Syllabus for RET examination (Department of Agricultural Chemistry and Soil Science), 2018

Soil texture, textural classes, mechanical analysis, specific surface. Soil consistence; dispersion and workability of soils; Soil structure – genesis, types, characterization and management soil structure; Soil water: content and potential, soil water retention, soil-water constants, measurement of soil water content, energy state of soil water, soil water potential, Poiseuille's law, Darcy's law; hydraulic conductivity in saturated and unsaturated soils, Composition of soil air; renewal of soil air – convective flow and diffusion, measurement of soil temperature; soil temperature in relation to plant growth; soil temperature management.

Soil fertility and soil productivity; nutrient sources – fertilizers and manures; essential plant nutrients – functions and deficiency symptoms. Micronutrients, Soil testing and fertilizer recommendation; Soil fertility evaluation – biological methods, soil, plant and tissue tests; soil quality in relation to sustainable agriculture.

Chemical (elemental) composition of the earth's crust and soils. Soil colloids: inorganic and organic colloids – origin of charge, concept of point of zero-charge (PZC) and its dependence on variable-charge soil components, surface charge characteristics of soils; diffuse double layer theories of soil colloids, zeta potential, stability, coagulation/ flocculation and peptization of soil colloids; soil organic matter – fractionation of soil organic matter and different fractions, clay-organic interactions. Ion exchange processes in soil; cation exchange- theories based on law of mass action (Kerr-Vanselow, Gapon equations, hysteresis, jenny's concept). AEC, CEC; experimental methods to study ion exchange phenomena and practical implications in plant nutrition. Potassium, phosphate and ammonium fixation in soils covering specific and non-specific sorption; precipitation-dissolution equilibria; step and constant-rate K; management aspects. Adsorption/desorption isotherms - Langmuir adsorption isotherm, Freundlich adsorption isotherm, normalized exchange isotherm, BET equation; selective and nonselective adsorption of ions on inorganic surfaces and organic surfaces of soil materials (citation of utility in agricultural system). Chemistry and electro-chemistry of submerged soils.

Classification, structure, chemical composition and properties of clay minerals; genesis and transformation of crystalline and non-crystalline clay minerals; identification techniques; amorphous soil constituents and other non-crystalline silicate minerals and their identification; clay minerals in Indian soils. Factors of soil formation, climatogenic soil, soil formation models, soil forming processes; weathering of rocks and mineral transformations soil profile; soil classification systems, soil taxonomy; soil classification, soil mineralogy and soil maps – usefulness. Soil survey and its types; soil survey techniques – conventional and modern; soil series – characterization and procedure for establishing soil series; major soil groups of India and West Bengal; land capability classification and land irrigability classification; land evaluation and land use type (LUT) – concept and application; approaches for managing soils and landscapes in the framework of agro-ecosystem. Remote sensing: Concept and its application in soil resource inventory.

Soil biota and characterisation, soil microbial ecology, types of organisms in different soils; soil microbial biomass; microbial interactions; un-culturable 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 carbon, nitrogen, phosphorus, sulphur, 15

iron and manganese in soil; biochemical composition and biodegradation of soil organic matter and crop residues, biochemistry of humus formation, functional groups, adsorption by soil clay, metal humus interaction, humus formation; cycles of important organic nutrients. Biodegradation of pesticides, organic wastes and their use for production of biogas and manures; Biofertilizers – definition, scope, classification, specifications, method of production and role in crop production. Constraint in application of biofertilizers.

Soil and water pollution problems associated with agriculture, nature and extent. Nature and sources of pollutants – agricultural, industrial, urban wastes, fertilizers and pesticides and other agrochemicals including herbicides, acid rains, oil spills etc.; water and soil pollutants, Sewage and industrial effluents, Heavy metal pollution in soils, emission of green house gases – carbon dioxide, methane and nitrous oxide; Radio pollution; Chemical and Bioremediation of contaminated soil. Soil erosion; Soil conservation Planning.

Preparation of solutions for standard curves, analytical reagents, qualitative reagents, indicators and standard solutions for acid-base, oxidation reduction and complexometric titration; Principles of visible and ultraviolet and infrared spectrophotometry, atomic absorption, flame-photometry, inductively coupled plasma spectrometry; chromatographic techniques, mass spectrometry and X-ray defractrometery; identification of minerals by X-ray by different methods. Determination of cation and anion exchange capacities of soils; estimation of exchangeable cations (Na, Ca, Mg, K); estimation of root cation exchange capacity. Analysis of soil and plant samples for N, P, K, Ca, Mg, S, Zn, Cu, Fe, Mn, B and Mo; analysis of plant samples by wet digesting and dry ashing and soil by wet digestion methods, Volumetric analysis.

problem soils – acidic, saline, sodic and physically degraded soils; origin and basic concept of problematic soils.