DETAILED SYLLABUS FOR THE POST OF JUNIOR MANAGER (QUALITY ASSURANCE) KERALA STATE CIVIL SUPPLIES CORPORATION LIMITED

(Cat.No:308/2022)

TOTAL: 100 MARKS

PART I: AGRICULTURE – 50 MARKS

Module I : CROPS, SOIL AND WATER (10 Marks)

- Agronomy - scope, seeds and sowing, tillage and tilth, crop density and geometry. Growth and development of crops, factors affecting growth and development, crop rotation - its principles, adaptation and distribution of crops.
- Crop nutrition- manures and fertilizers, nutrient use efficiency– soil and climatic requirements – area and production – varieties – seed rate spacing – methods of sowing/planting – manurial schedule, cultural practices and yield of major field crops of Kerala, viz, rice, tapioca, sugarcane, pulses and sesamum.- origin, geographic distribution, economic importance, botany and growth phases, varieties, harvesting, processing, conversion ratios (ratio between harvested and economic produce)
- Cropping systems – terminology – plant interactions in multiple cropping systems – criteria for assessing yield advantage –Major cropping systems of Kerala – (rice based – coconut based – cassava based – homestead farming) – organic farming – precision farming – Integrated farming system – sustainable agriculture – LEIA – HEIA – LEISA – sustainable technologies for crop production.
- Water management of principal crops, critical stages of crops, depth and schedule of irrigation – rice, wheat, banana, coconut, cowpea, sugarcane and vegetables .Soil moisture constants-Evapo-transpiration, potential evapo-transpiration and consumptive use, Reference crop evapo-transpiration (ETo)- Crop co-efficient (Kc)- K_c values for different crops. Main empirical methods of calculation of ETo- Effective rainfall, Water requirement of crops- Scheduling irrigation– Methods of irrigation-.Surface , subsurface, overhead and micro irrigations. Irrigation efficiency- Water productivity and water use efficiency- Agricultural drainage-causes of water logging and types of drainage.
- Weeds – harmful effects, classification of weeds, crop weed association – crop associated weeds, crop bound weeds and season bound weeds – critical period of crop weed competition – aquatic weeds and parasitic weeds
- Soil – definition; different kinds of rocks; soil physical/-chemical- biological properties - soils of India and Kerala; soil organic matter – composition and properties; soil organisms; soil taxonomy and its characteristics.Soil colloids – properties – nature - types and significance. Layer silicate clays - their genesis and sources of charges. Adsorption of ions - ion exchange - CEC and AEC - Concept of pH - soil acidity - Soil organic matter – composition – decomposability – humus - fractionation of organic matter. Carbon cycle - Characteristics, problems and management/reclamation; Salt affected soils-Arid soils -Acid soils- submerged soils-Eroded soils-Acid sulphate soils-Degraded soils-special problem soils
- Agroclimatic and agroecological classification of India and Kerala
- Organic Farming, natural farming, conventional farming, sustainable agriculture - Current status of organic farming -Initiatives in India and Kerala- National Programme for Organic Production (NPOP)

- Operational structure of NPOP-Accreditation agencies- Certification Agencies
- National Standards for Organic Products (NSOP)-inspection and certification procedures, labeling and marketing
- Marketing and export potential of organic produce
- Geo-informatics- GIS and Remote sensing concepts application in agriculture-Global positioning system (GPS),components and its functions. Nanotechnology- definition, concepts and techniques, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors

Module II: SEED TECHNOLOGY (10 Marks)

- Seed and seed technology: introduction, definition, its importance in increasing agricultural production. Difference between seed and grain and concept of seed quality. Deterioration causes of crop varieties and their control. Maintenance of genetic purity during seed production. Genetic and agronomic principles of seed production.
- Seed quality; Definition, Characters of good quality seed.
- Seed certification, field inspection- Different classes of seeds; Breeder seed, Foundation seed, Certified seed, Registered seed, Hybrid seed, Improved seed, Composite seed, etc. Foundation and certified seed production of rice and vegetables (varieties & hybrids)
- Foundation and certified seed production of important cereals (Rice, wheat and maize), pulses (Cowpea, mung, urd, pigeonpea, field bean and soyabean), oilseeds (Sesame, coconut, sunflower, groundnut), fodder (Guinea grass, napier grass and lucern), and vegetables (Bhindi, tomato, brinjal, chillies and cucurbitaceous vegetables).
- Seed Act and Seed Act enforcement- Central Seed Committee, Central Seed Certification Board, State Seed Certification Agency, Central and State Seed Testing Laboratories. Seeds Control Order 1983 and Seed Bill 2004, IPR- Intellectual Property Rights
- Seed dormancy, internal and external factors affecting dormancy in seeds. Seed drying. Seed processing and their steps. Seed treatment, its importance, methods of application. Seed packing. Seed sampling and testing. Seed storage: general principles, stages and factors affecting seed longevity during storage.
- Measures for pest and disease control during storage. Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies. Participatory seed production and seed village concept
- Duties and powers of seed inspectors, offences and penalties; Seed Control Order 1983, Seed Act 2000 and other issues related to seed quality regulation.
- Establishing a seed testing laboratory; Seed testing procedures for quality assessment
- Seed treatment, Importance of seed treatment, types of seed treatment, equipment used for seed treatment, Cleaning and grading - methods and equipments; cleaners and separators, colour sorter, Drying - principles, classificationconduction, convection and radiation driers, moisture contents, theory of grain drying;
- Seed packing and seed storage, factors affecting seed longevity during storage and conditions required for good storage,
- General principles of seed storage, measures for pest and disease control, temperature control, Seed marketing, marketing structure, marketing organization; Factors affecting seed marketing.
- Drying Constant and falling rate of drying, efficiency of drying; Types of dryers-mechanical dryers - working principles; Material handling equipment; conveyer and elevators, working and selection; Effect of temperature, Relative humidity and gas

composition on storage, Storage structures - traditional modified and controlled atmosphere structures

- Storage, grain storage, types of storage structures- traditional, improved and modern storage structures.
- Physical analysis of Field and Horticultural crops
- Moisture tests of Field and Horticultural crops
- IPR- definition, concepts and components; IPR policies and issues in Indian scenario
- Intellectual Property Rights, Patenting, WTO, Plant Breeders Rights
- GM crops

Module III : PLANT PROTECTION (10 Marks)

- Distribution, bio ecology, nature and symptoms of damage and management strategies of major insect pests of Field crops: rice, wheat, maize, sorghum, ragi, sugarcane, cotton and oil seeds – groundnut, sesamum, castor, sunflower and mustard, pulses. Vegetable crops: solanaceous ,cruciferous , leafy vegetables polyhouse vegetables; tuber crops , fruit crops, plantation crops, ornamentals, medicinal and aromatic plants and stored products pests, IPM
- Major nematode parasites and management in cereals (rice), millets (sorghum, and maize), pulses (redgram, blackgram, greengram and cowpea),oilseeds (castor and gingelly), vegetables (tomato, brinjal, bhindi, chilli potato, beet root and carrot), fruits (banana, citrus, grapevine and papaya), spices and plantation crops (turmeric, pepper, betelvine and coconut), Polyhouse vegetables, Tuber crops (coleus, diascorea, sweet potato).
- Principles and methods of plant disease management- symptoms, etiology, disease cycle and management of diseases of rice, wheat, sugarcane, groundnut, pulses, vegetables, tubers, citrus, mango, banana, grapevine, pineapple, papaya, guava, sapota, cashew, apple, coconut, arecanut, cocoa, black pepper, ginger, cardamom, tree spices, oil palm, betelvine, coffee, tea, rubber and ornamentals.Methods of control: IDM
- Post harvest pest and disease management – fruits and vegetables
- Pests of stored products- introduction, causes of storage losses
- Coleopteran and lepidopteran pests of stored products
- Management of stored product pests – preventive and curative methods
- Rodent management - principles and methods of control-physical, biological and mechanical methods.
- Rodenticides - acute poisons, chronic poisons, fumigants. Fumigation, baits, baiting and rat proofing

Module IV : POST HARVEST MANAGEMENT (10 Marks)

- Indian fruit and vegetable processing industry- Importance, problems & prospects- Physiology of maturity, ripening and senescence in fruits and vegetables and their chemical composition, -
- Post harvest losses - Pre and postharvest factors causing loss and spoilage- Post harvest management 68 techniques
- Pre-cooling- grading and sorting- other operations- washing-sanitization- heat treatments-waxing- curing etc. Storage systems and storage disorders- Packaging technologyGovernment policies, regulations and specifications
- Marketing systems- Export promotion agenciesPrinciples and methods of preservation-drying and dehydration - Thermal processing- Preservation by ionizing radiations, chemical methods and fermentation- Recent advances in food preservation techniques-

- Post harvest technology of coconut, Arecanut, Oil palm, Rubber, Tea, Coffee, Cocoa & cashew, pepper, cardamom, ginger, turmeric, chilies, Tree spices, essential oil yielding crops and cut flowers- Industrial waste utilization **.**
- Fruits and Vegetable Processing: Thermal processing, steps in canning of different fruits, and vegetables; Dehydration and dehydrated products. Solar drying. Intermediate moisture foods.Technology Squash, Crush, Syrup, Jam, Jelly, Marmalade, pickles, chutneys and sauces. Beverages, tea, cocoa and coffee processing.
- Physiology of maturity, ripening and senescence in cereals, pulses, fruits and vegetables, spices and condiments, tea, coffee, cashew, sugarcane.
- Maturity indices and harvesting of vegetables for vegetable purpose and seed purpose.
- Post harvest losses, phases of loss and measures to reduce the losses, post harvest handling, respiration and storage preservation and preservatives used in fruits and vegetables
- Winnowing- working principle, Cleaning- principles & properties, effectiveness of cleaning,
- Different cleaners and separators- length separator, cyclone separator, specific gravity separator, colour sorter, separators based on surface texture, working principles,
- Drying, principles, classification- conduction, convection and radiation driers, moisture contents, theory of grain drying.
- Drying- Constant and falling rate of drying, efficiency of drying.
- Types of dryers- mechanical dryers, batch, continuous, mixing and non mixing dryers- working principles.
- Fruits and vegetables- cleaning and grading, methods of grading, equipment for grading of fruits and vegetables.
- Storage of fruits and vegetables- Effect of temperature, Relative humidity and gas composition, traditional storages, Modified and Controlled atmosphere storage structures.
- Size reduction- Principles and equipment for size reduction.

Module V: AGRICULTURAL MARKETING (10 Marks)

- Agricultural Marketing – concepts and definitions – scope – subject matter
- Market and Marketing-meaning-definition-elements of a market
- Classification of market-based on commodity, location, volume of business, time, competition
- Agricultural Marketing-approaches-functional (Exchange function, physical marketing function, facilitating functions)-institutional (agencies, channels)-commodity
- Producer's surplus-meaning-types-marketable and marketed surplus importance- factors affecting
- Marketing efficiency-meaning-definition-estimation of marketing costs/margins for farm commodities-measures to improve marketing efficiency and tools for risk management-co-operative marketing futures trading-contract farming
- International trade-Domestic Vs International trade-theories of international trade-theory of absolute advantage
- Globalization and Liberalization-WTO-AOA (market access, domestic support, export subsidies)
- Agricultural price policy in India-objectives-role of CACP in agricultural price policy-Administered prices (support price, procurement price, levy price, statutory minimum price, issue price)

PART II - Food Science and Technology/Quality Assurance) – 50 MARKS

- **Food grain processing** **6 Marks**
- Structure and composition of grains such as rice, wheat, barley, oat, maize, millets and oil seeds. Milling technology of cereals, pulses and oil seeds. Technology of production of bread, biscuit, cakes, pasta, extruded products, confectionery, breakfast and snack foods. Instant ready mixtures. Milling and parboiling of paddy, utilization of by products. Oil seed processing - oil extraction and processing, refining of oil.
- **Technology of foods of animal origin** **5 Marks**
- Milk and milk products - handling and maintenance of dairy plant equipment. Dairy plant operations- receiving, separation, clarification, pasteurization, standardization, homogenization, sterilization, storage, transport and distribution of milk. Technology of milk products such as cream, butter, ghee, cheese, condensed milk, dried milk, ice cream and similar products.
- Meat, fish and poultry processing, structure of meat, slaughter and dressing of animals and poultry. Rigor mortis, Meat quality. Curing, smoking, freezing, canning and dehydration of meat and poultry products. Processing and preservation of fish and its products. Technology of egg products.
- **Bio material properties and Unit operations in food processing** **6 Marks**
- Physico-chemical and engineering properties of bio-materials - physical, rheological, aerodynamic, thermal, electrical and optical properties. EMC, sorption and desorption isotherms, water activity, phychrometry, drying , drying curves, various dryers, modes of heat transfer and heat exchangers, Mass transfer- Principles and applications.
- Theory, principles and equipments for Unit operations such as size reduction, crystallization, filtration, membrane processing, extraction, micro, ultra and nano-filtration, reverse osmosis, evaporation, mixing, distillation, mechanical separation, sedimentation, expelling, leaching, extrusion.
- **Non thermal technologies** **5 Marks**
- High pressure processing, irradiation, ultrasound, UV-light, pulsed electric field, pulsed light and magnetic field applications in food processing
- **Food microbiology** **6 Marks**
- Microbiology of food and water, bacterial growth curve, microbial kinetics, D-value, Z-value and F-value. Staining and culture techniques, pasteurization and sterilization, process time calculation. Sources of micro organisms, food borne diseases, food poisoning, fermentation technology, fermented food products, bio-reactors. Food contaminants, aflatoxins, food intoxication and infection. Consumer concerns about risks and values.

- **Food chemistry** **6 Marks**
- Major food constituents - carbohydrates, lipids, proteins, fiber, vitamins and minerals. Characteristics, sources, physico-chemical and bio chemical functions. Nutritional properties. Daily requirements- digestion and absorption. Biological value of protein, free radical and anti oxidants, energy levels in food – respiratory quotient, metabolism, basal metabolic rate- specific and dynamic action of food- balanced diet.
- Enzymes – classification and application in food processing. Food colour and flavor enhancers, browning reactions, polymorphism, interesterification, hydrogenation, rancidity and reversion
- **Food analysis** **5 Marks**
- Analysis of food- rules and regulations of food analysis – principles, procedures and detectors. Analysis of moisture content, ash, fat, carbohydrate, fiber, protein, minerals and vitamins. Pesticide residues analysis – chromatographic techniques (Column, paper, TLC,HPLC,GC), spectroscopic techniques (IR,UV, MS and AAS), immunoassay techniques in food analysis. Food composition analysis, near infrared absorption technology, inline and offline FTIR measurements. – Adulteration in food- detection of adulteration in food, Texture profile analysis, Viscometry.
- **Food packaging, storage and transport** **5 Marks**
- Design, operation and maintenance of bulk conveying systems- Belt, screw/auger and pneumatic conveyors. Bucket elevator.
- Food packaging materials, characteristics and selection. Flexible and rigid packaging materials. Packaging technologies and equipment for liquid, powder, granular materials and fresh horticultural produce. Vacuum packaging, Aseptic packaging, Modified and controlled atmosphere packaging. Mechanical and functional tests for packaging materials.
- Post harvest losses during storage, causes of storage, destructive agents, sources of infestation and control, storage structures- moisture and temperature changes during storage, respiration, bulk and bag storage structures, aeration and stored grain management, storage pests and control, conditions for storage of perishable products, cold storage- design of cold storage.
- **Food quality management** **6 Marks**
- Objectives, importance and functions of quality control. Quality systems and tools used for quality assurance including control charts, acceptance and auditing inspections, critical control points, reliability, safety, recall and liability. The principles and practices of food plant sanitation. Food and hygiene regulations. Environment and waste management. Total quality management, Good manufacturing practices, Good Laboratory Practices, Quality management systems, HACCP and codex in food. International and National food laws. US-FDA/ISO-9000 and FSSAI. Certification, certification procedures, certifying bodies, accrediting bodies. food safety. Sensory evaluation, panel screening, selection methods. Sensory and instrumental analysis of quality.

NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper