



Indian Institute of Technology Tirupati

Post Name: Executive Engineer (civil) & Assistant Executive Engineer (civil)

Advertisement No: IITTP/Staff RMT-01/2020 December 30, 2020

Syllabus for the Written Test Examination

Structural Engineering

Strength of Materials: Simple bending theory, flexural and shear stresses, shear centre; Uniform torsion, buckling of column, combined and direct bending stresses; Instruments used to measure displacements, strains and loads.

Structural Analysis: Statically determinate and indeterminate structures by force/ energy methods; Method of superposition; Analysis of trusses, arches, beams, cables and frames; Force methods: method of consistent deformation, column analogy method; Displacement methods: Slope deflection and moment distribution methods; Influence lines; Stiffness and flexibility methods of structural analysis.

Construction Materials: Structural steel - composition, material properties and behaviour, standard tests on rebars; Cement, sand and aggregate – determination of engineering properties; Concrete – constituents, mix design, short-term and long-term properties, determination of engineering properties; Bricks and mortar; Timber – types of wood, seasoning of timber, mechanical properties, defects of timber, wood preservation techniques.

Reinforced Concrete (RC) Structures: Working stress, Limit state and Ultimate load design concepts; Design of beams, slabs, columns as per Indian Standards; Bond and development length; Prestressed concrete; Analysis of beam sections at transfer and service loads.

Steel Structures: Limit state design concepts; Design of tension and compression members, beams and beam- columns, column bases as per Indian Standards; Connections - simple and eccentric, beam-column connections, plate girders and trusses; Design of purlins.

Geotechnical Engineering

Three-phase system and phase relationships, index properties; Unified and Indian standard soil classification system; Soil structure and fabric, clay mineralogy; Permeability – one dimensional flow, Darcy's law; Seepage through soils – two dimensional flow, flow nets, uplift pressure, piping; Principle of effective stress; Compaction in laboratory and field conditions; One-dimensional consolidation, time rate of consolidation; Effective and total shear strength parameters, characteristics of clays and sand.

Sub-surface investigations; Earth pressure theories - Rankine and Coulomb; Stability of slopes - finite and infinite slopes, method of slices and Bishop's method; Stress distribution in soils - Boussinesq's and Westergaard's theories, pressure bulbs; Shallow foundations - Terzaghi's and Meyerhoff's bearing capacity theories, effect of water table; Combined footing and raft foundation; Contact pressure; Settlement analysis in sands and clays; Deep foundations - types of piles, dynamic and static formulae, load capacity of piles in sands and clays, pile load test, negative skin friction; Pile groups, Relevant Indian standards

Transportation Engineering

Highway planning: alignment, land-use – transportation interaction, urban transportation planning, parking. Traffic signs and road markings, Traffic intersections, Traffic rotary and signal design, IRC and BIS guidelines.

Geometric design: sight distance, horizontal and vertical alignments, superelevation, extra-widening.

Pavement technology: pavement systems and types, materials, mixtures, design, analysis, performance criteria, performance tests, MoRTH specifications, IRC guidelines, AASHTO methods. Pavement engineering laboratory: penetration tests, ring and ball apparatus, and rotational viscometer; aggregate toughness and specific gravities; Marshall mix design using Marshall hammer.

Water Resources Engineering

Fluid Mechanics: Fluid statics; Continuity, momentum, energy and corresponding equations; Flow in pipes, pipe networks.

Hydraulics: Flow measurement in channels and pipes; Basics of hydraulic machines; Channel Hydraulics - Energy-depth relationships, specific energy, critical flow, slope profile, hydraulic jump, uniform flow and gradually varied flow.

Hydrology: Hydrologic cycle, precipitation, evaporation, evapo-transpiration, infiltration, unit hydrographs, hydrograph analysis, reservoirs, watersheds, groundwater hydrology - aquifers.

Environmental Engineering

Water quality: Water quality parameters; Drinking water standards; Physical, chemical, and bacteriological analysis of water; Sample collection and data analysis; knowledge of physical and chemical analysis of environmental samples, Permissible limits as per BIS requirements

Water and Wastewater treatment: Physicochemical treatment of water; Treatment of domestic Wastewater; Wastewater characteristics; Aerobic treatment of wastewater: Activated sludge process; Sequencing Batch Reactor (SBR); Trickling filters; Oxidation Ponds; basics of advanced water and wastewater treatment; basic knowledge of troubleshooting of water and wastewater treatment plants; knowledge of wastewater and solid waste disposal and disposal standards.

Solid waste management: Solid and hazardous waste management; Sampling and characterization of solid waste; Material and resource recovery/recycling from solid wastes; Basic knowledge on

treatment and disposal techniques for solid waste – composting, Biomethanisation; Integrated waste management practices.

Estimation and Construction management

Purpose and types of estimates, units of items of work, methods of building estimates, quantity take-off, specifications and cost estimate, rate analysis; WBS and Bar charts; networks and relationships; Critical Path Methods (CPM); floats; resource levelling; PERT; Crashing, **Tender and contractual requirements**

General Aptitude

Verbal and numerical ability.