

TECHNICAL ADVISOR & ZONAL NODAL OFFICER

Exam Syllabus

KERALA FINANCIAL CORPORATION

(Notification No. KFC/04/2024-25 dated 24.06.2024)

Part I - General Knowledge and Current Affairs

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Part II - General English

Grammar - Agreement of Subject and Verb - Confusing Adjectives and Adverbs - Comparison of Adjectives - Correct usage of Articles - Prepositions - Direct and Indirect Speech - Active and Passive Voice - Correction in Sentences - etc. Vocabulary - Gender - Singular and Plural - Synonyms - Antonyms - One word Substitutes - Problem concerning Words - Idioms and their meanings - etc.

Part III - Civil Engineering

Mechanics of Solids and Structural Analysis

Concept of stress and strain, Bending moment and shear force, Stresses in beams, Deflection of beams, Theory of columns, Truss analysis, Displacement response of statically determinate structural systems using energy methods, Principle of virtual work, Statically indeterminate structures, Strain Energy methods, Moving loads and influence lines, Arches. Slope Deflection Method, Moment Distribution Method, Clapeyron's Theorem (Three Moment Equation), Kani's method of analysis.

Fluid Mechanics and Water Resources Engineering

Fluid Statics - Fluid pressure, Buoyancy and floatation, Fluid Kinematics, Dynamics of fluid flow, Flow through orifice and notches, Flow through pipes, Boundary layer, Drag, and Lift on immersed bodies. Hydraulic machines - flow through vanes (moving and stationary) Impulse and reaction Turbines, Centrifugal Pumps, Open channel flow, Uniform flow, Hydraulic Jump, Gradually varied flow, Dimensional analysis and model testing.

Hydrologic cycle, Precipitation, Infiltration and Evaporation-measurement and data analysis. Runoff-components and computation, Hydrograph, Unit Hydrograph and S-Hydrograph. Irrigation types and methods-Soil water plant relationships, Frequency of Irrigation, Computation of crop water requirement. Stream flow measurement-Stage-discharge curve. Meandering of rivers, river training works. Surface water systems: diversion and storage systems, reservoir - estimation of storage and yield of reservoirs - reservoir sedimentation - useful life of reservoir. Groundwater - Aquifer types and properties - Steady radial flow into a well. Estimation of yield of an open well.

Surveying and Levelling, Quantity Surveying and Valuation

Basics of Surveying, Levelling and Contouring, Area and Volume Computation, Theodolite Survey, Mass Diagram, Triangulation, Theory of Errors, Electronic Distance Measurement, Total Station Survey, Global Positioning Systems, Remote Sensing, Geographical Information System

Analysis of rates - Data book and schedule of rates, Analysis of rates for various items of work, Detailed specification, Types of Estimate, Detailed estimate including quantities, abstract and preparation of various items of works, Preparation of bar bending schedules for various RCC works, Valuation - Methods of valuation, Depreciation, Fixation of rent.

Building materials, Construction Technology, Construction Management

Construction Materials - Timber, Mortar, Iron and Steel, Structural steel, Modern materials. Concrete - Admixtures, Making of concrete, Properties of concrete, Mix proportioning.

Building construction - Foundations, Cost-effective construction, Masonry, Lintels and arches. Floors and flooring. Roofs and roof coverings, Doors, windows and ventilators, Finishing works. Tall Buildings - Steel and Concrete frame, Prefabricated construction, Slip form construction. Vertical transportation - Stairs, Elevators, Escalators and Ramps. Building failures and Retrofitting, failures in RCC and Steel structures.

Construction Planning and Scheduling, Construction disputes and settlement, Ethics in Construction, Construction safety, Principles of materials management, Quality management practices, Construction procedures.

Environmental Engineering

Water sources and demand, Quantity estimation, Population forecasting, Quality of water. Water treatment - Physical methods, Chemical methods. Design of sedimentation tank, flocculator, clariflocculator, filters, Membrane treatment techniques. Disinfection methods. Distribution of water, Pumps, Hardy Cross method of analysis

Waste water - Sources, Characteristics, Oxygen demand. Design of sewers, Circular sewers, Partial flow and full flow conditions. Sewer appurtenances, Disposal of wastewater, Streeter Phelps equation, Oxygen sag curve, Treatment methods, Aerobic and anaerobic methods, Design of various treatment units - Screening, Grit chamber, Sedimentation tank, Activated Sludge process, Trickling filter, Rotating biological contactor, Septic tanks, Imhoff tanks, Oxidation ditches, ponds, Upflow anaerobic sludge blanket reactors, Sludge digestion, Sludge drying bed. Air pollution - sources, effects on human, Control of air pollutants, Air quality legislations.

Design of Structures

Limit state method of design, Analysis of reinforced rectangular beams, Shear strength of RC beam, Design of shear reinforcement, Bond and development length, Curtailment of reinforcement, Design for torsion, Design of one way slab, Cantilever slab, Continuous slab (detailing only), Two way slabs, Limit state of serviceability, Deflection, Cracking, Stair cases - design & detailing. Columns - effective length - design of axially loaded short columns with rectangular ties and helical reinforcement.

Columns subjected to compression, Uniaxial bending and biaxial bending, Design of slender columns, Design of wall/strip footing - design of footings, Design of cantilever retaining wall without surcharge, design principles of counter fort retaining wall, Circular slabs simply supported, fixed and partially fixed subjected to udl, Design of water tanks, Design philosophy and requirements, joints, IS code recommendations, Pre-stressed concrete, Concept of prestressing, materials and methods of prestressing, Prestressing

systems, losses of prestress, Analysis of prestressed beams (rectangular and I-sections) at stages of transfer and service

Steel and steel structures - Bolted and welded connections, Tension members, Compression members, Beams, Roof trusses, Purlins. Timber structures- columns, composite beams (concepts only)

Geotechnical Engineering

Major soil deposits of India, Classification and three phase system of soil, Permeability of soils, Principle of effective stress, Shear characteristics of soil, Consolidation (Terzaghi's theory of one-dimensional consolidation only) and Compaction.

Stability of finite slopes-Swedish Circle Method and Friction circle method, Stresses in subsoil due to loaded areas of various shapes, Boussinesq's formula, Newmark's chart Lateral earth pressure-Rankine's and Coulomb' theories

Bearing capacity of soil, Estimation of magnitude of settlement, Site investigation, Standard Penetration Test and Plate load test, Design of shallow, deep and machine foundations, Ground improvement techniques.

Transportation Engineering and Urban Planning

Classification and alignment of highways, Geometric design of highways, Properties and testing of pavement materials, CBR method of flexible pavement design, Construction and maintenance of pavements, Design of runways, taxiways and aprons. Traffic characteristics- Traffic studies and analysis, Traffic control devices.

Goals and objectives of planning; Components of planning, Regional planning. Theories of urbanization, Study of Urban Forms, Zoning, Development of new towns, Town Development Plan, Town planning acts.

Mechanical Engineering

Zeroth, first and second laws of thermodynamics, CI and SI Engines, properties of steam. Centrifugal and reciprocating pumps, hydraulic turbines, refrigeration and air conditioning, hydro-electric, thermal and nuclear power plants, mechanical power transmission systems such as belt, rope, chain and gear, manufacturing process - casting, forging, rolling, brazing, soldering, and welding, machining process - turning, shaping, drilling, grinding and milling. Conic sections and miscellaneous curves, orthographic, isometric and perspective projections.

Electrical Engineering

Ohm's law, Kirchoff's laws - solution of series and parallel circuits with dc excitation.

Magnetic circuits: MMF, field strength, flux density, reluctance, electromagnetic induction, Faraday's laws, Lenz's law, statically and dynamically induced emfs, self and mutual induction, co-efficient of coupling.

Principle of generation of alternating current - waveforms - frequency, period, average and rms values, form factor.

Generation of 3 phase ac voltage, star and delta connections, voltage & current relationships in star and delta (balanced system only). Principle of operation of dc motor & generator, single phase transformer and three phase induction motor. Types of lamps, necessity of earthing.

Electronics Engineering

Devices - working principle of PN junction, Zener diode and BJT.

Systems Rectifiers: Half wave, Full wave and Bridge. Filters: Capacitors and Inductors.

Amplifiers & Oscillators - Common Emitter RC coupled amplifier and its frequency response. Principles of Wein-bridge oscillator. Op-amps: Basics, inverting and non-inverting amplifier.

Communication - Need for modulation, principles of AM and FM.

Measurements - Working principles of CRO and Multimeter.

Indian Financial Markets

Overview of Indian Financial Ecosystem, Key facets of Indian financial system, Growth of Financial Institutions, Public and private sector banks, Industrial Finance Corporation of India, Small Industries Development Bank of India, Regional Rural Banks, Cooperative Banks, Non-Banking Finance Companies, SFCs, Financial assistance scenario for Small and Medium Enterprises and Start-Ups.

Business Environment

Entrepreneurship Scenario: Government initiatives to foster entrepreneurship, Need for entrepreneurship in India & Kerala, Bottlenecks in entrepreneurial growth.

Business Environment: Overview of Business Environment, Features and factors influencing business environment, Types of environment: Economic environment, Socio-cultural environment, Political environment, Legal and Technological environment. Ease of Doing Business Index by World Bank for India and Department for Promotion of Industry and Internal Trade (DPIIT) for States.