

## **Junior Technical Officer (House Keeping)**

### **Syllabus**

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#### **I - SURVEYING**

Principles of surveying - Plane surveying and geodetic surveying-Classification of surveys - Chain Surveying - Plane table survey - compass survey - levelling - concept of level surface, datum, reduced level and Bench mark- leveling instruments - Reduction of levels-Fly levelling/profile levelling/ check levelling/reciprocal leveling- Contour - Theodolite survey- balancing of consecutive co-ordinates by Bowditch and transit rules- Height and distance -problems- Principles of tacheometry - Stadia systems and tangential system - Curves- Rankines method of deflection angles - problems related- description of transition curves. Electronic Theodolites - Total stations - uses-component parts - set up - working principles - maintenance of EDM instruments - temporary adjustments - total station-data processing components - error sources and controlling errors - data transfer - Remote sensing - Photogrammetry and its applications-Drone surveying, Global navigation satellite system (GNSS).

#### **II - ENGG MECHANICS**

Basics of mechanics- Composition of forces – Resultant- Moment of a force- Free body and Free body diagram - Lami's Theorem – Types of beam, supports and loads acting on beam -reaction for cantilever, simply supported beam without overhang -Truss - methods of joints:- method of sections. Friction - Centroid- centre of gravity and moment of inertia - Identify the centroid of geometrical plane figures such as square, rectangle, triangle, circle, semi-circle, quarter circle, and trapezoidal section - Centroid of composite figures - Moment of inertia - Parallel and Perpendicular axes theorems-Simple stresses and strains - Definition of rigid, elastic and plastic bodies, deformation of elastic body under various forces, stress, strain, elasticity, Hook's law, Elastic limit, Modulus of elasticity - Type of Stresses - Mechanical properties of materials - Relation between modulus of elasticity, modulus of rigidity and bulk modulus.

#### **III - CONCRETE TECHNOLOGY**

Properties of Ingredients of Concrete- cement- properties-BIS codes - Testing - types - Aggregates- Water: Quality of water, impurities in water and permissible limits for Solids - Properties of Fresh and Hardened Concrete - grades of concrete -nominal and design mix, provisions of IS 456 - significance of w/c ratio - Properties of fresh concrete -

Properties of Hardened concrete Joints in concrete construction - Types of joints - Concrete Mix Design and Testing of Concrete - Nondestructive testing of concrete - waterproofing - Chemical Admixture-air entraining admixtures and super plasticizers- Special Concrete - Hot weather concreting - Underwater concreting-

#### **IV - BUILDING CONSTRUCTION**

Building materials - types/ tests/uses Structural Steel sections for buildings- National Building Code/KMBR/KPBR-Types of Constructions - Load Bearing wall- Structural Steel buildings-Building Components - Parts of building - Construction of Substructure - Job Layout - Site Clearance-Earthwork- Foundation- Functions/ Types- stone masonry-Brick masonry -Scaffolding and Shoring-Doors- Windows-Ventilators -Vertical Communication methods-stair, lifts and escalators-Roofs -Roofing Materials -Construction Management- Principles - objectives-Role of consultant for various activities-Methods of Scheduling- Development of bar charts- CPM networks-Floats-Introduction to BIM- tender and tender procedure-Types of Construction contracts --modern equipment used in construction projects-Construction safety-Occupational hazard - Role of supervisor/ Engineer in ensuring safety at construction site - Labour Laws and Acts pertaining to Civil construction activities. Estimation and Costing - Types of estimates - Measurement Book- measurements for different items of work as per IS:1200. Rules for deduction in different category of work as per IS:1200. Description / specification of items of building work as per PWD /DS- Earth work computation -Rate Analysis- CPWD data book and schedule of rates-Centre line method and long wall and short wall method -Detailed estimate and abstract of estimate of various items of works-Valuation-Cracks in buildings - Defects/causes/preventive measures in foundation/masonry/ roof /concrete /plastering /painting/building services such as water supply system/sewage and sullage/ electrical system - Lifts- Air conditioning system-Electrical installations- domestic gas pipeline- Retrofitting and restoration of building .

#### **V - THEORY OF STRUCTURES**

Shear Force and Bending Moment -Bending and Shear Stresses in beams-Concept and theory of pure bending-moment of resistance -Shear stress equation-Columns-Euler's theory-Rankine's formula and its application-Direct and Bending Stresses in vertical members- axial and eccentric loads-Analysis of dams subjected to horizontal water pressure-Retaining wall- Slope and Deflection-Moment area method – Mohr's theorems – Fixed Beam-Torsion of circular shaf-Continuous beams and moment distribution method - Clapeyron's the Thorem of three moment - Moment distribution method - Application - Introduction to portal frames.

## **VI - GEOTECHNICAL ENGG**

Introduction to Soil Mechanics-Physical and Index Properties of Soil-Gradation of soil- Permeability of Soil-Shear Strength of Soil- Compaction of Soil-Consolidation of soil-Site investigation and soil exploration-types of boring-Bearing Capacity of Soil-Different types of foundation-General methods of ground improvement-Drainage and dewatering- Methods of soil stabilizations- grouting-soil reinforcement-Reinforced earth wall construction -Geosynthetics-Vertical drains.

## **VII - DESIGN OF STEEL AND RCC STRUCTURES**

Tension members- Design of axially loaded tension members with welded connection. Types of section used as compression member. Calculation of effective length, Radius of gyration and slenderness ratio, Permissible values of slenderness ratio as per IS 800, Design constant for Compressive stress. Design of single and double angle struts with welded connections Introduction to build up sections, lacing and battening-Design of Steel beams-Plate girders and Steel trusses -Concept of Limit state, Stress block Diagram, singly and doubly reinforced sections, Design requirements as per IS456/2000, one way slab and two-way slab-Definition and classification of column- precast concrete members - BIS specifications- Structural Precast elements - tunnel linings, Canal lining, Box culvert, bridge panels, foundation, sheet piles -Testing of Precast components as per BIS standards-Precast components-Prefabrication technology-Principles of pre-stressed concrete -Systems for pre tensioning -Prestressing force in Cable-Basic assumptions in analysis of pre-stressed concrete beams.

## **VIII- TRANSPORTATION ENGG**

IRC classification of road - Major SH and NH in Kerala. - road alignment -- Traffic volume study - Traffic intensity studies - Intersections - Road markings - Traffic signs - Highway Geometrics -various components- Camber - Gradient - Design speed - Sight distance (SSD), road arboriculture- Road drainage-Curves -Super elevation-road materials and their Tests - Construction of pavement -Classification of Indian Railways- Permanent way- components - Rail Gauge - Sleepers- Railway Track -geometrics -Track Cross - sections -Points and crossings - Turn out - types, components, functions - Track junctions-Track signals -principles of interlocking - Station yards -Overview of Mono Rail and Metro rail- Terminologies in bridge engineering - IRC classification - Bridge - components -Tunneling- airport components - components/classifications of dock and harbour - IRC58 guidelines for design of concrete pavement-maintenance – Joints - pavement failures - damages, Remedial measures.

## **IX - HYDRAULICS AND IRRIGATION**

Hydrostatics and hydrodynamics - ideal and real fluid- properties of fluid -types of pressure - Pressure head -Pascal's law-Pressure measuring devices -Total pressure and center of pressure on various surfaces immersed in liquids-Types of flow - Reynolds number-continuity equation of flow- Energy of flowing liquid- Bernoulli's theorem- Discharge measuring devices - Orifices -Notches -weirs -Flow through pipes - head loss in pipe- losses in pipe Hydraulic gradient line and total -energy line - (Definition only). Water hammer in pipes-Flow through Open Channel - determination of discharge by Chezy's equation and Manning's equation-Velocity measurement Devices - Hydroelectric Installation Layout - Turbines - Hydraulic Pumps -Irrigation and Cropping- irrigation projects-Canals - Irrigation structures - Storage Head works-dams-Spillways-Diversion head works - Weirs - Barrages - Canal regulators -Cross Drainage works.

## **X - ENVIRONMENTAL ENGG**

Ecosystems-biogeochemical cycle. Global Warming-Green House Effect-Ozone layer Depletion-acid rain- air pollution-Water pollution-Noise pollution-Solar Energy-Biomass energy-Wind energy-New Energy Sources-Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) - power plants -Solid wastes-Air quality act 2004, air pollution control act 1981 and water pollution and control act1996-Structure and role of Central and state pollution control board-Carbon credit- Carbon Footprint.- ISO14000: Implementation in industries, Benefits-Sources of Water:-Yield from wells - Demand of water- forecasting of population-Quality of water- Conveyance of water- Rainwater Harvesting – Treatment of water-Distribution system-Appurtenances in Distribution system - sewage - Systems of sewage disposal - Quantity of Sewage- sewers- Sewage characteristics-Sewage Treatment And Disposal-Preliminary treatment- Primary treatment - Secondary treatment-Miscellaneous treatment- septic tank - Imhoff tank-Sewage disposal - Sewage recycling - Drainage and Sanitation in Buildings - Sanitary fittings.

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