

**RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER**  
**SYLLABUS FOR SCREENING TEST FOR THE POST OF**  
**ASSISTANT ENGINEER (CIVIL)**  
**(GROUND WATER DEPARTMENT)**

**CONSTRUCTION MATERIALS, TECHNOLOGY AND MANAGEMENT**

Building Materials: stones, bricks, steel, Timber, lime, cement, sand, aggregates for cement concrete, paints, distempers, use of pozzolana manufacturing of lime concrete, cement concrete for plain, reinforced and pre-stressed concrete work, Road Materials: Coarse aggregate, screenings and binding materials for WBM, Bricks for soling, Coarse and fine aggregate for bituminous roads, IRC standard size aggregates, Tars and Asphalt, Asphaltic concrete, Asphaltic emulsions, Mastic Asphalt and Minerals fillers

Stone and Brick Masonry: Ashlar, course and random rubble, stone pillar, dry stone and arch masonry, brick bonds and type of walls; Lintels; Plastering, pointing, flooring, Expansion and construction joints; Centering and shuttering, General Selection criteria of site, Planning and orientation of buildings, Roofing: Stone slab, RCC, G.C. Steel, Asbestos cement and jack arch roofing, Flooring: Cement concrete, flag stone, terrazzo mosaic, Terrazzo tile, Brick on edge, timber Granolithic, linoleum and other floorings, Plastering: Lime, cement sand, composite and rough coat plaster, Plaster of Paris, painting, Damp proof course, anti-termites treatment, Centering and Shuttering: Centering form work, shuttering and moulds, timber & steel trestles and false work, scaffolding and shoring, under pinning

Construction Management: Plants and equipments, Planning for construction using network analysis CPM and PERT techniques

**SURVEYING, ESTIMATING & COSTING**

Basic principles of surveying, Level, Theodolite, Tacheometer, Compass and other instruments; Introduction to Total Station; Temporary and permanent adjustments; Measurement of distances and directions; Leveling; Contouring; Traversing; Adjustment of survey data; Curves, Introduction to Remote Sensing and GIS

Estimation for quantities for various types of construction, Rate Analysis, Preparation of Tender & contract documents, Centre-line diagram, Building layout Shuttering plan

**STRENGTH OF MATERIALS AND THEORY OF STRUCTURES**

Behaviour of engineering materials in tension, compression and shear, elastic limit, yield stress, proof stress, nominal stress, actual stress and ultimate stress, factor of safety, load factor and elastic constants, Principal stresses and strains, Strain energy, theories of elastic failure, Bending moment and shear force in statically determinate beams, stress due to bending moment and shear force, design of section, section modulus, elementary theory of torsion, combined bending and torsion, Forces in statically determinate plane trusses

**DESIGN OF STRUCTURES**

Materials for cement concrete; properties and testing of cement, water, fine and coarse aggregates, brief introduction to admixtures, IS Concrete mix design procedure; properties and testing of fresh and hardened concrete, durability of concrete, Limit state design as per IS:456 for bending, shear, axial compression and combined forces, Codal provisions for slabs, beams, walls, columns and footings, Working stress method of design of R.C. members. Design of cantilever and counter-fort Retaining walls, Principles of pre-stressed concrete design, materials, methods of pre-stressing, losses, Design of simple members and determinate structures, IS: 1343 provisions

Mild steel and high tensile steel, working stress, factor of safety, introduction to IS: 875 with respect to dead loads, imposed loads and Wind loads, Design of welded and bolted joints, Plastic analysis, Types of Cross sections; plastic, compact, semi-compact and slender sections as per IS: 800, Design of tension members, Compression members; axially and eccentrically loaded columns; Design of beams; simple and built up sections; laterally restrained and unrestrained beams; design of beam column connections, Column bases; column footing, Lateral Loads: determination of wind and Earthquake effects as per IS codes

## **SOIL MECHANICS AND FOUNDATION ENGINEERING**

Preliminary definitions and relationship: Water content unit weight, specific gravity, void ratio, porosity and degree of saturation, density index, phase relationship, Index Properties of soil, various laboratory Tests, Soil water interaction, Quick sand phenomenon, permeability, Flow net and its uses, Vertical pressure distribution: Circular load, pressure bulb and its significance, Contact pressure distribution, Consolidation: Concept of one-dimensional consolidation, Laboratory consolidation test, over-consolidated normally consolidated soils, settlement analysis, Shear Strength: Basic concept, Mohr-Coulomb Failure theory and measurement of shear strength, Earth Pressure, Rankine's and Coulomb's theory, Stability of slopes, Bearing Capacity, general shear and local shear failures, Field Compaction method, water content, field compaction control and factors affecting compaction, Methods of site exploration, boring, sampling, standard penetration test, plate load test

## **HYDRAULICS AND HYDRAULIC MACHINES**

Fluid properties, Newton's law, types of flow, Fluid statics, stability and forces on fully and partially submerged bodies, Fluid kinematics, acceleration of fluid particle, velocity potential and stream function, irrotational flows, ideal fluid flow, Bernoulli's & Reynold's equations and their applications, Flow measuring devices, Momentum and angular momentum principles as applied to fluid in a control volume, applications to jets, Introduction to viscous flow, concept of lift and drag, Flow through pipes; Laminar and turbulent, Gravity/Channel flows, Surges, Dimensional analysis and Similitude techniques, Centrifugal and Reciprocating pumps: Volute and whirlpool chambers, Head loss due to variation of discharge, Manometric and Hydraulic efficiencies, Calculation of pumping power requirements, Description of single and multistage pumps, Specific speed, Characteristic curves, Model Test

## **HYDROLOGY AND WATER RESOURCES ENGINEERING**

Engineering Hydrology: Hydrological cycle, precipitation, evaporation, evapo-transpiration and infiltration, Estimation of dependable runoff, factors effecting runoff, Rainfall runoff relationship, flood/drought estimation using frequency analysis and unit hydrograph methods, Groundwater Hydrology: Aquifers, steady flow towards fully penetrating wells, confined and unconfined aquifers, Diversion Head Works: Principles of design of weirs on non-permeable and permeable foundations, Khosla's theory, design for uplift and exit gradient, Silt exclusion from canal head works, Canals: Lined and unlined canals, Lacey's and Kennedy's theories, Tractive force approach, Types of lining and its selection criteria, Lift Irrigation from Canals and Wells, Ground water availability in unconfined aquifers, Safe yield formulae, construction and maintenance of wells, Relative merits of lift irrigation and flow irrigation, Design principles of irrigation canals and energy dissipation, Storage Works: Different types of dams, Elementary concepts of masonry, concrete, earthen, butters and arch dams, Forces on gravity dams, Structural stability behaviour and stress variation in gravity dams, Appurtenances, Foundation treatment and control of seepage, Hydropower; General features and components of a Hydropower Station, Major rivers and Dams of India and Rajasthan, their history and development

## **ENVIRONMENTAL ENGINEERING**

Water Supply Engineering: Qualitative and Quantitative requirements of water, Variation in demand, Forecast of population, Different sources of water supply; lakes, rivers and ground water, Types of Intake, Pumping of raw water, Design of rising mains, various types of Water treatment, flow diagram, Water distribution system, Clear water reservoirs

Wastewater Engineering: separate sewers and combined sewers, Hydraulic and structural design considerations, House plumbing, Sewage pumping station, Characterization of Sewage, Self purification of streams, various types of sewage treatment plants, sludge digesters and sludge drying, Final disposal, oxidation ponds, oxidation ditches, aerated lagoons, septic tank, anaerobic lagoons

## **TRANSPORTATION ENGINEERING**

Highway Material & Testing: Properties of subgrade soil, stone aggregates & bituminous material, significance, method & applications of various tests on soil, stone aggregate and bitumen, Geometric Design: Highway classification, design, cross-sectional elements, horizontal & vertical alignment, sight distance, types of road crossings, roundabout, grade-separated intersections, Road Construction: Methods of constructing different types of roads viz. earth roads, gravel roads, WBM and WMM roads, bituminous and concrete roads

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### **Pattern of Question Papers:**

1. Objective Type Paper
2. Maximum Marks : 100
3. Number of Questions : 100
4. Duration of Paper : Two Hours
5. All Questions carry equal marks
6. There will be Negative Marking

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