

**RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER**

**SCHEME & SYLLABUS FOR THE POST OF ASSISTANT  
CONSERVATOR FOREST & FOREST RANGE OFFICER GRADE I<sup>st</sup>  
COMPETITIVE EXAMINATION, 2018  
FOREST DEPARTMENT**

**OPTIONAL SUBJECT - CIVIL ENGINEERING**

**1. Engineering Materials**

Stone, Lime, Glass, Timber, Paint, Varnishes, Bricks and Aggregates: Classification, properties and selection criteria; Cement: Types, Composition, Properties, Uses, Specifications and various Tests; Lime & Cement Mortars and Concrete: Properties and various Tests; Design of Concrete Mixes: Proportioning of aggregates and methods of mix design; Basic Admixtures.

**2. Construction Technology and Management**

Foundation, Brick & Stone masonry, Walls, Lintels, Arches, Staircases, Floors, Roofs, Doors, Windows, Plastering, Damp, sound and fire proofing, Anti-termite treatment, Centring & Shuttering, Scaffolding, Under pinning, Eco-friendly and Green buildings.

Construction Management: Management of construction, Plant and Equipment, Planning for construction using bar charts, Mile stone charts and C.P.M. & PERT techniques.

**3. Strength of Materials**

Behaviour of engineering materials in tension, compression and shear, Elastic constants. Principal stresses and strains, Mohr's circle of stress and strain, Strain energy, Bending moment and shear force in statically determinate beams, Stress due to bending moment and shear force, Design of section, Section modulus, Torsion, Forces in statically determinate plane trusses, Columns, Combined direct and bending stresses, Slope and deflection of statically determinate beams, Thin cylindrical and spherical shells.

**4. Theory of Structures:**

Static and kinematics indeterminacy, Energy theorems, Stiffness and flexibility methods elementary analysis of structures, Methods of consistent deformation, Slope deflection and moment distribution, Analysis of indeterminate beams (including continuous) and portal frames, Influence lines for moment, shear and reaction for statically determinate beams, Muller-Breslau Principle and influence lines for indeterminate beams, Rolling loads on beams- shear force and bending moment due to concentrated loads, uniformly distributed loads- shorter and longer than span, Free and Forced vibrations of single degree and multi degree freedom system.

## **5. Reinforced concrete structures**

Provisions of latest IS: 456, Introduction of working stress method, Limit state design of beams: singly reinforced, doubly reinforced and T-beam, Design of shear reinforcement, Design of slabs, Design of column: axially and uniaxially eccentrically loaded, Design of isolated and combined column footings, Design of retaining walls, Reinforcement in overhead and underground water tanks, Principles of pre-stressed concrete design including materials and methods, Elementary design of building for wind and earthquake.

## **6. Design of steel structures**

Provisions of latest IS : 800 and 875, Tension and compression members, Single and built up sections, Connection and splices, Roof trusses, Simple beams and Purlin connections, Columns, lacing and batten, Grillage, Gusseted and slab base foundation, Plate and gantry girders, Through and deck type plate girder bridges and with lateral bracings.

## **7. Soil/ geotechnical engineering**

Classification of soil as per I.S. code, Field identification tests for soils, Preliminary definitions and relationship in between different parameters of soil, Index Properties and Laboratory Test: Particle size analysis, liquid limit, plastic limit, proctor density, field density, Inter-granular and pore water pressure, Quick sand phenomenon, Permeability, Flow net and its uses, Compaction and consolidation of soil, Quality control, soil stabilization methods, Vertical pressure distribution, Shear strength, Bearing capacity: local and general shear failures, design Criteria for shallow foundation, Plate load test and standard penetration test, Earth pressures on retaining wall, Stability of simple slopes, Pile Foundation: Types of piles, driving of piles, load carrying capacity of piles, pile load testing, under-reamed pile foundation, bored compaction piles, Soil Exploration: Methods of site exploration, boring, sampling.

## **8. Transportation Engineering**

Highway Engineering: Highway material and testing: properties of subgrade soil, stone aggregate, bituminous material, Highway standard classification, land width, building line centre line, formation width, terrain classification, highway geometric design, Methods of highway construction for different types of roads Viz namely earth roads, gravel roads, WBM roads, WMM roads, bituminous road and concrete roads, Design of flexible and rigid pavements.

Traffic Engineering : Traffic characteristics, road user characteristics, vehicular characteristics, volume, speed and delay studies origin and destination study, traffic flow characteristics, traffic capacity and parking studies, traffic regulation, traffic control devices, Intersection control, System approach in traffic management.

## **9. 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, 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, Major rivers and Dams of India and Rajasthan, their history and development.

#### **10. 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.

#### **11. 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, Leveling, Contouring, Traversing, Adjustment of survey data, Plane Table survey, Curves, Introduction to Remote Sensing and GIS.

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

#### **12. 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, Stabilization 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.

International, National and State pollution control by laws.

Note :- **Pattern of Question Paper**

- 1. Objective type paper**
- 2. Maximum Marks : 200**
- 3. Number of Questions : 120**
- 4. Duration of Paper : Three Hours**
- 5. All questions carry equal marks.**
- 6. There will be Negative Marking.**