

MPPSC SES (AE) CIVIL 2020 CIVIL ENGINEERING SYLLABUS

Unit-1

Structural Analysis

Stress, plane stress, Strains, plane strain, Mohr's circle of stress and strain, Elastic theories of failure, Principal Stresses, Bending, Shear and Torsion. Determinate and Indeterminate structures, Degrees of Freedom, Static and kinematic Indeterminacy, Principal of Superposition, Virtual Work, Energy theorem, Deflection of Trusses, Redundant Frames.

Unit-2

Steel Structural Design

Factors of Safety and Load Factors. Riveted and Welded connections of members, Design of Tension, Compression and Flexural members, Built-up Beams and Plate Girder, Slab and Gusseted Bases for Columns, Design of Roof Trusses, Purling and Coverings, Structural Steel Tubes and their connection, Plastic Design of Continuous Beams and Frames.

Unit-3

Reinforced Concrete Design

Working Stress and Limit State methods for design of Rectangular, T and L Beams, Slabs and Columns Isolated and Combined Footing, Raft Foundation. Overhead, Resting on Ground and Underground Water Tanks, Method and System of Prestressing, Anchorages Losses in Prestress, Design of prestressed Concrete Beams. Principles of pre-stressed concrete design including materials and methods: Earthquake resistant design of structures; Design of Masonry Structure.

Unit-4

Construction Planning and Management

Construction materials, Detailed estimates, specifications, analysis and rates of various works in civil engineering, construction activity, scheduling through CPM and PERT analysis, cost optimization through network construction, Float times, Bar charts, cost analysis and allocation, Types of tenders and contract conditions, Analysis of Rates of various types of works; Quality Control, Productivity, Operation Cost; Land acquisition; Labour safety and welfare.

Unit-5

Environmental Engineering

Water Demand-Per capita Demand, Population Estimation methods

Water Quality Criteria for various uses viz, Domestic and Non-Domestic, Irrigation effects and significance of important parameters and permissible concentration as per relevant standards. Transmission of water. A.C. Pressure pipes, Corrosion of Pipes, types and Methods of control systems of distribution and layouts of distribution. Unit Processes and operation of water treatment viz., objectives and Design criteria of sedimentation, Coagulation Flocculation, Chemical Sedimentation. Filtration (Slow sand and Rapid sand), Disinfection and Softening.

Quantity and Characterization of Domestic Sewage significance of B.O.D, C.O.D, D.O., Solids, T.O.C, Effluent Standards, River Standards, Sewage System-Design of Sewers and Storm Sewer, Design of Screens, Grit Chambers, Design of Primary Sedimentation tanks. Design of Biological Treatment Units viz., trickling filters, Activated Sludge Treatment and secondary sedimentation tank,

Water Stabilization ponds Aerobic, Anaerobic and Facultative Ponds, design criteria and principles. Sludge Treatment-Digestion and sludge disposal, Septic Tanks-design criteria and working, Self-purification of streams-oxygen sag curve, Types of Pollution-Sources and effects of various pollution viz., water, Air, Land and Noise, Relevant standards, Rural Sanitation, Solid Waste-collection and disposal.

Sewage collection and disposal: Plumbing Systems. Components and layout of sewerage system; Planning & design of Domestic Waste-water disposal system; Sludge management including treatment, disposal and re-use of treated effluents; Industrial waste waters and Effluent Treatment Plants including institutional and industrial sewage management.

Unit-6

Water resource Engineering

Water Resources in the Globe, Available Fresh Water. Need for Optimum use of Available water, Schemes for Drinking, Irrigation, Hydro Power, and Multipurpose Schemes

Irrigation - Necessity, Scope, Benefits and Effects.

Methods and systems of Irrigation, their efficiencies, Water Distribution and Scheduling techniques. Crop Water Requirements, Evapotranspiration, Consumptive Use, Duty, Delta, Base Period their relation. Quality of Irrigation water.

Hydrology - Hydrological Cycle, Precipitation — Types, Measurement, Rain gauge Network,

Analysis of Precipitation Data, Unit Hydrograph, Summation and Synthetic Hydrograph, Design Flood by UH and Frequency Studies.

Ground Water — Classes aid Availability of soil moisture. Aquifers- Confined and Unconfined. Open and Tube Wells, Radial Flow in wells, Dupuits's Theory, Darcy's Law, Seepage Analysis using Flow Nets, Yield of Wells determination.

Storage Schemes - Reservoir Planning, Capacity, Yield Life, Gravity and Earthen Dams. Forces Acting, Modes of Failures, Stability Criteria, Design.

Spillway, Types, Design of ogee and Syphon Spillway, Energy Dissipation Devices, Stilling basins.

Diversion Schemes — Structures on Pervious Formations, Bligh's and Khosla's Theory, Hydraulic Jump. Design of Vertical Drop Weir and Barrage.

Distribution System—Canals-classification, Layout Alignment, Capacity, Design of Canals, Silt Theories, Canal Regulation Structures, Design of Head and Cross Regulators, Canal Falls, Cross Drainage Works and Outlets, Escapes.

Water Logging - Causes, Effects, Remedial Measures, Losses in Canals, Canal lining, Types. Advantages, Conjunctive use of Surface and Ground Water.

River Training — Objective and Methods, Concepts of Hydropower projects.

Unit-7

Fluid Mechanics;

Fluid properties; Dimensional Analysis and Modeling; Fluid dynamics including flow kinematics and measurements; Flow net; Viscosity, Boundary layer and control, Drag, Lift, Open Channel Flow, Pipe Flow, Principles in open channel flow, Flow controls. Hydraulic jump; Surges; Pipe networks.

Unit-8

Railways Engineering

Permanent Way, Sleepers, Rail Fastenings, Ballast, Points and Crossings, different types of Turnouts.

Signals and Interlocking, Level Crossing.

Maintenance of track, Super-elevation, Creep of Rails, Ruling Gradients, Track Resistance. Tractive Efforts, Curve Resistance.

Unit-9

Highways and Airports

Principles of Highway Planning, Highway Alignments.

Geometrical design, cross-section. Camber, Super-elevation. Horizontal and Vertical curves, Classification of Roads.

Design and Construction of flexible and rigid pavements for Highway and Airfields.

Evaluation of pavement failure and Strengthening Drainage of Roads.

Traffic Engineering: Traffic Surveys, Highway Capacity, Intersections, Rotary Design Elements, signs, signals and Markings.

Selection of Airport Sites, Wind rose Diagram and Runway Orientation. Runway and taxiway Geometric and Lighting.

Bridge Engineering — Selection of sites, Design Data collection, Hydraulic Design, Scour Depth for Bridge foundation, Economic Span.

Type of Road and Railway Bridge, Design load and forces

Unit-10

Geotechnical Engineering

Index properties of soil, Classification of soils, Clay Minerals.

Capillary Water. Permeability, Factors Affecting permeability, Lab and Field Methods, Permeability of stratified soil deposits.

Seepage Pressure, Quick Sand condition, Flow Nets, its properties and uses. Stress distribution in soils, Boussinesq's theory. Newmark's chart

Consolidation and settlement: Terzaghi's theory. Consolidation test, Settlement curve, Time Settlement curve.

Compaction tests and their significance, factors affecting compaction.

Shear strength Parameters, Shear Test, Mohr coulomb's failure theory, Skempton's pore pressure coefficients.

Earth Pressure at rest, active and passive pressure, Rankine's and Coulomb's theory

Bearing capacity, Terzaghi analysis, factors affecting Bearing Capacity, Plate Load Test.



Stability of Slopes, Swedish Slip Circle method and Bishop's Simplified method, Stability number

Sub-surface exploration, Method, sampling, SPT, DCPT and Static Cone Penetration Test,

Electrical Resistivity and Seismic method.

Essential features of Foundations. Types, design, criteria, Rafts

Pile Foundation, Types of piles, Pile Capacity, Pile Load Test, and Group Action

Static/Dynamic formulae

Ground Improvement techniques, Sand Drains, Soil Stabilization, Geotextiles

Sambhav Engineers