



भारत सरकार GOVERNMENT OF INDIA
अंतरिक्ष विभाग DEPARTMENT OF SPACE
भारतीय अंतरिक्ष अनुसंधान संगठन INDIAN SPACE RESEARCH ORGANISATION
राष्ट्रीय सुदूर संवेदन केंद्र NATIONAL REMOTE SENSING CENTRE
बालानगर, हैदराबाद BALANAGAR, HYDERABAD 500 037

No: NRSC-RMT-1-2024/12

Syllabus for Written Test

Advertisement No	:	NRSC-RMT-1-2024 dated 22.01.2024
Name of the post	:	Scientist/ Engineer 'SC'
Post Code	:	12
Specialization	:	Soil Science
Essential Qualification	:	M.Sc in Soil Science & Agriculture Chemistry or equivalent With B.Sc in Agriculture (4 years course)
Number of Posts	:	04

The syllabus for the above posts is given below. Candidates may note that it is not exhaustive but indicative only. Refer above advertisement for pattern of the examination.

Part-A: Area/ Discipline Specific part (90 Minutes, 80 Marks, 80 Multiple Choice Questions)

Pedology:

Concept of land, soil and soil science. Composition of earth crust and its relationship with soils; Rocks, minerals and other soil forming materials; Weathering of rocks and minerals; Factors of soil formation, Pedogenic processes and their relationships with soil properties; Soil development; Pedon, polypedon, soil profile, horizons and their nomenclature. Soil Taxonomy - epipedons, diagnostic subsurface horizons and other diagnostic characteristics, soil moisture and temperature regimes, Interpretation of soil survey data for land capability and crop suitability classifications, Fertility Capability Classification- Nutrient indexing. Macro-morphological study of soils. Application and use of global positioning system for soil survey. Soil survey- types and techniques. Soil series characterization and procedure for establishing soil series, benchmark soils and soil correlations. Study of base maps: cadastral maps, toposheets, aerial photograph and satellite imageries. Use of geographical information system for preparing thematic maps. Application of Remote Sensing in soil survey and mapping. Soils of India

Soil Physics:

Significance of soil physical properties. Soil texture - Stoke's Law- textural classes. Soil structure — classification soil aggregation and significance, soil consistency, bulk density and particle density of soils and porosity and their significance. Soil water- retention and potentials. Soil moisture constants. Movement of soil water- saturated and unsaturated flow- Darcy's law - hydraulic conductivity - infiltration, percolation, permeability, drainage and methods of determination of soil moisture. Thermal properties of soils, soil temperature. Soil air- composition, gaseous exchange, influence of soil temperature and air on plant growth. Soil physical constraints affecting crop production and their management strategies. Methods of soil analysis - particle size distribution, bulk and particle density, moisture constants. Soil erosion - types, effects, Rain erosivity and soil erodibility. Runoff - methods of measurement, factors and management. Soil conservation measures. Characterization and evaluation of soil and land quality indicators; Causes of land degradation; Management of soil physical properties for prevention/restoration of land degradation; management of waste lands; Concept of watershed — its characterization and management.

Soil Chemistry:

Chemical composition of soil; Soil colloids - structure, composition, constitution of clay minerals, amorphous clays and other non-crystalline silicate minerals, oxide and hydroxide minerals; Charge development on clays and organic matter; pH-charge relations; Buffer capacity of soils. Inorganic and organic colloids- surface charge characteristics, diffuse double layer, zeta potential, Soil organic matter fractionation, humus formation and theories of clay-organic interactions. Cation exchange — Hysteresis-definition. Nitrogen, potassium, phosphorus and ammonium fixation in soils and management aspects.

Soil Fertility:

Essential elements in plant nutrition; Nutrient cycles in soil; Transformation and movement of nutrients (Macro and micro nutrients) in soil; Manures and fertilizers; Fate and reactions of fertilizers in soils; Slow release fertilizers and nitrification retarders- Soil fertility evaluation- Concepts and approaches ;. FCO Soil fertility evaluation — soil testing, plant and tissue tests and biological methods; Common soil test methods for fertilizer recommendation; Nutrient Management concepts- INM, IPNS, SSNM- Soil test-crop response correlations; Fertilizer application methods- Nutrient use efficiency- Macro and micronutrients. Nature, properties and development of acid, acid sulphate, saline and alkali soil and their management; Lime and gypsum requirements of soils; Irrigation water quality assessment. Fertility status of soils of India. Pollution: types, causes and management. Carbon sequestration and carbon trading. Modern methods of soil, plant and fertilizer analysis; Flame photometry and inductively coupled plasma optical emission spectroscopy; spectrophotometry - visible, ultra-violet and infrared; Atomic absorption spectrophotometry; Potentiometry and conductimetry; X-ray diffractometry; Mass spectrometry.

Soil Microbiology:

Soil biota, soil microbial ecology, types of organisms. Soil microbial biomass, microbial interactions, uncultivable soil biota. Microbiology and biochemistry of root-soil interface. Phyllosphere. Soil enzymes, origin, activities and importance. Soil characteristics influencing growth and activity of microflora. Microbial transformations of N, P, K, S, Fe and Zn in soil. Biochemical composition and biodegradation of soil organic matter and crop residues. Humus formation. Cycles of important organic nutrients. Biodegradation of pesticides, organic wastes and their use for production of biogas and manures. Biofertilizers — definition, classification, specifications, method of production and role in crop production.

Statistics:

Experimental designs for pot culture and field experiments; Statistical measures of central tendency and dispersion; Correlation and regression; tests of significance - t and F tests; Computer use in soil research, Geo statistics.

Soil Physical Chemistry:

Surface chemistry, pH, Buffer solutions; Redox reactions, Chemical kinetics, Stereochemistry and chirality, isomerism, thermodynamics of nutrient transformations in soils; cationic and anionic exchange and their models, molecular interaction. Adsorption/desorption isotherms - Langmuir adsorption isotherm, Freundlich adsorption isotherm, normalized exchange isotherm, BET equation; selective and non-selective adsorption of ions on inorganic surfaces and organic surfaces of soil materials Common solubility equilibria - carbonates, iron oxide and hydroxides, aluminum silicate, aluminum phosphate; electrochemical properties of clays.

Chromatography and Spectroscopic Techniques:

Basic principles and application of chromatography; column, paper, thin layer, and ion exchange chromatography; gas liquid chromatography (GLC); high performance liquid chromatography (HPLC); UV, FTIR; NMR and mass spectroscopy; GC-MS and LC-MS techniques and their applications.

Soil Water Management:

Water Resources Management, Soil Water, Plant and Atmosphere Relationships, Irrigation Water Management and Drainage, Natural Resource Management, Watershed Management, Soil Erosion, Soil and Water Conservation, Soil Degradation, Environmental Pollution and Remediation.

Agriculture:

Fundamentals of Agronomy, Plant Physiology, Crop Production Technology of seasonal, annual Crops, Fruit crops, Plantation crops, Vegetables, Spices & Ornamentals; Farming System and Sustainable Agriculture, Agro-meteorology & Climate Change, Precision Farming, Rainfed and irrigated Agriculture, Fundamental of Soil Science, Manures, Fertilizers and Soil Fertility Management, Problematic Soils and their Management, Soil, Plant and Water Testing methods, Fundamentals of Soil and Water Conservation, Watershed Management; Fundamentals of Agriculture Economics, Basic Mathematics & Statistical Methods; Fundamentals of Plant Breeding, Plant Biochemistry, Entomology, Plant Pathology; Diseases of Field and Horticultural Crops and their Management; Principles of Integrated Pest Management; Fundamentals of seed technology.

Part-B: Aptitude/Ability tests (30 Minutes, 20 Marks, Maximum of 15 Multiple Choice Questions)

Topics: Numerical Reasoning; Logical Reasoning; Diagrammatic Reasoning; Abstract Reasoning; Deductive Reasoning