

# RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

## SYLLABUS FOR THE COMPETITIVE EXAMINATION FOR RAJASTHAN FOREST SERVICE

### The Scheme & Syllabus for the competitive examination for the post of Assistant Soil Conservation Officer (Engineering /Agriculture) for Forest Department:-

1. A candidate for the Rajasthan Forest Service must take all the compulsory subjects and **Any Two** of the optional subjects listed below. The time allowed for each paper shall be **Three** hours.

**(I) Compulsory subjects: Marks**

|  |     |
|--|-----|
| (1) General Knowledge  | 100 |
| (2) General English  | 100 |
| (3) Mathematics (Higher Secondary/Matriculation or equivalent standard). | 100 |

**(II) Optional subjects:**

|                            |   |                 |
|----------------------------|---|-----------------|
| (1) Botany                 | } | <b>100 Each</b> |
| (2) Zoology                |   |                 |
| (3) Mathematics            |   |                 |
| (4) Chemistry              |   |                 |
| (5) Physics                |   |                 |
| (6) Geology                |   |                 |
| (7) Mechanical Engineering |   |                 |
| (8) Agriculture            |   |                 |
| (9) Civil Engineering      |   |                 |
| (10) Chemical Engineering  |   |                 |
| (11) Statistics            |   |                 |

नोट:- सामान्य अंग्रेजी (General English) का पेपर वर्णनात्मक प्रकार (Descriptive Type) का होगा। शेष सभी पेपर (General Knowledge, Mathematics and any two of the Optional subjects) वस्तुनिष्ठ प्रकार (Objective Type) के होंगे। इनमें प्रत्येक प्रश्न-पत्र में प्रश्नों की संख्या 200 तथा प्रत्येक प्रश्न 1/2 अंक का होगा।

### SCOPE OF PAPER

#### Compulsory subjects

- 1. General Knowledge** Includes knowledge of current events and of such matters of every day observation as may be expected of an educated person who has not made a special study of any specific subject. Questions on Indian History and Geography with special reference to Rajasthan may be included.
- 2. General English** The paper will be set to test the candidate's proficiency in the language besides an essay to be written in English on one of the several specified subjects, it may include translation from Hindi to English, precis writing and use of idioms etc.
- 3. Mathematics** Mathematics of Matriculation standard and Algebra of Intermediate standard.

**1. Number system :** Natural numbers, Whole numbers, Integers, Prime and Composite numbers, Divisibility of numbers, Prime factorization, H.C.M. and L.C.M., Real numbers and their decimal expansions, Operation on real numbers, Laws of exponents for real number, Fundamental theorem of Arithmetic.

**2. Algebra :** Polynomials in one variable, zero's of a polynomial, Remainder theorem, Factorization of polynomials, Linear equations (in two variables). Quadratic equations, nature of roots, Linear inequalities, Binomial theorem, Finite and infinite sequences, Arithmetic progression, Geometric Progression, Harmonic Progression. Permutations, Combinations. Matrix and its properties. Determinants of order two and three, Inverse of a matrix. Solution of simultaneous linear equations of two and three variables. Sets, Relations and functions.

**3. Trigonometry :** Angles and their measurements, Trigonometric ratios of acute angles, Angles and lengths of arc, trigonometric functions, compound multiple angles, solutions of trigonometric equations, inverse trigonometric functions. Properties of triangles, heights and distance.

**4. Statistics :** Mean, Mode, Median, Quartiles, Deciles, Percentiles, Measure of dispersion.

**5.Plane Geometry** : Angles and lines at a point, Angles made by a transversal with two lines, classification of triangles on the basis of sides and angles, Rectilinear figures, congruence of triangles, inequalities of triangles, similar triangles, Circles, arcs and angles subtended by them.

**6.Mansuration** : Perimeter and area of plane figures, Surface area and volume of Cube, Cuboids, Cone, Cylinder and Sphere. Conversion of solid from one shape to another.

### Optional subjects

1. Botany Morphology, Physiology and Life histories of the Gryptograms and Gymnosperms, Life histories of Angiosperms, General Plant Physiology, Ecology, Evolution, Variation and Heredity, Economic botany.
2. Zoology Non-Chordata, cell and tissue, the subjects of Reproduction and Histology, General Principles of Evolution, Chordata, Elementary facts about Embryology, Physiology, Geological and Geographical distribution.
3. Geology Dynamical and Structural Geology, Palaeontology, Historical Geology, Crystallograph, Mineralogy, Petrology and Economic Geology.
4. Chemistry Inorganic, Organic and Physical Chemistry.
5. Physics General Properties of Matter, Sound, Heat, Light, Electricity and Magnetism.
6. Agriculture Agronomy, Animal Husbandry and Dairy, Horticulture, Agricultural Economics, Farm Management and Extension.
7. Mech. Engineering Theory of Machines II, Heat Engines IV, Mechanical Engineering, Design, Power Plant Engineering, Engineering Production and Metrology, Industrial Organisation and Management.
8. Mathematics Degree Standard.

**1.Theory of equations** : Relation between the roots and coefficients of general polynomial equation in one variable. Transformation of equations. Descartes' rule of signs, solution of cubic equations by Cardon's method, Biquadratic equations by Ferari's method.

**2. Group Theory** : Groups and their simple properties, order of an element, order of a group, permutation groups, cyclic groups and their properties, subgroups and their basic algebraic properties, cosets and their properties. Normal subgroups and quotient groups, theorems on homomorphism and isomorphism.

**3.Real Analysis** : Continuity and Differentiability convergence of sequence and series, Mean value theorems (Rolle's, Lagrange's and Cauchy's)

**4.Complex Analysis** : Complex numbers and their elementary properties. Argend plane, Polar representation of complex numbers. Continuity and Differentiability of complex functions, Analytic functions, Cauchy- Riemann's equations. Zero's and Singularities of complex functions.

**5.Calculus** : Partial derivatives, curvature, asymptotes, envelopes and evolutes, maxima and minima of functions upto two variables, Beta and Gamma functions, double and triple integrals, quadrature and rectification.

**6.Ordinary and Partial differential equations** : Linear differential equations of first order and higher degree, Clairaut's form, Linear differential equations of constant coefficients, ordinary homogeneous differential equations, Linear differential equations of second order with variable coefficients. Partial differential equations of first order, solution by Lagrange's method.

**7.Vector Analysis** : Dot and Cross product of vectors and their properties. Scalar and vector triple product. Gradient, Divergence and Curl. Line, surface and volume integrals. Simple problems related to Gauss, Stoke's and Green's theorems.

### 8 Co-ordinate Geometry :

**(i) Dimensional Geometry** :Distance between two points, Sections formula, area of triangle, locus. Equations of straight line, pair of straight lines, circles, parabola, ellipse, hyperbola, their equations, general properties, tangent, normal, chord of contact, pair of tangents, conditions to represent a conic by a general equation of second degree in two dimension.

**(ii) Co-ordinate Geometry in 3 - dimensions** – Co-ordinate axes and co-ordinate planes in three dimensions, co-ordinates of a point, distance between two points and section formula, direction cosines/ratios of a line joining two points, Cartesian equation of a line, coplaner and skew lines, shortest distance between two lines, cartesian equation of a plane, Angle between (i) two lines, (ii) two planes (iii) a line and a plane, distance of a point from a plane, sphere, cone and cylinder.

## 9. Civil Engineering

**1. Building material and Properties and strength of materials:-** Building materials-Timber, Stone brick, lime, files and surkhi, mortar and concrete metal and glass-Structural properties of metals and alloy used in engineering practice.

Stresses and strains- Hooke's law-bending. Torsion and direct stresses. Elastic theory of bending of beams-maximum and minimum stresses due to eccentric loading. Bending moment and Shear force diagrams and deflection of beams under static and live loads.

**2. Building construction and Water Supply and Sanitary engineering:-** Construction-Brick and Stone masonry; walls, floors and roofs, staircases, carpentry in wooden floor, roofs, ceilings, doors and windows, finishes(plastering painting, painting and warnishing etc.).

Soil mechanics-Soils and their investigation, Bearing capacities and foundations of building and structures-Principles of design.

Building estimates-Principles, units of measurement; Taking out quantities for building and preparation of abstract of cost-specifications and data sheets for important items.

Water supply-Sources of water, standards of purity, methods of purification, layout of distribution system, pump and boosters.

Sanitation-Sewers, storm water; overflows, house drainage, requirements and appurtenances, septic tanks, Imhoff tanks, sewage, treatment and dispersion trenches-Activated sludge process.

**3. Roads and bridges:-** Survey and alignment- Highway materials and their placement-Principles of design-width of foundation and pavement, camber, gradient, curves and super-elevation-Retaining walls.

Construction-Earth roads stabilized and water bound macadam roads, Bituminous surfaces and concrete roads, drainage of roads, Bridges-Types, economical spans, I.R.C. loading, designing super-structure of small span bridges-Principles of designing foundation of abutments and pillars of bridge, pile and well foundation.

Estimating Earthwork for roads and canals.

**4. Structural Engineering. :-**

Steel structures-Permissible stresses, Design of beams, simple and build-up columns and simple roof trusses and girders column bases and grillages for axially and eccentrically loaded columns-Bolted rivetted and welded connections.

R.C.C. structures-Specifications of materials used-proportioning workability and strength requirement. I.S.I. standards for design loads, permissible stress in R.C.C. members subject to direct and bending stresses, Design of simply supported, overhanding and cantilever beams, rectangular and Tee beams in floors, roofs, and lintels-addilly loaded columns; their bases;

## 10. Chemical Engineering

**1. Transport phenomena(under steady state conditions):-**

(a) Momentum transfer-(i) Different patterns of flow and their criteria-

(ii) Velocity profile.

(iii) Filtration, Sedimentation centrifuge;

(iv) Flow of solids through fluids.

(b) Heat transfer-Different modes of heat transfer:

Conduction- Calculation for single and composite walls of flat, cylindrical and spherical shapes.

Convection- Different dimensionless groups used in forced and free convection. Equivalent diameter. Determination of individual and overall heat transfer co-eff.

Evaporation-Radiation-Stefan-Boltzman law. Emmissivity and absorptivity. Geometrical Shapes factor.

Head load of furnaces-calculation.

(c) Mass transfer-Diffussion in gases and liquids, Absorption, despersion humidification, dehumidification, drying and distillation. Analogy between momentum, heat and mass and transfer.

**2. Thermodynamics:-**(a) 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> Laws of thermodynamics.

(b) Determination of internal energy, entropy, enthalpy and free energy-Determination of Chemical equilibrium constants for homogeneous and heterogeneous systems. Use of thermodynamics in combustion, distillation and heat transfer, Mechanism and theory of mixing, various mixers for liquid-liquid, solid-liquid and solid-solid.

**3. Reaction Engineering:-** (i) Kinetics: Homogeneous and heterogeneous reactions 1<sup>st</sup> and 2<sup>nd</sup> order reactions.

Batch and flows- Reactors and their design.

(ii) Catalysis-Choice of catalysts-preparation.  
mechanics of catalysts based upon mechanism.

**4. Transportation:-** Storage and transport of materials and in particular powders, resins, volatile and non-volatile liquids, emulsions and dispersions, pumps, compressors and blowers. Mixers-Mechanism and theory of mixing various mixers for liquid-liquid solid-liquid solid-solid.

**5. Materials:-** Factors that determine choice of materials of construction in chemical industries, Metals and Alloys, ceramic, plastics and rubbers. Timber and timber products, Ply-wood laminates;

Fabrication of equipment with particular reference to production of vats, Barrels, filter presses etc.

**6. Instrumentation and process control:-** Mechanical, hydraulic, pneumatics, thermal optical, magnetic, electrical and electronic instruments. Controls and control systems. Automantion.

## 11. Statistics

1. Frequency distributions-averages percentiles and simple methods of measuring, dispersion, graphic methods, treatment of qualitative data e.g. investigation of association by comparison of ratios, the practice of graphic and algebraic methods of interpolation.

2. Practical methods used in the analysis and interpretation of statistics of prices, wages and income, trade, transport, production and consumption, education etc. methods of dealing with population and vital statistics, miscellaneous methods used in handling statistics of experiments observations.

3. Elements of modern mathematical theory of statistics, frequency curves and the mathematical representation of groups generally of accuracy sampling as affecting averages, percentages, the standard deviation, significance of observed differences between averages of groups etc. theory of co-relation for two variables.

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