DETAILED SYLLABUS FOR THE POST OF DRAFTSMAN GRADE I / TOWN PLANNING SURVEYOR GR I (TOWN AND COUNTRY PLANNING)

(CAT.NO.: 554/2021, 666/2021)

(Total Marks : 100)

MODULE I – SURVEYING (10 MARKS)

Purpose of surveying - types of survey - **Chain survey** - calculate areas - functions of chain, tape and cross-staff - operations involved in chain survey to make site plan - survey plan from given field notes. **Plane table survey** - principles of plane table survey - functions of accessories of plane table - operations to set up and orient the plane table - advantages and disadvantages. **Compass survey** -principle of Compass survey - determine inaccessible distance - the parts and their functions of a prismatic compass- operations involved in the field to take various bearings - inaccessible distance by using prismatic compass. **Levelling** -Principle of levelling - parts and functions of dumpy level and telescopic levelling staff - steps involved in performing the temporary adjustments of levelling Instrument - record observations in field book - compute the reduced levels of stations from field book – Classifications of levelling - steps involved in classification of levelling - principle of contouring - contour plans from given field notes. **Theodolite traversing** - Principles of theodolite traversing - their parts and function - temporary adjustments and terms - fundamental lines and their relationship - horizontal angle measurement by repetition and reiteration method - steps involved in setting out angles using a theodolite - method of conducting traverse survey in the field using the theodolite - compute the co- ordinates - principle of trigonometry for determining the elevation of stations -vertical angle measurements -principle of trigonometric levelling - compute the elevations using trigonometric levelling. **Modern surveying equipments** - electronic theodolite – distomat - laser level – GPS - remote sensing in architecture -application of GIS in architecture **Total Station** - principles of Total Station - features and technical terms -method of operation - contour map of an area - Determine height of building - horizontal distance between points - data down loading - prepare drawing by using total station.

MODULE II - BUILDING DRAWING AND ARCHITECTURAL DRAWING (10 MARKS)

Building drawing - Conventional signs for construction materials- Building rules and Bye laws. Provision of safety for buildings, plinth area-floor area- carpet area-floor area ratio-coverage of building-height of building, building line-set back line-head room-mezzanine floor-basement floor- detached building-- row houses Planning requirements of building as per NBC

& KMBR: Plumbing layout showing water supply and sanitary fixtures of a residential building-electrical layout showing electrical fixtures and control points.

Architectural Drawing- Drawing instruments-Introduction to drawing instruments and media Introduction to drawing instruments – drawing media – paper sizes – Drawing paper – butter paper – tracing paper – fixing of paper – types of lines – dimensioning – free hand lettering -

Orthographic projection - Orthographic projection – top view – front view – rear view – left side and right side views
– symbols – enlarging scale – reducing scale – developing centre line plan – prepare plans ,elevationsand sections – dimensioning plans and sections – indicating specifications of materials – notations .**Three Dimensional views** - Three dimensional views – free hand sketching with pencil – still life – interior view- exterior view. **Rendering** - Rendering with pencil – pen and ink – application of lines, curves and geometric forms – colour – tint – shade – value - colour wheel - primary –secondary –tertiary– colour schemes **Perspective views**. Types of perspective views; terminology used in perspective drawings- ground plane - horizon plane - picture plane - cone of vision - station point - vanishing points - two point perspective views of small objects - single block - combination block - single storied buildings- flat roof - gable roof and hip roof.

Introduction to CAD - Importance of CAD in engineering drawing- Applications, Basic commands, Tool bars, function keys, and shortcut keys. 2D drafting and 3D modelling, knowledge of layout and printing drawing.

MODULE III - <u>THEORY OF STRUCTURES</u> (10 MARKS)

Forces and Moments Definition of force –types of forces, Moment of force – types of moments – principle of moments – Determination of Reactions of simply supported beams and overhanging beams with point loads, uniformly Distributed loads, uniformly Varying loads. **Centre of Gravity** Centroid of plane figures –Determination of centroid of rectangle, triangle, circle, semi-circle and compound areas and reminders – Definition of centre of gravity (C.G). C.G. of combination of simple solids. C.G. of plane in the same straight line and those distributed over a plane, C.G. of solids. **Moment of inertia** -Definition of rectangular moment of inertia and polar moment of inertia – radius of gyration. Determination of radius of gyration of plane sections, parallel axis theorem and perpendicular axis theorem. M.I of simple sections, rectangle, triangle, circle. M.I. of composite areas and remainders. Polar moment of inertia of solid and hollow circular shaft. **Mechanical properties of materials** Elasticity, stiffness,

plasticity, toughness, brittleness, ductility, Malleability and hardness. Simple stresses and strains – types of stresses

– Elasticity – Hook's law – Young's modulus – stresses and strains in uniform sections of same and composite materials like steel, aluminium and copper. Tensile test on ductile material (mild steel bar) 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 –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– simple problems. **Strain energy** - Resilience- proof resilience – modulus of resilience – stress and strain when load is applied gradually, Suddenly and with impact. **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.l and point loads) Relation between SF and BM. Maximum BM – point of contra flexure. **Torsion of circular shafts** -Theory of pure torsion –assumptions in pure torsion- derivation of formula –. Power transmitted by circular shafts – problems thin cylinders Failure of thin cylindrical shell due to internal pressure – circumferential and longitudinal stresses – Changes in dimension and volume of thin cylinders due to internal pressure. **Theory of simple Bending** Theory of simple bending, Explain the terms 'Neutral axis', 'moment of resistance' and 'section modulus'. Assumptions in simple bending, Equation of simple bending. Apply the theory of simple bending to simple and compound sections. Calculate stress, section modulus and moment of resistance. Calculate the shear stress and draw the shear stress distribution diagram for rectangular and I Sections.

MODULE IV- <u>CONSTRUCTION MATERIALS AND ENGINEERING</u> (10 MARKS)

Structural building materials- Properties of Engineering materials Stone, Clay Products, Tiles, Lime, Cement, Puzzolana, Fine Aggregates, Coarse Aggregates, Cement Concrete, Timber and wood products, Metals, Ornamental materials for finishing: Paints and Varnishes, Plastics, Aluminium, Rubber, Glass, Miscellaneous.

Construction Technology- Masonry walls, Partition walls, 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.

Modern methods of constructions: - Framed, Prefabricated, Earthquake resistant. Damp proof courses, Pre stressed concrete, Form work, Scaffolding, Shoring and Under pinning, Plastering and Pointing, Building Components, Foundations, Flooring, Doors and Windows, Lintels and sunshades, Vertical Transportation, Ceiling, Roof.

Cost effective construction and Green Building - Introduction to the concept of cost effective construction -Uses of different types of materials and their availability -Stone and Laterite blocks- Burned Bricks- Concrete Blocks- Stabilized Mud Blocks- Lime Puzzolana Cement- Gypsum Board- Light Weight Beams- Fiber Reinforced Cement Components- Fiber Reinforced Polymer Composite- Bamboo- Availability of different materials-Recycling of building materials – Brick- Concrete- Steel- Plastics - Environmental issues related to quarrying of building materials. Environment friendly and cost effective Building Technologies - Different substitute for wall construction Flemish Bond - Rat Trap Bond – Arches
– Panels - Cavity Wall - Ferro Cement and Ferro Concrete constructions – different pre cast members using these materials - Wall and Roof Panels – Beams – columns - Door and Window frames - Water tanks - Septic Tanks - Alternate roofing systems - Filler Slab - Composite Beam and Panel Roof -Pre- engineered and ready to use building elements - wood products - steel and plastic - Contributions of agencies - Costford - Nirmithi Kendra – Habitat. Global Warming – Definition - Causes and Effects - Contribution of Buildings towards Global Warming - Carbon Footprint – Global Efforts to reduce carbon Emissions Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical benefits - Health and Social benefits - Major Energy efficient areas for buildings – Embodied Energy in Materials- Green Materials - Comparison of Initial cost of Green V/s Conventional Building - Life cycle cost of Buildings. Green Building rating Systems- BREEAM – LEED - GREEN STAR -GRIHA (Green Rating for Integrated Habitat Assessment) for new buildings – Purpose - Key highlights - Point System with Differential weight age. Green Design – Definition - Principles of sustainable development in Building Design - Characteristics of Sustainable Buildings – Sustainably managed Materials - Integrated Lifecycle design of Materials and Structures.

MODULE V – <u>QUANTITY SURVEYING</u> **(10 MARKS)**

Quantity surveying-quantity surveyor– duties of quantity surveyor-essential requirements of quantity surveyor, Different types of estimates, approximate estimate-types of approximate estimate, Units of measurements for different items as per standard, sundries, Lump sum, Lead

and lift, contingencies unforeseen items-work charged establishment. Capacity of reservoir from contour map. Different methods of taking out quantities, method Compute quantities of a compound wall – steps - doors- windows-ventilator. Cost of materials at source and at site – conveyance charges – standard data book

–schedule of rates – Lump sum items –-extra labour – contractor's profit- conveyance statement for different materials-– schedule of rates labour and materials -Analysis of rates-preparation of standard DATA of CPWD with specification as per CPWD standard- Rules of measurements – rules regarding tolerance of wastage of materials- general rules for taking measurements as per CPWD standard- abstract of estimate preparation of abstract

Detailed Estimate of RCC beam, slab, Column 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, RCC, Plastering, Pointing, Flooring, Painting and Polishing, I RC Specifications for WBM road. Preparation of Plan, Estimate and other documents for submission. Valuation- Definition of Valuation: - 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.

MODULE VI – PRINCIPLES OF DESIGN (10 MARKS)

Elements of Architecture - Primary elements of design- point, line, plane and volume- characteristics and uses Form- Definition, visual and relational properties, regular and irregular forms. Colour- Definition, Qualities- hue, value and intensity; Tint and shade; Classification of colours on the colour wheel- primary, secondary and tertiary colours; Warm and cool colours, light, dark and dull colours; Colour schemes- Related colour scheme- Monochromatic, analogous and neutral colour schemes; Contrasting colour scheme- complementary, double complementary, split complementary; triad. Texture- Definition and explanation of rough and smooth textures.

Principles of Architecture - The basic principles of composition such as Balance, Proportion, Scale, Rhythm, Contrast, Harmony and Character Creative principles of design namely Function, Strength and Aesthetics or Appearance.

Architectural space and Design process - Definition of space, Explanation of interior and exterior spaces; Characteristics of interior space Quantity and Quality; Spatial organizations- Centralized, Linear, Radial, Clustered and Grid organizations. The steps involved in architectural

design process- program analysis, preliminary studies, intermediate studies, presentation drawings. (marks-10)

MODULE VII- HISTORY OF ARCHITECTURE (10 MARKS)

Indus valley civilisation – Settlement pattern - town planning – materials used – construction methods – Vedic culture –settlement pattern of vedic village – Buddhist period – forms of structures – stupa – Sanchi stupa - stambha – asoka pillar at Sarnath- chaithya halls –Chaithya hall at Karli - viharas – planning pattern of viharas at different periods – rock cut caves at Ajantha. Hindu temples – typical layout – different styles– North Indian – central Indian – South Indian Architectural features of - Orissan Temples –Lingaraja temple at Bhuvaneswar–Sun temple at Konark - Khajuraho group temples –Khandariya Mahadev Temple -Chalukyan Architecture – Ladkhan temple at Aihole - South Indian temples –Pallava style – mandapas and rathas – Shore Temple - Chola style – Brihadeswara Temple - Pandya style– Gopuram – Vijayanajar style- General features – Madurai style – Meenakshi temple. Islamic Architecture – General features – Different periods – Imperial style –- Slave dynasty-Khilji dynasty –Tughlaque dynasty – Sayyid and Lodhi dynasty - Mughal style- Akbar – Shah Jahan – Jehangir Kerala Architecture – Factors influencing development of Architecture – Evolution of temple forms – Layout of temple – Evolution of residences – form of residences – Typical residence layout – features Padmanabhapuram palace. Modern Architecture after Independence- Works of Laurie Baker, Charles Correa and B.V Dhoshi. World Architecture- Works of masters in Architecture- Louis Sullivan, Frank Lloyd Wright, Le Corbuiser and Mies Van der Rohe. Works of modern architect-Frank Gehry, Zaha Hadid.

MODULE VIII - TOWN PLANNING (10 MARKS)

Principles- necessity and objectives of Town planning- Representation- origin and growth of town - natural and planned-horizontal and vertical-stages in town development – define city - district unit - Municipality, neighborhood 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.

MODULE IX - BUILDING SERVICES (10 MARKS)

Sources of water / hydrological cycle, Quantity of water – factors effecting demand & consumption – population forecasting –Quality of water - Drinking water standards, physical and chemical characteristics of water- Processes involved – sedimentation, coagulation, filtration & disinfection, sedimentation tanks – slow sand filters, rapid sand filters. Distribution systems-Plumbing layout in residential, high rise building Wastewater characteristics – Types of oxygen demand. Preliminary treatment of wastewater – screens, grit chamber, detritus tank, sedimentation tank Biological & Anaerobic treatment of waste water, Wastewater disposal. Solid waste management, Refuse collection, disposal, Incinerator, composting, vermi-composting, Sanitary Land filling, Bio gas plants. Refrigeration systems, Refrigeration Cycle, Various components of refrigeration systems and Cycle, Window AC, Split AC, Centralized systems. Understanding Principles of Air-conditioning, Air Conditioning Equipment. Cooling towers, cooling coil, refrigerants, boilers, ducts, concepts of zoning, room air distribution-types of outlets, Direct expansion and chilled water systems. Types of compressors air-cooled & water-cooled condensers, introduction to cooling tower air handling unit.

MODULE X - CONSTRUCTION MANAGEMENT (10 MARKS)

Introduction to construction projects: – Types of construction projects – Elements of construction project – Overview of construction industry – Importance of construction projects – Functions of construction management – Planning and its importance – Details to be collected during planning and preparation of detailed project report - Scheduling – Organizing – Directing – Controlling – Increasing productivity. Different stages in construction project: – Idea formulation – Investigation - Feasibility study/Report – Project implementation - Types of estimate – Rough cost estimate and detailed estimate – Financial management – cash flow - Budget – Seeking budget provision – Bills of appropriation – AS and TS. Organizational structure of PWD/PSU: – Duties and responsibilities of Overseer, AE, AEE, EE, SE and CE. Types Establishment – Regular or permanent establishment – Work charged establishment –CLR and NMR workers. Project management tools: – Bar chat – Network models – CPM – Project duration – EPO – LPO – ESTEFT – LST – LFT - Total float – Free float – Independent float – PERT – Calculation of expected time - Slack time – Comparison between Bar chart, CPM and PERT. Project crashing – Information about project management software - Resource levelling and resource smoothening - Time cost trade off - Job lay out – Modern housekeeping principles - Work study - Time and motion study. Tender: – Objectives of tendering - Tender notice – Details

to be included in a tender notice – EMD – Tender documents – Types of tender – Procedure for opening tender - Tender tabulation – Firm period – Negotiations – Selection of contractor Contract:

- conditions for validity of contract - Types of contract – Item rate contract – Percentage contract – Cost plus percentage contract – Lump sum contract –Piece work system - Departmental execution of works - Comparison of different types of contract –Execution of agreement – Conditions of agreement - Work order. Quality control: – Need and objectives of quality control – Role of specification, supervision, check lists, inspection and sampling & testing of materials in quality control. Measurement of works: – Rules for taking measurement – M-book – Rules for recording in M-book – contractors' acceptance of measurement – Arithmetic check – Preparation of bill – Types of bills – F&F bill – Part bill – Part & Final bill, Final bill – Recoveries from bill – Mode of payment – Hand receipt - Contractor's ledger – Impress money. Stores: – types of stores – T&P stores – material stores – Material handling - Store management – VED – ABC principles – Shelf life of materials - Issue of materials from stores – Stock register - Intent – Invoice – USR – MAS – Minimizing wastage - Survey report & writing off unserviceable materials – Surplus stores & safe custody – Stock verification.

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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.