

# KERALA PUBLIC SERVICE COMMISSION

## SYLLABUS FOR THE POST OF RANGE FOREST OFFICER IN KERALA FOREST & WILDLIFE DEPARTMENT

### Optional subject- CIVIL ENGINEERING

	TOPIC	MARKS
1	<b>Construction Materials and Management:</b> Physical and Chemical properties, classification, standard tests, uses and manufacture/quarrying of materials e.g. building stones, silicate based materials, cement, asbestos products, timber and wood based products, bituminous materials; Construction Materials: Structural Steel – Composition, material properties and behaviour; Concrete - Constituents, Advantages and uses of concrete, cement aggregates, importance of water quality, water cement ratio, workability, mix design, storage, batching, mixing, placement, compaction, finishing and curing of concrete, quality control of concrete, mix design, short term and long-term properties.  Construction Management: Types of construction projects; Project planning and network analysis - PERT and CPM;	15 marks
2	<b>Estimating, Costing and Valuation:</b> <b>Estimation:</b> methods and unit of measurement, Buildings, roofs, RCC and steel works, structures, sanitary and water supply works, Road, irrigation works.  <b>Analysis of rates:</b> Items of work – earthwork, Brick work (Modular & Traditional bricks), RCC work, Shuttering, Timber work, Painting, Flooring, Plastering. Boundary wall, Brick building, Water Tank, Septic tank, Bar bending schedule, Centre line method, Midsection formula, Trapezoidal formula, Simpson's rule.	15 marks

	<b>Valuation:</b> Value and cost, scrap value, salvage value, assessed value, sinking fund, depreciation and obsolescence, methods of valuation	
<b>3</b>	<b>Geotechnical Engineering:</b>	<b>30 marks</b>
	<p><b>Soil Mechanics :</b> Three-phase system and phase relationships, index properties; Definitions-void ratio, porosity, degree of saturation, water content, specific gravity of soil grains, unit weights, density index and interrelationship of different parameters, Grain size distribution curves and their uses. Atterberg's limits, ISI soil classification and plasticity chart. Permeability of soil: coefficient of permeability, determination of coefficient of permeability, Unconfined and confined aquifers, effective stress, quick sand, consolidation of soils: Principles of consolidation, degree of consolidation, normally consolidated soil, e-log p curve, computation of ultimate settlement. Shear strength of soils, direct shear test, Vane shear test, Triaxial test. Soil compaction, Laboratory compaction test, Maximum dry density and optimum moisture content, earth pressure theories, active and passive earth pressures, Bearing capacity of soils, plate load test, standard penetration test.</p> <p><b>Foundation Engineering:</b> Sub-surface investigations - Drilling bore holes, sampling, plate load test, standard penetration and cone penetration tests; Earth pressure theories - Rankine and Coulomb; Stability of slopes – Finite and infinite slopes, Stress distribution in soils – Boussinesq's theory; Pressure bulbs, Shallow foundations – Terzaghi's and Meyerhoff's bearing capacity theories, effect of water table; Combined footing and raft foundation; Settlement analysis in sands and clays;</p>	
<b>4</b>	<b>Structural Engineering</b>	<b>30 marks</b>
	<p><b>Solid Mechanics:</b> Bending moment and shear force in statically determinate beams; Simple stress and strain relationships; Simple bending theory, flexural and shear stresses, shear centre; Uniform torsion, Transformation of stress; buckling of column, combined and direct bending stresses.</p> <p><b>Structural Analysis:</b> Statically determinate and indeterminate</p>	

	<p>structures by force/ energy methods; Method of superposition; Analysis of trusses, arches, beams, cables and frames; Displacement methods: Slope deflection and moment distribution methods; Influence lines; Stiffness and flexibility methods of structural analysis.</p> <p><b>RCC Structures:</b> Working stress and Limit state design concepts; RCC beams-flexural strength, shear strength, bond strength, design of singly reinforced and double reinforced beams, cantilever beams. T-beams, lintels. One way and two way slabs, Columns with axial and eccentric loading, isolated footings, staircases, retaining wall, water tanks.</p> <p><b>Steel Structures:</b> Working stress and Limit state design concepts; Design of tension and compression members, beams and beam-columns, column bases; Connections – Bolted and welded, simple and eccentric, beam-column connections, trusses; Concept of plastic analysis - beams and frames.</p>	
<b>5</b>	<b>Surveying :</b>	<b>20 marks</b>
	Common methods and instruments for distance and angle measurement for CE work—their use in plane table, traverse survey, levelling work, triangulation, contouring and topographical map.	
<b>6</b>	<b>Water Resources Engineering</b>	<b>30 marks</b>
	<p>Fluid Mechanics: Properties of fluids, fluid statics; Continuity, momentum and energy equations and their applications; Potential flow, Laminar and turbulent flow; Flow in pipes, pipe networks; Concept of boundary layer and its growth; Concept of lift and drag.</p> <p>Hydraulics: Forces on immersed bodies; Flow measurement in channels and pipes; Dimensional analysis and hydraulic similitude; Channel Hydraulics - Energy-depth relationships, specific energy, critical flow, hydraulic jump, uniform flow, gradually varied flow and water surface profiles.</p> <p>Hydrology: Hydrologic cycle, precipitation, evaporation, evapo-transpiration, watershed, infiltration, unit hydrographs, hydrograph analysis, reservoir capacity, flood estimation and routing, surface runoff models, ground water hydrology - steady state well hydraulics and aquifers; Application of Darcy's Law.</p> <p>Irrigation: Types of irrigation systems and methods; Crop water requirements - Duty, delta, evapo-transpiration; Gravity Dams and Spillways; Lined and unlined canals, Design of weirs on permeable foundation; cross drainage structures.</p>	
<b>7</b>	<b>Transportation Engineering:</b>	<b>30 Marks</b>
	Highway Engineering – cross sectional elements, geometric design,	

	<p>types of pavements, pavement materials – aggregates and bitumen, different tests,</p> <p>Design of flexible and rigid pavements – Water Bound Macadam (WBM) and Wet Mix Macadam (WMM), Gravel Road, Bituminous construction, Rigid pavement joint, pavement maintenance, Highway drainage,</p> <p>Railway Engineering- Components of permanent way – sleepers, ballast, fixtures and fastening, track geometry, points and crossings, track junction, stations and yards.</p> <p>Traffic Engineering – Different traffic survey, speed-flow-density and their interrelationships, intersections and interchanges, traffic signals, traffic operation, traffic signs and markings, road safety</p>	
<b>8</b>	<b>Environmental Engineering:</b>	<b>30 Marks</b>
	<p>Water and Waste Water Quality and Treatment: Basics of water quality standards – Physical, chemical and biological parameters; Water quality index; Unit processes and operations; Water requirement; Water distribution system; Drinking water treatment.</p> <p>Sewerage system design, quantity of domestic wastewater, primary and secondary treatment. Effluent discharge standards; Sludge disposal; Reuse of treated sewage for different applications.</p> <p>Air Pollution: Types of pollutants, their sources and impacts, air pollution control, air quality standards, Air quality Index and limits.</p> <p>Municipal Solid Wastes: Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment and disposal).</p>	

**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.