondary and tertiary treatment, types of treatment units employed in sewage treatment, their function and efficiencies comparative statement, grit chambers and detritus tanks, skimming tanks, primary sedimentation, filtration of sewage, tricking filters, activated sludge process, comparison of trickling filters and ASP, oxidation ponds Aerated lagoons

12. Septic and Imhoff Tanks: Theory, working and design criteria of septic and Imhoff tanks, advantages and Disadvantages of septic and Imhoff tanks, Sectional elevation and plan of septic and Imhoff tanks.

13. Air Pollution: causes, effects and controls Noise

14. Pollution: Causes, effects and controls

- **ESTIMATING AND COSTING**

Introduction: Introduction to quantity surveying and its importance, Duties of quantity surveyor Types of estimates; preliminary estimates, plinth area estimate, cubic rate estimate, estimate per unit base, Detailed estimates; definition, stages of preparation details of measurement and calculation of quantities and abstract,

Measurement, units of measurement for various items of work as per BIS:1200, rules for measurements, Earth work, Brick work (modular and traditional bricks), RCC works, shuttering woodwork, painting, flooring, plastering etc., different methods of taking out quantities-center line method and long wall and short wall method

Preparation of Detailed and Abstract Estimates from Drawings; A small residential building with a flat roof, pitched roof with steel truss, timber structures

Earthwork for unlined channel, mid-section formula, trapezoidal formula, Simpson's formula rule, water supply lines, sanitary and water supply fittings, septic tank for a domestic building and cost estimate of septic tanks, WBM road and pre-mix carpeting, tube well, isolated and combined footing, steel truss, piles and piles cap, Single span RCC slab culvert, earthwork for plain, hill roads, RCC work in beams, slab, column and lintel, Arches and their bar bending schedule

Calculation of quantities of materials for cement mortars of different proportions, Portland cement concrete of different proportions, brick masonry in cement mortar, plastering and pointing, white washing, cement concrete flooring, terrazzo flooring, stone masonry-random rubble and ashlar, Analysis of Rates: Steps involved in the analysis of rates, Requirement of material, labour, sundaries, contractor's profit and overheads

Analysis of rates for finished items when data regarding labour, rates of material and labour is given, Earthwork in excavation hard / ordinary soil and filling with a concept

of lead and lift, cement concrete in foundation, RCC in roof slab, brick masonry in cement mortar, cement plaster, white washing

Valuation: Value and cost, scrap value, salvage value, assessed value, sinking fund, depreciation & obsolescence, methods of valuation

- **FINISHING WORKS**

1. Granite flooring, laying clamp specifications, dry cladding tiles, polishing
2. IPS flooring,
3. Aluminium composite panels - fixing, properties, framing sealant
4. Glass-properties for lamination, toughening, clamping, sealant
5. Stainless Steel (SS)- Railing work, cladding works, canopy works, properties field test to verify grade 304 etc
6. Calcium silicate board-fixing properties, baffle/ metal false ceiling
7. GFRC screen/ panel-properties, fixing arrangement, quality control.

- **CONSTRUCTION MANAGEMENT**

1. **Basic Principle of Managements:** Management principles, planning, organizing, directing controlling, organization, structure of organization, structure of construction organization both government and project organizations

2. **Accident, Safety and Housekeeping:** Types, causes, cost and investigation of accidents, hazards safety analysis, planning, implementation and education, BIS measures for safety (specially construction industry),fire fighting, First aid, security, pilferage, job layout- location of store equipments, materials, project office, security guards etc

3. **Project Management**: Project planning, Man, machine, money and material, work breakdown scheduling, Bar charts, CPM and PERT, types of construction machines-crawler and wheel tractors Power shovels, cranes, lifts, hoes, trenching machines, selection of equipment etc, Operation, cost, troubles and maintenance, store and Inventory management, cash flow, depreciation, instalments, Interest, manpower planning, organization chart, purchasing, introduction to management software like primavera

4. **Quality Control**: Specification, Inspection, stages of inspection, testing, tolerances, BIS code specifications, for cement, aggregates, steel, concrete & mild

steel, Quality Management Systems ISO: 9000 series, Environmental Quality Management system-ISO: 14001 series, Total quality management

5. **Professional Ethics**: Ethics, morality, social and spiritual values and need, professional bodies, code of conduct, dilemma before a civil engineer, conflict management

- **CAD IN CIVIL ENGINEERING PRACTICE**

Introduction to Auto Cad, definition of various commands used, Simple exercises using Auto Cad commands, Double line plan, Front elevation and section of a one bed room set residential single storey building.

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