

# **Rajasthan Public Service Commission, Ajmer**

## **Syllabus of Screening Test for the post of**

### **Lecturer-Civil Engineering**

#### **Technical Education**

##### **Building Technology and Construction Management**

Building materials; Stone, Brick, Tiles, Lime & Surkhi, Cement, Mortar, Concrete, Steel and Wood; Introduction to Glass, Paint, Plastics, Aluminum, Reinforced and Fiber reinforced cement concrete; Ferro cement.

Brick and stone masonry, brick bonds and type of walls; Lintels and Arches; flat and pitched roofs; Plastering, pointing, flooring, damp, sound and fire proofing, Expansion and construction joints; Centering and shuttering; Stairs and Lifts; Doors & Windows; Load bearing and framed structure construction. Building bye laws.

Bar charts, Milestone charts, preparation of construction schedules; CPM & PERT. Crashing of networks.

##### **Fluid Mechanics**

Properties of fluids; Newtonian and non-Newtonian fluids; Principles of fluid statics; Kinematics of flow; Equations of motion; Energy and momentum-applications; flow measurement in pipes and open channels; Dimensional analysis and similitude; Introduction to boundary layer theory, Laminar and turbulent flow through pipes. Performance parameters of pumps and turbines.

##### **Surveying, Estimating Costing & Field Engineering**

Basic principles, Level, Theodolite, Tacheometer, Compass and other instruments; Introduction to Total Station; Temporary and permanent adjustments; Measurement of distances and directions; Levelling; Contouring; Traversing; Adjustment of survey data; Computation of coordinates; Plane Table survey; Curves.

Estimation for quantities for various types of construction, like building construction, road construction, Rate Analysis. Preparation of Tender & contract documents.

##### **Environmental Engineering**

Water supply; Demand; sources; Quality standards; Water treatment: Coagulation, flocculation, settling, filtration; Water softening; Iron, Manganese, Fluoride and Nitrate removal; Electro-dialysis, R.O. and Ion exchange process, Desalination.

Water distribution system design and storage, Pumping stations.

Sewerage system; Layout and design; Characteristics of municipal wastewater; Wastewater Treatment: Treatment scheme; Activated sludge process; Trickling filters; RBC, UASB; Statbilization ponds and lagoons; Septic tank; sludge handling and disposal. Basics of noise pollution, Measurement of noise, standards, noise abatement.

Basics of Air Pollution and its ill effects on human beings.

## **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.

Traffic Engineering: Traffic flow characteristics; Traffic studies and their significance. Geometric improvement of intersections.

Traffic Control & Parking studies: General principles & types of traffic signs, advantages & disadvantages of traffic signals, signal phases, requirements & design standards for on street parking, off-street parking.

Highway construction and pavement design: Design of Highway Pavements: Design of pavements; C.B.R. and G.I. method; Westergaard's analysis of wheel load stresses in rigid pavement; I.R.C. design method for concrete pavement.

Road Construction: Methods of constructing different types of roads viz. earth roads, gravel roads, WBM and WMM roads, bituminous and concrete roads.

Railway Engineering: Introduction; Gauges; right of way, gradient, Resistance to traction and stresses in track; Track component parts their functions and requirements viz. Rails; Sleepers; Ballasts. Geometric design of railway track, super elevation, points and crossing; requirement of rail joints.

Airport Engineering: Site selection; Airport classification; layout, zoning laws; Runway orientation and geometric design of runway.

## **Water Resources Engineering**

Introduction, need for harnessing water resources; irrigation practices; Irrigation-its importance and impact on environment, assessment of water requirements for crops; Methods of irrigation; canal and well irrigation; Design principles of irrigation canal, energy dissipation; salient features of diversion head works; Falls; Regulators and cross drainage structures; Reservoir and flood routing through reservoir; basic principles for design of dams and spillway; Hydropower; General features and components of a hydropower station.

Hydrological cycle and hydrologic budget; Precipitation; measurement and analysis; Stream flow; Rainfall-Runoff relationship; frequency analysis; Flood Routing.

## **Solid Mechanics**

Elastic constants, stress, plane stress, Mohr's circle of stress, strains, plane strain, Mohr's circle of strain, combined stress; Elastic theories of failure; Simple bending, shear; Torsions of circular and rectangular sections and simple members.

## **Structural analysis**

Slopes and deflections in determinate beams using conjugate beam method and moment area method; Maxwell's reciprocal theorem; Betti's theorem; Castigliano's theorems; Strain energy expressions; Strain energy method and virtual work (unit load). Static indeterminacy; Force method, Three moment theorem; Column analogy method; Application to statically determinate structures; Muller Breslau's principle.

## **Soil Mechanics and Foundation Engineering**

Soil and soil-mass constituents; and weight volume relationships, index properties, classification of soils, soil structure and clay minerals. Capillarity, permeability and seepage through soils, piping phenomenon. Shearing strength of soil; determination of parameters by direct shear box., tri-axial and unconfined compression test, vane shear test. Typical stress-strain curves for soils; determination of pore pressure coefficients. Liquification of soil; Soil compaction, laboratory tests and field control. Ground improvement techniques: mechanical stabilization, cement lime and bitumen stabilization.

Types of foundations, selection criteria, bearing capacity, settlement, laboratory and field tests; Types of piles and their design and layout, Foundations on expansive soils, swelling and its prevention, foundation on swelling soils.

## **Design of Concrete and Masonry Structures**

Materials for cement concrete; properties and testing of cement, water, fine and coarse aggregates, brief introduction to admixtures. Concrete mix design procedures; properties and testing of fresh and hardened concrete, durability of concrete.

Limit state design 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 counterfort Retaining walls.

Principles of prestressed concrete design, materials, methods of prestressing, losses. Design of simple members and determinate structures.

Design of brick masonry as per I.S. Codes.

## **Design of Steel Structures**

Mild steel and high tensile steel, working stress, factor of safety, imposed loads on various types of floors and roofs; introduction to IS: 875 with respect to dead loads and imposed loads. Design of riveted, welded and bolted joints. Design of tension members, Compression members; axially and eccentrically loaded columns; built up columns; Design of beams; simple and built up sections; laterally restrained and unrestrained beams; design of beam column connections. Plate girders. Design of roof trusses, Column bases; column footing; grillage foundations.

Note :- Pattern of Question Paper

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.