

**FURTHER DETAILS REGARDING MAIN TOPICS OF
PROGRAMME NO. 10/2015 (Item No. 23)**

**DRAFTSMAN GRADE I/TOWN PLANNING
SURVEYOR GRADE I**

**TOWN & COUNTRY PLANNING
(CATEGORY Nos. 62/2014)**

PART I

Module 1: Chain Surveying-purpose and principle of chain survey-equipments used .Different types of chain and tape-selection of stations – base line – check line – tie line. Different operations in chain Surveying. Ranging – different methods. Chaining and taking offsets- -setting out right angles. chaining on sloping grounds. Errors in ordinary chaining .Obstacles in chaining – methods to overcome obstacles, scaling, Plotting, conventional signs. **Plane table survey** - Purpose and principles of plane table survey-accessories of plane table – description and use-setting up the plane table -radiation, intersection, traversing, and resection-relative advantage and disadvantages **Compass survey**-purpose and principles of compass survey-description and working of prismatic compass - concept of meridian – bearing of a line – True bearing and magnetic bearing. Magnetic dip and declination. Field work in compass survey – booking of field notes. Reduced and whole circle bearings. Calculations of included angles in compass traverse. Sources of errors in compass surveying - local attraction – detection and Correction. Plotting of compass traverse – closing error and adjustments. **Levelling** - Purpose of levelling - concept of level surface, datum, reduced level and Bench mark. Types of leveling instruments - dumpy, Y, modern tilting and automatic levels. Component parts of leveling instrument – concept of line of collimation, axis of bubble tube, axis of telescope, vertical axis and Sensitiveness of bubble tube. Types of levelling staff. Field work - Temporary adjustments, form of level book. Reduction of levels by rise and fall method and height of collimation method – comparison - problems. Errors in levelling – curvature and refraction corrections, distance to visible horizon – problems. Classification of leveling - fly levelling, profile levelling, cross sectioning, checks levelling, reciprocal levelling and contouring. Contouring - Characteristics – methods of contouring, plotting by interpolation - tracing contour gradient – uses. Marking alignments of road, railway and canal in a contour map. Capacity of reservoirs using contour

maps. Longitudinal sectioning and cross sectioning – plotting – working profile for roads. Permanent adjustments of dumpy level.

Module 2: Forces and Moments Definition of force – Conditions of Equilibrium of forces – Resolution of forces – Principles of resolution – Resultant of a number of coplanar forces acting at a point. Moment of force – types of moments – principle of moments (proof not required) – Determination of Reactions of simply supported beams and overhanging beams with point loads and uniformly Distributed loads Centre of Gravity Definition of center of gravity (C.G) – C.G. of plane in the same straight line and those distributed Over a plane – Centroid of plane figures – C.G. of solids. Determination of centroid of compound areas and remainders – C.G. of combination of simple solids Moment of inertia Definition of rectangular moment of inertia and polar moment of inertia – radius of gyration parallel axis theorem and perpendicular axis theorem M.I of simple sections, rectangle, triangle, circle(without proof) M.I. of composite areas and remainders Friction: Static, dynamic and limiting friction – Laws of friction – Angle of friction – coefficient of friction- angle of repose.. Equilibrium of a body on inclined rough surface [simple problems]. **Simple stresses and strains** Stress and strain – types of stresses – Elasticity – Hook’s law – Young’s modulus – stresses and strains in uniform sections of same and composite materials Mechanical properties of materials – Elasticity, stiffness, plasticity, toughness, brittleness, ductility, Malleability and hardness – Tensile test on ductile material (mild steel bar) and stress strain curve – Compression test on brittle material (cement concrete) and stress strain curve – limit of Proportionality, elastic limit, yield point – ultimate stress – breaking stress – working stress and factor of safety. Temperature stresses – elongation and contraction due to temperature change – temperature stress when deformation is fully or partially prevented – temperature stress in composite sections. Linear strain and lateral strain – Poisson’s ratio- volumetric strain — Bulk modulus – modulus of rigidity – relationship between Elastic constants (No proof) – simple problems. Strain energy Resilience- proof resilience – modulus of resilience – stress and strain when load is applied gradually, Suddenly and with impact. Torsion of circular shafts Theory of pure torsion – derivation of formula – problems. Power transmitted by circular shafts – problems. Beams and bending Classification of beams – cantilever, simply supported, fixed, overhanging and continuous. Types of loading – concentrated, uniformly distributed and uniformly varying load. Shear force and bending moment – definition and sign conventions. Calculation of SF and BM for Cantilever, simply supported and overhanging beams and sketching of SF and BM diagrams (for point load, uniformly distributed load, uniformly varying load and combinations of u.d. and point loads) Relation between SF and BM. Maximum BM – point of contra flexure. **Theory of simple Bending** Theory of simple bending, Explain the terms ‘Neutral axis’, ‘moment of resistance’ and ‘section modulus’. Apply the theory of simple bending to simple and compound sections to calculate stress, section modulus and moment of resistance. Calculate shear stress distribution in rectangular and I Sections. **Direct and Bending Stresses** Eccentric loading of symmetrical columns (about one axis only) – maximum and minimum stress Limit of eccentricity. Dams and Retaining walls. Trapezoidal dam with vertical water face – forces acting, intensity of pressure at base, conditions of Stability, minimum base width.

Retaining wall (trapezoidal with earth face vertical without surcharge) – Rankine’s formulae for earth pressure (proof not required) – conditions of stability – minimum base width. Fixed Beams Fixed beams – advantages, method of finding fixing moments (derivations) BM and SF diagrams for fixed beams under point load and u.d. load (for Symmetrical loading only) **Deflection of Beams** Strength and stiffness of beam – curvature, slope and deflection – derivation of the differential Equation. Double integration method (Macaulay’s method) of slope and deflection of – cantilever with point load, cantilever with u.d. load, simply supported beam with point load, S.S. Beam with u.d. load – Problems in cantilever and simply supported beams with combinations of point and u.d. load Calculation of fixed beam with central point load; fixed beam with UD load over whole span using double integration method. Moment area method for slope and deflection of beams – Mohr’s theorems – application of the Method to problems in cantilever beams with point load, UD. load ; and combinations of point and UD. Load. Application of the Method to problems in simply supported beam with point load, UD. Load; and combinations of point and UD. Load.[symmetrical load. **Continuous Beams** Continuous beams – statement of the theorem of three moments – BM and SF diagrams for simple, Concentrated and u.d. loads Moment distribution method Hardy cross methods of moment distribution – stiffness factor – carry over moment – distribution factor – application to continuous beams and simple portal frames– sketching the SFD and BMD

Module 3: Properties of materials of RCC as per the latest IS codes- materials for concrete- Grading of aggregate, proportioning and mixing of concrete, bulking of sand, water cement ratio and placing and Compaction of concrete and removal of forms-Grades of concrete and their strength- types of steel used in RCC- the Permissible stresses in concrete and steel.- The concept of Limit State Design, Partial Safety factors in Limit State method of Design, values of Partial safety factors with reference to latest I S Codes, Principles of Limit State Design, Characteristic load & characteristic strength, stress-strain curve of Concrete and steel, assumptions made in the Limit State method of Design, Neutral Axis Depth, Limiting value of NA, Design a simply supported beam and Cantilever beams for different loading conditions for flexure, Design doubly Reinforced Rectangular beams under different loading conditions. Design of lintels under different loading conditions. Design of flanged beams under different loading conditions (Use S P16). Check for stiffness as per IS code, Basic l/d ratio, Modification factor, reduction factor for flanged beams, Check the deflection of singly reinforced, doubly reinforced and flanged beams, the shear and torsional behavior in RCC members, Nominal shear stress, maximum shear stress in concrete, permissible shear stress in concrete, Design beams under different loading Conditions for shear, bond and anchorage, calculation of development length, Check for curtailment of bars in beams, Code provisions for lap length.**Study the behavior of slabs**, Design of one way slabs simply supported, Continuous, cantilever and sunshade, Design of Two way slab, simply supported, restrained and different end condition (Design of two way slab by using S P 16 only), Design of staircases under different loading and end conditions. Theory on design of columns, behavior of short and long columns, Slenderness limit for columns as per IS code, Design the short column for direct load,. Design the column for uniaxial bending using

SP16, Study of slender columns, Theory of Column footing, Design of isolated column footing (SP 16). Introduction on combined footing. **Design of Steel Structures**-Introduction to steel Design- Use of IS: 800, steel tables –Strength of bolted and Welded connections-Design of members using bolted and welded connection. Design of Tension members-General- Net sectional Area of Tension members- Effective sectional area of angles / T-sections connected by one leg / flange (welded Connections only)- Design of ties using Single/Double angles, T-Sections and channels Design of Compression members-General-effective length – slenderness ratio reference to IS Code – Design compressive stress and strength – Discontinuous single/double angle struts – continuous angle struts Design of columns using rolled steel sections with/without cover plates – Lacing and battens – requirements – Description only – (Design of Lacing or battens not necessary) **Design of Steel beams**- Plastic moment carrying capacity of section –Classification of cross- section Bending strength, Shearing strength and deflection limit of laterally supported beam. (Symmetrical Cross sections only) Fundamentals of Plate Girder-parts and function Design of Roof truss-Elements of roof truss-Loads acting with reference to IS Code-Design of elements of Roof truss. Design of angle purlins

Module 4: Definition of quantity surveying – essential requirements – Quantity surveyor – duties and qualities – definition and elements of estimate – types – rough cost, plinth area, cubical content and service unit method – detailed estimate. Units of measurements for different items as per standard – accuracy of measurements – explain the terms – sundries, Lump sum, Lead and lift, contingencies, unforeseen items, work charged establishment. Earth work computation – Trapezoidal – Mid ordinate and Prismoidal formula for computing volumes – Taking out quantities from Longitudinal section and Cross section in cutting and filling. **Different methods of taking out measurements** – Center line – in to in and out to out - Crossing – methods. Taking out quantities of all items of the following- Below roof level excluding finishing items 1. A compound wall 2. Computation of the capacity of reservoir from a contour map. 3. One roomed building (RCC roof-Flat & Sloped 4. Two roomed building (RCC roof-Flat & Sloped) 5. A residential building with RCC roof-Flat & Sloped 6. An office building with RCC roof-Flat & Sloped 7. Doors, windows, ventilators etc. **Taking out quantities of all items of the following**- above roof level and finishing items including water supply and sanitary fittings. 1. One roomed building (RCC roof-Flat & Sloped) 2. Two roomed building (RCC roof-Flat & Sloped) 3. A residential building with RCC roof-Flat & Sloped 4. An office building with RCC roof-Flat & Sloped 5. Masonry Well. 6. Ground level RCC water tank. 7. Road estimate- Method of taking quantities of a W.B.M. road. **Definition** – cost of materials – at source and at site – conveyance charges – standard data book – schedule of rates – Lump sum items – Rules of measurements – rules regarding tolerance of wastage of materials and extra labour. Preparation of data – categories of labour and labour charge – cost of materials – over head charge including establishment – incidental, lead and lift – exercises. Methods of preparing abstract estimate-exercises. **Detailed and abstract estimate** preparation for building with gabled roof, building with hipped roof, building with valley, two storied building (residential and office) Septic Tank and soak pit and steel roof truss. MODULE II Detailed and abstract estimate of Slab Culvert,

Pipe culvert, Single span T-beam bridge, Pier of a bridge, , Detailed Estimate of an RCC well and RCC retaining wall. **Detailed Estimate** of RCC beam, slab, Column, etc and preparation of bar bending schedule. Detailed Estimate of Aqueduct. Detailed specifications for various items of work of Earth work excavation, Foundation concrete, Masonry work, D P C, Form work, R C C, Plastering, Pointing, Flooring, Painting and Polishing, I RC Specifications for WBM road. Preparation of Plan, Estimate and other documents for submission. **Definition** of Valuation, meaning, purpose-.Factors governing valuation-Life of structure-type , location- Maintenance -legal control. Scrap value-salvage value-market value-book value-sinking fund annuity and depreciation. Methods of valuation-Rental method-direct comparison with cost-Based on profit-Development method of valuation- depreciation method. Calculation of depreciation by different methods. Land valuation-Problems.

Module 5

Structural building materials:

Stone:—classification—geological, Physical and chemical classification—characteristics of good Building stone—varieties of stones—granite—trap—basalt—sand stone—Laterite. Quarrying of stones—methods—wedging and blasting—explosives used. Dressing of stones.

Clay Products: Bricks: Raw materials used—Composition of brick earth, manufacturing methods (Description only)—IS specifications of bricks—characteristics of good brick used for building purpose.

Tiles: Types of tiles-characteristics-uses-Porcelain and glazed tiles .

Lime: Sources of lime-Classification-methods of manufacturing (Description only)

Cements: Composition, Compounds present, Manufacturing methods-characteristics of cement, Types of cement-Properties of each-characteristics of cement-Tests on cement-Consistency test, fineness test, Sp.gravity test, Setting time test, Soundness test. Puzzolona-definition- Common puzzolonas used as admixtures in cement.

Aggregates:

Sand: Sources of sand-River sand, Sea sand and pit sand-Limitations of mining of sand from river sand sea shore-M- sand, alternatives of sand.

Coarse aggregates: Materials generally used, requirements of good coarse aggregates, commonly used sizes for different applications.

Cement Concrete: Plain concrete-Water cement ratio-Ingredients and proportioning methods-characteristics-preparation-workability-Tests on Cement concrete-Laboratory tests and field tests-Slump test, compaction factor test-Qualities of water used for mixing. Reinforced cement concrete-Qualities of materials-Types of reinforcement used-characteristics of reinforcing material-waterproofing compounds.

Mortar: Preparation of lime and cement mortar-Proportions of mortar for various items of work-tests on cement mortar.

Timber and wood products: Structural classification-Soft wood and hard wood-defects in timber-seasoning of timber-preservation of timber

Metals: Ferrous metals-Wrought iron, Cast iron, Mild steel-Special steels-High carbon steel, High tensile steel and stainless steel (Properties and uses only)-

Non-ferrous metals: Aluminium, Copper, Lead, Zinc and Titanium-important alloys-properties and uses.

Ornamental materials for finishing: Paints and Varnishes: Types-Constituents-Preparation-characteristics and application. Plastics: types-characteristics and properties of P V C-uses-Limitations of using plastics.

Rubber: Characteristics and properties, uses. Aluminium: Aluminium sections used for building construction-Hand rail and baluster, Doors and windows, Panelling and false ceiling, building façade.

Glass: Types- Uses and properties. Glass used for Structural applications. Miscellaneous: Abrasives-Adhesives-asbestos- asphalt-bitumen-cork-Plaster of Paris insulating materials-fibre glass-thermo Cole wood products-veneers, ply wood, particle board-fibreboard, hard board, etc.

Construction Technology:

Masonry: Classification-Stone masonry-Brick masonry-Laterite masonry-composite masonry. Different types of stone masonry-General principles and specifications for stone masonry as per relevant codes.

Brick masonry: Different types of bonds for walls, piers and junctions of walls for equal and unequal thickness-English, Flemish (Single and Double Flemish)-Specification for brick masonry as per relevant codes.

Hollow block masonry: Types of hollow blocks used in construction and methods of construction-Advantages and Disadvantages with reference to other types of masonry. Solid block masonry and inter locking block masonry.

Partition walls- Types, materials, requirements.

Modern methods of constructions-Framed, Prefabricated, Earthquake resistant.

Damp proof courses: Definition of dampness-causes and effects-methods of prevention-surface treatment-internal water proofing courses.

Pre-stressed concrete: Principle of pre stressing-Types-Internal & External and different methods-pre-tensioning & post tensioning.

Form work: Functions-materials used-Requirements of good form work-modern trends in material & technology-slip forms.

Scaffolding, Shoring and under pinning: Definition-purpose and function-Requirements-materials used.

Plastering and Pointing: Materials and proportion-Functions-general specifications-types

Building Components:

Different components of building from foundation to roof and their functions

Foundations: Functions, Classification, Shallow-Deep, Types-Spread footing-raft-mat-Column footing-pile foundation-well foundation.

Flooring: Requirements of a good floor- materials used for flooring, Floor finishes-Types-Mosaic, Marble, Granite, Ceramic tiles, Vitrified tiles, Glass, Wooden, and other types of modern floor finishes

Lintels and sunshades: Types of lintels-Wooden, Stone, brick, RCC and RSJ lintels-Sunshades-Canopy and sun breakers. Arches- Types, terms used.

Vertical Transportation: Staircases, Lifts and Escalators-Planning and location-Component parts of staircase and lift-Types of staircase

Ceiling: Types, Requirements of good ceiling ,Materials used for Ceiling-False ceiling.

Roof: Definition-importance of roofing with respect to climatic conditions-classification-pitched and flat-Couple, couple closed and collar roof. RCC roof-slab with beams-flat and sloped slabs-Flat slab construction-weather-proof course to flat roof.

Module 6

Foundations-Masonry footing, column footing, raft foundation and pile foundation. Brick masonry, English bond, Flemish bond, rat trap bond – Alternate courses, corners, T joints for one brick wall.

Doors and Windows: Different types, Wooden Panelled/ Glazed Doors and Windows. Positioning of Doors and windows with respect to lighting and ventilation- Size-Special types of doors-Flush, Revolving, and collapsible, Rolling and sliding-Windows-Different types-Ventilator Different types-Fittings for doors and windows.

Stairs and staircases: Location–Types–Standards for stair case as per KBR–Tread, Rise, Going, Riser, Nosing–Width of stair—Head room–Flight–Landing–Hand rails. Different stair layouts-circular, spiral, half turn, quarter turn, bifurcated, elliptical, etc., detailed drawing of dog legged RCC staircase.

Lift and escalators: Component parts and requirements as per NBC. Passenger Lift- Detailed drawing showing-Lift well, car, machine room, Lift pit.

Roof trusses: Different types of trusses for pitched roof–wood and steel trusses - tubular and angular sections.

Roof covering for pitched roof–AC sheets, GI corrugated sheets, Aluminium sheets-PVC sheets–method of arranging and fixing to the battens rafters and purlins

Kitchen Details: Planning of a kitchen, counter height, top cabinet height, depth of counter slab, heights for different equipment, details of cabinets, drawers etc., lighting their mounting heights etc.

Toilets: Planning of a toilet, arrangement of various fittings such as water closet, shower, bath tub, geyser, wash basin etc., their mounting heights etc.

Module 7

Principles, necessity and objectives of Town planning- its Representation, origin and growth of town-natural and planned-horizontal and vertical-stages in town development – define city, district unit, Municipality, neighbourhood unit – distribution of land uses-zoning – objects and Principles-advantage- classification – use zones, height zones and density zones – density – net and gross – local density – calculation.

Urban roads- objects-Planning principles-classification of urban roads-through and bye-pass roads-outer and inner roads-expressways-freeways-types of street systems-precinct-traffic management- objects-traffic congestion- traffic control- road junctions, planning principles-classification of junctions –parking- traffic capacity of roads - problems-causes of accidents traffic signals-signs-markings-lighting

Importance of Housing-requirements of residential buildings- classification- design aspects-Housing agencies, Housing finance-HUDCO- Policies and programmes in India – slum –causes-characteristics-effects- slum clearance-prevention Parks and play grounds- classification –park systems- park design- parkways-boulevards- play grounds

Importance of framing building bye-laws-objects – function of local authority-study of KBR, compare bye – laws published in National building Code Applying building bye-laws in the design and layout of buildings referring KBR and NBC and local bodies- Master plan -objects –

necessity-features-drawings to be prepared principles and techniques of planning roads, streets and other service lane- Chandigarh and Gandhinagar city.

Module 8

Renewable and Non-renewable Resources- Natural resources and associated problems: (a) Forest resources: Use and over- exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people (b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. (c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. (d) Food resources: World Food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity (e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. (f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Ecosystems- Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers. Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristics features, structure and function of the following ecosystem: (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (Ponds, streams, lakes, rivers, oceans, estuaries).

Environmental Pollution- Definition: Causes, effects and control measures of (a) Air pollution (b) Water pollution (c)oil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.

Environmental Hazards & Disasters- a) Meaning of Environmental hazards, Environmental Disasters and Environmental stress. b. Concept of Environmental Hazards, Environmental stress & Environmental stress & Environmental Disasters. Types of Environmental hazards & Disasters: a) Natural hazards and Disasters b) Man induced hazards & Disasters. Causes and Environmental Consequences of the flowing natural HAZARDS – Droughts and Floods. Volcanic Eruption, Earthquakes, Landslides, Cyclones, Lightning, Tsunami. Chemical hazards/disasters : Causes and consequences of Release of toxic chemicals, nuclear explosion. Emerging approaches in Disaster Management – Three Stages 1. Pre-disaster stage (preparedness): a) Preparing hazard zonation maps, Predictability/ forecasting & warning. B) Preparing disaster preparedness plan c) Land use zoning d) Preparedness through (IEC) Information, education & Communication. Pre-disaster stage (mitigation): a) Disaster resistant house construction b) Population reduction in vulnerable areas c) Awareness 2. Emergency Stage a) Rescue training for search & operation at national & regional level b) immediate relief c) Assessment surveys. 3. Post Disaster stage-Rehabilitation: a) Political administrative Aspect c) Economic Aspect d) Environmental Aspect.

PART II: General Knowledge, Current Affairs and Renaissance in Kerala

General Knowledge

Facts about India

Geography of India – Physical features – Climate – Soils – Rivers – Famous sites – etc.

Demography – Economic and social development – Poverty alleviation – Economy and planning – etc.

History of India – Period from 1857 to 1947 – National movement

Five Year Plans

Facts about Kerala

Geographical Facts – Physical features – Climate – Soils – Rivers – Famous sites – Economic and Social deve – Historical importance - etc.

Renaissance in Kerala

Important Events/Movements/Leaders

Brahmananda Swami Sivayogi, Chattampi Swami, Sree Narayana Guru, Vagbhatananda, Thycaud Ayya, Ayya Vaikundar, Poikayil Yohannan (Kumara Guru), Ayyankali, Pandit Karuppan, Mannathu Padmanabhan, V. T. Bhattathirippad, Dr. Palpu, Kumaranasan, Vakkom Moulavi, Blessed Kuriakose Elias Chavara, Etc.

Current Affairs

Important world, national and regional events related to the political and scientific fields, sports, cinema and literature etc.

NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper.