DETAILED SYLLABUS FOR THE POST OF PRIORITY SECTOR OFFICER IN KERALA STATE CO-OPERATIVE BANK LTD. – DIRECT RECRUITMENT

(Category Nos.:432/2023)

PART -I - AGRICULTURE / HORTICULTURE - 16 MARKS

MODULE 1- Fundamentals of Agronomy and plant physiology, Crop production and farming system (2 marks)

Crops – classification- agronomic, botanical, ontogenic, growth habit – growth – definition and factors affecting growth – yield contributing characters – harvest index – vegetative propagation of crops – setts, slips, tubers, rhizomes, etc. – methods of sowing

Mineral nutrition of plants- functions and deficiency symptoms of nutrients– nutrient uptake mechanisms- foliar nutrition and hydroponics. Photosynthesis - Light and dark reactions C3, C4 and CAM plants, photorespiration: Plant respiration- glycolysis, TCA cycle and Electron transport chain, Alternate respiration in plants; Plant growth regulators – physiological roles and agricultural uses; Physiological aspects of growth and development of major crops; Photoperiodism and vernalisation; Growth analysis, role of physiological growth parameters in crop productivity.

Rice (including speciality rices) , wheat, maize, millets, tapioca, potato, yams and aroids, sugarcane, groundnut, sesamum, sunflower, safflower, linseed, important pulses, banana, mango, coconut, cashew, spices and condiments – origin, geographic distribution, economic importance, botany and growth phases, varieties, harvesting, processing, conversion ratios (ratio between harvested and economic produce)-Agroclimatic and agroecological classification of India and Kerala-Production technology of cereals, millets, tuber crops, pulses, oil seeds, fodder crops-Integrated Farming System and its components-Cropping systems of Kerala-Sustainable Agriculture, Good Agricultural Practices

MODULE 2 -Fundamentals of horticulture and production technology of horticultural crops (2 marks)

Horticulture - definition, importance, division and classification of horticultural crops- Importance of horticulture in India and Kerala.- Commercial orchards, garden and plantations - selection of site for perennial horticultural crops - climate, soil, socio economic factors-Orchard planting-training and pruning in horticultural crops-fruit set and development- Seedlessness in horticultural crops; significance and induction-Bioregulators- Natural and synthetic regulators - Role of bioregulators in horticultural crops - preparation and methods of application.-Nursery management-layout, planting, aftercare-irrigation, manuring -stage of harvest, harvesting, yield, on farm processing and uses of coconut, arecanut, oil palm, rubber, cashew, tea, coffee and cocoa.

MODULE 3 -Soil fertility management (1 marks)

Soil – definition; different kinds of rocks; soil physical properties – soil structure, soil texture, particle density, bulk density, porosity; soil profile - soils of India and Kerala; soil organic matter – composition and properties; soil organisms; soil taxonomy and its characteristics-crop nutrition – classification of nutrients – fertilizers – Chemical fertilizers and their properties-Soil amendments -Straight and complex fertilizers, nitrogenous, phosphatic and potassic fertilizers; specialty

fertilizers –cutomised fertilizers and 100 per cent water soluble fertilizers; methods for improving nutrient use efficiency, biological nitrogen fixation and biofertilizers-- Fertilizer control order-

MODULE 4- Agrometeorology and Climate change (1 mark)

Agriculture and weather relations - climatic variability, global warming-causes of climate change and its impact on regional and national Agriculture-Weather modifications-Weather forecasting--Climate change-Climate chnge adaptation-Climate change mitigation

MODULE 5 -Irrigation and Weed management (1 mark)

Water requirement and irrigation requirement- Soil moisture constants – Evapotranspiration and consumptive use – potential evapotranspiration and reference crop evapotranspiration – crop coefficient – irrigation water quality criteria and its management-Water management of principal crops, critical stages of crops, depth and schedule of irrigation – rice, wheat, banana, coconut, cowpea, sugarcane and vegetables- Methods of irrigation-Agronomic techniques improve water productivity-
Crop water relations, water potential and its components, diffusion and osmosis, absorption of water; Transpiration and stomatal physiology, water use efficiency.

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-Weed control methods-Herbicide formulations- Methods of application-Selectivity of herbicides-Concept of Integrated Weed Management

MODULE 6- Organic farming, precision farming and nano technology (1 mark)

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-

Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture-; Geoinformatics- definition, concepts, tool and techniques- their use in Precision Agriculture-Nanotechnology- definition, concepts and techniques,- nano-particles-nano-pesticides-nanofertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scalingup farm productivity.

MODULE 7- Post harvest management and value addition of horticulture crops- land scaping and ornamental horticulture (3 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 techniques - Packaging technology-Government policies, regulations and specifications- Principles 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.

Landscaping, gardening and commercial Floriculture.–Principles of landscaping. - Lawn making-Annuals and herbaceous perennials - Specialized gardening techniques Roof garden, terrace garden, sunken garden, water garden, rock garden etc. Indoor gardening of plants Bonsai, vertical garden, tray garden, terrarium etc. Introduction to commercial Horticulture -Present status of the cut flower industry in India and abroad – Area under flower crops – Problems and prospects of commercial floriculture in India and Kerala- classification, varieties grown, identification, environmental requirements, propagation, media and containers, planting, care and management, nutrition, plant protection, harvesting and marketing of flower crops

MODULE 8- Agricultural Marketing, Entrepreneurship Development and Agricultural Extension Management (3 marks)

Agricultural Marketing – concepts and definitions – scope – Market and Marketing-meaning-definition-elements of a market-Classification of market-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)

MODULE 9 -Fundamentals of Entomology, management of crop pests of agricultural and horticultural crops, beneficial insects and nematodes (1 mark)

Classification of insects up to family- Important families, their identifying characters and economic importance- -Pest monitoring and surveillance.. Integrated Pest Management: Principles of IPM, -tools of IPM - advantages and disadvantages- Basic concept of host plant resistance-Biocontrol of pests and weeds: -Regulatory control of pest-plant quarantine and phytosanitory certificate-Pesticides: Insecticide act and rules- Insecticides – classification, mode of action and formulations - advantages and limitations - mammalian toxicity and environmental pollution. Insecticide appliances. Newer trends in insect pest management – pheromones, Insect Growth Regulators, Chitin synthesis Inhibitors, biotechnological method-
Distribution, bioecology, nature and symptoms of damage and management strategies of major insect pests of Field crops, vegetable crops, tuber crops, fruit crops-Distribution, biology, nature and symptoms of damage and management strategies of major insects of plantation crops, spices: ornamentals, medicinal and aromatic plants –Stored products: Primary feeders, secondary feeders, principles of storage to reduce storage losses
Honey bees: Species of honey bee-Types of bee hives and accessories. -Bee hive products- Diseases and enemies of honey bees and their management. Meliponiculture-Scope of beekeeping in Kerala. Silkworms: Species of silk worms and their bio-ecology. Rearing of mulberry silkworm, diseases and enemies of silkworm and their management. Scope of sericulture in Kerala. - Lac insects: Lac culture and its economic importance- Processing of lac- Enemies of lac insect-Beneficial insects: Insect pollinators, predators, parasites, weed killers, soil builders, scavengers Plant Parasitic Mites:. Mites infesting crops in Kerala- Mites as vectors of plant diseases. Management of mites. Rodents, birds and invertebrate pests.-Acaricides, rodenticides and molluscicides. Formulations and applications-Identification of important nematodes -– symptoms of important nematode diseases – Nematicides and their application

MODULE 10- Management of diseases of agricultural and horticultural crops (1 mark)
Classification of plant diseases. Important plant pathogenic organisms- Fungi, bacteria, fastidious vascular bacteria, virus,viroids, phytoplasma, spiroplasma, algae, protozoa, nematodes, phanerogamic parasiteswith examples of disease caused by them-Diseases due to abiotic causes.- variability of plant pathogens.-Defense mechanism in plants-Pathogenesis.
Principles and tools of IDM-.Epidemiology: Factors affecting disease development- Methods of detection and diagnosis of diseases-Principles and methods of plant disease management-.Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control- Survey, surveillance and forecasting of diseases.- Introduction to conventional fungicides and new generation fungicides for the disease management-Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics- Safety issues in pesticide uses.

Symptoms, etiology, disease cycle and management of major diseases of Field crops (Rice, wheat, maize, sorghum, bajra, finger miller, sugarcane, cotton, tobacco), oil seeds (groundnut, soybean, Sunflower, Castor), pulses (Pea, pigeonpea, gram, lentil), vegetables, tuber crops, onion and garlic, leafy vegetables, coriander-Post harvest diseases in field and vegetable crops etc.- Symptoms, etiology, disease cycle and management of diseases of coconut, arecanut, oil palm, cocoa, rubber, tea, coffee, cardamom, black pepper, betel vine, ginger, turmeric, clove, cinnamon, nutmeg, vanila, banana, mango, cashew, grape vine, citrus, pine apple, papaya, sapota, mulberry, apple, ornamental plants

PART - II - AGRICULTURAL ENGINEERING– 16 MARKS

Farm Machinery and Power Engineering (4 marks)

Primary and secondary tillage implements and its operations. Forces acting on tillage implements-field capacity-field efficiencies. Different sowing, planting, weeding, harvesting, threshing and winnowing equipment. Grain and straw Combines– computation of combine losses. Materials used in construction of farm machines - Heat treatment processes and their requirement in farm machines - Properties of materials used for critical and functional components of agricultural machines. Tractors and power tillers - engines -fuel, lubrication, cooling, power transmission and hydraulic systems. Tractor power outlets- PTO power and drawbar power. Hitching of implements – mounted, semi mounted and trailed type implements. Traction mechanics: pull and draft, coefficient of traction, tractive efficiency and weight transfer. Economics of machinery usage, fixed cost, variable cost - Methods for calculating depreciation - Estimation of cost of operation - Break even analysis – small, large and own, hired machine - Economic considerations in selection of farm implements and machinery. Testing of tractors and farm machines: Types, test procedure, national and international codes and types of tests. Importance of ergonomics and its application in agriculture; Assessment of energy expenditure- direct calorimetry, indirect calorimetry, basal metabolism and work metabolism.

Renewable Energy Engineering (2 marks)

Concept of Renewable Energy Sources (RES)-Clean Development Mechanism-Role of renewable energy for mitigation of Global warming, Classification of RES, Energy inputs for agricultural production. Solar Energy: Fundamentals and basic principles- Solar radiation measurement, Basic Principles of Solar thermal energy conversion, different solar thermal devices - Solar drying, Solar still. Solar Photo voltaic electricity production: Principles of Photo voltaic energy production-p-n junctions, Solar cells, PV Systems- Cell characteristics. Wind Energy: Energy available in wind, General formula, Lift and drag. Basics of Wind energy conversion. Bio-energy: Thermochemical

energy conversion of biomass – Biomass combustion- Biomass gasification, Types of gasifiers. Biochemical energy conversion of biomass: Anaerobic digestion process-types of biogas plants-Basic design aspects of Biogas plants operational and environmental parameters affecting biogas generation.

Soil and Water Conservation Engineering (4 marks)

Surveying – Instruments - Methods of surveying – Levelling – Definition - Types of benchmarks - Different types of levels –Total station and GPS survey. Hydrology – Hydrologic cycle-Measurement of rainfall-rain gauges- hyetograph and mass curves- evaporation and infiltration measurement – evapotranspiration measurement– Estimation of runoff-Factors affecting runoff – Computation of volume of runoff and peak flow. Soil erosion – Types – Factors affecting erosion by water and wind - Stages of water erosion -Biological control measures and their suitability - Contour farming, strip cropping, mixed cropping, intercropping and mulching - Mechanical control measures and their suitability –Design and construction of contour bunds, graded bunds, terraces, contour stone walls, contour trenches, staggered trenches and diversion drains - Gully erosion control structures- Drop spillway, chute spillway, drop inlet spill way and check dams - Wind erosion – Types and control - Dry farming techniques for improving crop production - Estimation of soil erosion - Universal Soil Loss Equation-RUSLE-MUSLE. Watershed – Concept, types and delineation - Linear, aerial and relief aspects of water sheds –stream order. Land capability classification - Participatory rural appraisal technique – Watershed development plan – Estimation of cost and benefits -Gully and ravine reclamation – In-situ & Ex-situ water harvesting systems, micro catchments – Ground water recharge - Farm pond and percolation pond – Selection of suitable soil and water conservation practices – Afforestation – Holistic planning - Watershed based rural development- Use of aerial photography and remote sensing in watershed management-Applications of GIS in planning and development of watersheds including forest cover and water resources- on-farm structures for water conveyance- control and distribution-drop structures. Underground pipe line system – Components and their functions – Structures for plant environment–Precision farming- Greenhouses, polyhouses and shade nets – Construction and utilization - Soilless cultivation. Remote Sensing: basic components, advantages and limitations. Types of sensors and platforms. GIS: basic components, spatial data, map projections, data models and its integration. Factors affecting quality of surface water and groundwater- domestic, industrial and agricultural activities- Drinking water quality standards, irrigation water quality classification as per USSL and All Indian Coordinated Research Project (AICRP) criteria. Point and non-point water pollution sources-water contamination due to inorganic and organic compounds- water contamination due to agricultural activities-Arsenic and fluoride contamination in groundwater and remedial measures- Water decontamination technologies.

Irrigation and Drainage Engineering (3 marks)

Occurrence of ground water- Verification of Darcy's Law-geological formations-aquifer, aquitard, aquiclude, aquifuge-Observation wells and piezometers-Hydraulics of flow in wells- types of wells and their construction - Well drilling – Techniques for different formations- Well logging - Types of well screen - Well design under confined and unconfined conditions- Design of well screens - Well development –Well Efficiency, Yield testing -Estimation of aquifer parameters by Theis method, Coopers-Jacob method, Chow’s method-Theis Recovery method- Estimating ground water balance-Study of artificial ground water recharge structures. Properties of fluids- Bernoulli's theorem-laminar flow in pipes-general equation for head loss-Darcy’s equation major and minor losses through pipes and fittings. Water conveyance and storage structures – Open channel hydraulics-Earthen channels and lined channels – Advantages of lining – materials of lining -Design of channel cross section Measurement of flow in open channels-Chezy’s and Manning’s equation- Current meter Kennedys theory- Lacey’s theory–Hydraulic jump-types – Cross drainage works –Culvert, aqueduct, syphon aqueduct, super passage, level crossing- Design features of earthen dams and

gravity dams. Irrigation - Sources – Soil- water- Plant relationship - infiltration characteristics of soil and equation - Water requirement of crops. Measurement of irrigation water - Weirs and flumes - Methods of irrigation – Surface and sub-surface irrigation methods- sprinkler and drip irrigation - Drip irrigation – Components – Wetting pattern - Filters and Fertigation devices - Design of laterals – Sub main - Main lines -Pump capacity - Operation and maintenance of Sprinkler irrigation - Components - Sprinkler performance - Hydraulic design of sprinkler systems - Duty and delta relationship – Irrigation scheduling - Irrigation efficiencies and their estimation Pumping systems- water lifting devices- different types of pumps, classification of pumps - Centrifugal pumps- parts of centrifugal pumps, priming, cavitation-pump selection, installation- affinity laws, total pumping head -NPSH- maximum suction lift- power requirement - performance curves- Maintenance and troubleshooting- hydraulic ram, propeller pumps, mixed flow pumps and their performance. Drainage - Causes of water logging and salt problem - Methods of drainage – Surface drainage system –types and design, coefficient- design parameters - hydraulic conductivity and its measurements- drainable porosity -Sub-surface drainage system-mole drains, tile drains-design of subsurface drainage system- Hooghout's drain spacing equations - Vertical drainage systems - Improvement and utilization of poor quality water - Reclamation of saline and alkali soils.

Processing and Food Engineering (3 marks)

Engineering properties of biological materials – classification - physical properties – size – shape – roundness-sphericity- functional properties of agricultural materials: static and kinetic frictions-rolling resistance- angle of internal friction - angle of repose-aerodynamics of agricultural products: drag coefficient and terminal velocity. Equipment for cleaning and grading. Cleaning and grading, aspiration, scalping; size separators, screens, sieve analysis, capacity and effectiveness of screens. Various types of separators: specific gravity, magnetic, disc, spiral, pneumatic, inclined draper, velvet roll, colour sorters, cyclone, shape graders. Heat transfer principles – Conduction, convection and radiation - Types of heat exchangers - Unit operations – Evaporators - Types - Mechanical separation – Filtration – Sedimentation – Settling – Centrifugal separation – Cyclone separation-Size reduction – Mixing – Blending – emulsification - Food processing operations- Pasteurization – Sterilization – Canning - Retort processing - Extrusion processing of foods - Methods of drying of foods-Preservation of food by irradiation - Microwave and dielectric heating - Fats and oil processing – Extraction methods and equipment - Food packaging – Materials and characteristics – Suitability - Processing of milk and milk products, packaging of milk - Principles of refrigeration and applications in food industries – Cold storage of fruits and vegetables - Design aspects. Drying: moisture content and water activity; Free, bound and equilibrium moisture content, isotherm, hysteresis effect, EMC determination, Psychrometric chart and its use in drying, Drying principles and theory, Thin layer and deep bed drying analysis, Falling rate and constant rate drying periods, maximum and decreasing drying rate period, drying equations, Mass and energy balance, Shedd's equation, Dryer performance, Different methods of drying, batch-continuous; mixing-non-mixing, Sun-mechanical, conduction, convection, radiation, superheated steam, tempering during drying, Different types of grain dryers. Size reduction machinery: Jaw crusher, Hammer mill, Plate mill, Ball mill. Material handling equipment. Material handling equipment. Types of conveyors: Belt, roller, chain and screw. Elevators: bucket, Cranes& hoists. Trucks (refrigerated/ unrefrigerated), Pneumatic conveying. Storage of grains, Causes of spoilage, Water activity for low and high moisture food and its limits for storage, Moisture and temperature changes in grain bins; Traditional storage structures and their improvements, Improved storage structures (CAP, hermetic storage, Pusa 4 bin, RCC ring bins), Design consideration for grain storage godowns, Bag storage structures, Shallow and Deep bin, Calculation of pressure in bins, Storage of seeds. Principles of processing and preservation: blanching and canning. Thermal processing of food – freezing, refrigeration and cold storage. Design, construction and cost estimation of farm structures; animal shelters, compost pit, fodder silo, fencing and implement sheds, barn for cows, buffalo, poultry, etc. Rural living and development, rural roads, their construction cost and repair and maintenance. Sources of water

supply and water treatment suitable to rural community. Site and orientation of building in regard to sanitation, community sanitation system; sewage system-design, cost and maintenance, design of septic tank for small family- Estimation of domestic power requirement.

PART - III - DAIRY SCIENCE AND TECHNOLOGY - 16 MARKS

Module No.& Name	Description
1. Dairy Technology - 4 Marks -	Milk and its various physical and chemical properties - Collection, transportation and chilling of milk – Milk processing methods including pasteurisation, homogenization, cream separation, sterilisation, UHT and thermization - Different types of milk and their legal standards – Manufacturing of traditional milk products – Fat rich dairy products – Condensed and dried milks – Fermented and coagulated milk products – Ice cream and frozen desserts – By-products from milk – Preservation, packaging and storage of milk and milk products – Judging and evaluating milk products – Dairy plant operations and management - Cleaning and sanitization of dairy equipment – Disposal of dairy waste and pollution control – Innovations in dairy processing.
2. Dairy Engineering - 3 Marks -	Basic engineering concepts and practices –Application of fluid mechanics and thermodynamics in dairy processing – Different type of heat exchangers in dairy industry – Boilers and steam generation – Fundamentals of electrical engineering – Refrigeration and air conditioning -Basic concepts and principles of various dairy operations – Filtration, cream separation, homogenization, pasteurization and sterilization – Classification and operation of various dairy equipment and their maintenance –Packaging machines for milk and milk products – Cleaning operations and CIP – Designing of dairy machines - Requirements for construction of dairy plants, including their design and layout – Energy conservation in dairy plant.
3.Dairy Chemistry - 3 Marks -	Composition of milk from different species and breeds of animals – Importance of milk constituents in human nutrition–Chemical composition and legal standards of milk products –Importance of chemical quality control and quality assurance - Testing of milk and milk products - Food safety standards and regulations in the dairy industry - National and international food regulatory systems – Chemical contaminants in milk – Detection of adulterants, preservatives and neutralisers in milk and milk products. Chemical quality of water in dairy industry – Advanced milk testing equipment.
4. Dairy Microbiology - 3 Marks -	Fundamentals of dairy microbiology - Microbial contaminants and spoilage of raw milk – Sources of contamination - Types of microbial spoilage - Concept of clean milk production–Public health aspects of fluid milk – Milk-borne diseases, food infection, intoxication and toxic-infection caused by pathogenic microorganisms - Microbiology of milk products - Cream, butter, ice cream and frozen desserts – Starter cultures and fermented milk products – Consumer awareness about microbiological quality and safety of dairy foods –Food safety management system – Microbiological risk analysis- Microbiological grading and legal standards of raw/processed milk and milk products – Functional foods, nutraceuticals, probiotics, antioxidants and cultured dairy products.
5.Dairy Business Management - 3 Marks -	Overview of Indian dairy industry - Classification and characteristics of dairy animal breeds and their identification – General dairy farming practices – Breeding, feeding and management of dairy animals – Fodder production – ICT and AI application in dairy industry - Basic concepts of dairy economics – Elementary concepts of operations research – Extension teaching methods –

	Dairy development programmes in India – Operation Flood and Anand Pattern Cooperatives – Annual statement of accounts – Balance Sheet and Profit and Loss Account - Milk marketing in organized and unorganized sectors – International trade of milk and milk products - Basic industrial statistics - Dairy entrepreneurship development –Dairy plant management systems – Project management and project appraisal techniques.

PART - IV - VETERINARY SCIENCE AND TECHNOLOGY - 16 MARKS

1. LIVESTOCK PRODUCTION MANAGEMENT - 3 Marks

Demographic distribution of livestock and role in Indian economy. Problems and prospects of livestock industry in India. Body conformation and identification. Transportation of livestock. Common farm management practices. Drug administration. Livestock production systems. Animal holding and land holding patterns in different agro-climatic zones. Organic livestock production. Judging and BCS for body parts of livestock. Preparation of animals for show. Culling of animals. Selection and purchase of livestock.

Importance of grasslands and fodder in livestock production. Housing systems, layout and design of different buildings for animals. Routine animal farm operations and labour management. Animal farm accounts and records.

Animal welfare in relation to ecosystem and environmental factors. Role of veterinarians in animal welfare. Animal welfare organizations, Animal Welfare Board of India. Rules, regulations, laws on animal welfare. Prevention of Cruelty to Animals (PCA) Act, 1960 {59 of 1960). Role and function of Committee for the Purpose of Controlling and Supervising Experiments in Animals (CPCSEA). Legal duties of veterinarians, Common offences against animals and laws related to these offences. Provincial and Central Acts relating to animals. Laws relating to offences affecting Public Health. Livestock Importation Act. Code of Conduct and Ethics for veterinarians - the Regulations made under the Act.

Indian poultry industry– poultry statistics. Housing –space requirements of poultry. Recent advances in housing systems and rearing systems. Feeding management–Feeding systems. Breeding for specific characters and for hybrid chicken production. Poultry judging.

Principles of incubation and hatchery management practices. Economics of hatchery business – Troubleshooting hatchery failures–Computer applications in hatchery management. Poultry waste management. Organic and hill farming. Mixed or integrated poultry farming

Vertical & horizontal integration in commercial poultry production – Contract farming. Export or import of poultry produce and marketing.

2.VETERINARY AND ANIMAL HUSBANDRY EXTENSION EDUCATION - 3 Marks

History of domestication and their social dimensions. Evolution and relationship between agriculture and animal husbandry. Farming and characteristics of farming in India. Classification of farming, types and systems. Role of animals in the contemporary society.

Early extension efforts in India. Types of education. Extension education. Concept of need and its types. Rural development. Panchayati Raj System.

Concept of sociology and rural sociology in animal husbandry extension. Culture. Basic sociological concepts. Rural society. Social control. Social stratification. Social institutions in rural society. Social change. Social groups. Leadership.

Technology. Adoption and diffusion of innovations. Programme planning. Evaluation of

extension programme. Role of extension agents in diffusion of livestock innovations. Cattle and buffalo improvement programmes. Dairy development programmes. Transfer of technology projects of Indian Council of Agricultural Research (ICAR): Krishi Vigyan Kendra (KVK), Agricultural Technology Information Centre (ATIC), Agricultural Technology Management Agency (ATMA), National Agricultural Innovation Project (NAIP), Rashtriya Krishi Vikas Yojana (RKVY) etc. Different ongoing central and state government animal husbandry development programmes.

Communication and its functions. Basic concepts, Types, Elements, Barriers. Individual contact methods. Group contact methods. Mass contact methods. Selection and use of extension teaching methods..

Introduction to Economics and Livestock Economics. Basic concepts. Important features of land, labour, capital and organization. Theories of demand, supply and cost. Theories of production. Concept of market. Marketing functions. Marketing agencies, institutions and channels for livestock and livestock products. Government interventions and role in marketing of livestock and livestock products. External trade in livestock products, recent policies on trade and international trade agreements and their implications in livestock sector.

Entrepreneur, entrepreneurship, enterprise, and manager. Financial management. Project appraisal. Institutions promoting entrepreneurship in India. Entrepreneurship development programmes. Accounting. Resource management.

Strengths and limitations of ICTs application in livestock sector and farmers capacity building. Cyber extension. Computer networking.

Gender and animal husbandry. Recent livestock census, livestock insurance scheme, national livestock mission. Sustainability. Environmental consequences of livestock rearing. Animal welfare, ethics and rights. Importance of animal welfare in the contemporary society. Expectations from veterinary professionals.

3.ANIMAL GENETICS AND BREEDING - 3 Marks

Biostatistics. Classification and tabulation of data. Graphical and diagrammatic representation of data. Measures of Central tendency. Measures of Dispersion. Probability and probability distributions. Moments, Skewness and Kurtosis. Correlation and Regression. Sampling methods. Tests of hypothesis- t and Z- tests. Chi-square test. Design of experiment- Completely randomized design (CRD). Randomized block design (RBD). Analysis of variance and F-test of significance. Non-parametric tests.

Computer Application. Data Base Management. Review of MS-Office. Analysis of data using MS-Excel. Concepts of computer networks, internet & e-mail.

Population Genetics: individual vs population. Genetic structure of population. Hardy - Weinberg law and its application. Forces changing gene and genotypic frequencies. Quantitative vs qualitative genetics; concept of average effect and breeding value. Components of Variance. Concept of correlation and interaction between Genotype and Environment. Heritability and Repeatability. Genetic and Phenotypic Correlations.

Economic characters of livestock and poultry and their importance. Selection, types of selection, Bases of selection. Method of selection. Classification of mating systems. Inbreeding coefficient and coefficient of relationship. Breeding strategies for the improvement of animal production. Methods livestock and poultry conservation programmes in the state and country. Application of reproductive and biotechnological tools for genetic improvement of livestock and poultry. Breeding for disease resistance.

4.VETERINARY PUBLIC HEALTH AND EPIDEMIOLOGY - 2 Marks

Aims and scope of Veterinary Public Health. Role of veterinarians in public health. One Health concept and initiatives. Veterinary Public Health administration. Elements of meat inspection and meat hygiene practices. Pathological conditions associated with the transport of food animals. Hygiene in abattoirs and meat plants. Detection of conditions or diseases and judgements during ante mortem and post mortem inspection. Speciation of meat. Animal welfare and public health issues.

Types of biohazards. Hazard analysis and critical control points (HACCP) system. Importance of ISO 9000 and 14000 series in meat industry. Risk analysis, assessment and management. International food safety standards: World Organisation for Animal Health (OIE), World Trade Organization (WTO) agreements and Codex Alimentarius Commission. Food Safety and Standards Act and Regulations. Role of Food Safety and Standards Authority of India (FSSAI), Bureau of Indian Standards (BIS) and other national agencies.

Measures and patterns of disease occurrence. Survey and surveillance of animal diseases and related parameters. Epidemiological methods- Descriptive, analytical, experimental, theoretical, serological and molecular. Animal disease forecasting. Strategies of disease management: prevention, control and biosecurity. Economics of animal diseases. National and international regulations on livestock diseases. Role of OIE and laws on international trade of animals and animal products.

Socio-economic impact of zoonotic diseases. Classification of zoonoses and approaches to their management. Multisectoral approach for zoonoses prevention and control. Emerging, re-emerging and occupational zoonoses.

Scope and importance of Environmental Hygiene. Ecosystem. Biodiversity. Natural resources. Environmental contaminants. Environmental pollution. Water purification methods for community water supplies. National rules and legislations related to environmental pollution and role of pollution control board in India. Biosafety. Disaster management and mitigation. Solid and liquid waste management at farms/ animal industries and biomedical waste management. Sanitation and disinfection of farm and hospital environment in veterinary public practice for infection control. Global warming and greenhouse effect- Definition, greenhouse gases, impact of climate change and international treaties or protocols.

5. LIVESTOCK PRODUCTS TECHNOLOGY - 2 Marks

Retrospect and prospects of milk industry in India. Layout of milk processing plant and its management. Introduction to functional milk products. Common defects of milk products and their remedial measures. Packaging, transportation, storage and distribution of milk and milk product*s*. Good manufacturing practices and implementation of HACCP in milk plant.

Layout and management of rural, urban and modern abattoirs. HACCP concepts in abattoir management. FSSA standards on organization and layout of abattoirs. Animal welfare and pre-slaughter care, handling and transport of meat animals including poultry. Procedures of Ante-mortem and post mortem examination of meat animals. Slaughtering and dressing of meat animals and birds. Emergency and casualty slaughter. Evaluation, grading and fabrication of dressed carcasses including poultry.

Prospect of meat industry in India. Modern processing technologies of meat and meat products. Laws governing national or international trade in meat and meat products.

6. VETERINARY GYNAECOLOGY AND OBSTETRICS - 1 Marks

Applied reproductive physiology and endocrinology -Clinical management of specific and non-specific forms of infectious infertility- Role of nutrition, climate and stress on reproductive efficiency- Managemental causes of infertility- Diagnostic procedures in infertility investigation. Herd reproductive health management and fertility parameters in individual animals and in herds. Assisted reproductive techniques. Methods of Population control by medical and surgical techniques. Farm and pet animals - Maternal recognition of pregnancy – Applied Endocrinology of pregnancy – Pregnancy diagnosis- Duration of pregnancy -Factors affecting gestation length. Farm and pet animals - Puberty and sexual maturity and factors affecting them.

7. ANIMAL NUTRITION 1 Marks

Importance of nutrients in animal production and health. Common feeds and fodders, their classification, availability and importance for livestock and poultry production. Measures of food energy and their applications. Feed technology- Feed industry. Preparation, storage and conservation of livestock feed. Harmful natural constituents and common adulterants of feeds and fodders. Feed additives in the rations of livestock and poultry and their uses.

Feeding standards, their uses and significance, merit and demerits of various feeding standards with reference to ruminants. Balanced ration and its characteristics.

Nutrient requirements and methods for assessing the energy and protein requirements for maintenance and production. General principles of computation of rations.

7.VETERINARY MEDICINE - 1 Marks

Scope of Veterinary Medicine, concept of animal diseases. Concepts of diagnosis, differential diagnosis, treatment and prognosis. General systemic states. Estimates of diseases, patterns of disease, disease monitoring and surveillance, herd health and quarantine.

Legal duties of veterinarians, laws related to medicine, evidence, common offences against animals and laws related to these offences. Examination of living and dead animals in criminal cases. Cruelty to animals and bestiality. Legal aspects of: Examination of animals for soundness, examination of injuries and post-mortem examination. Causes of sudden death in animals. Collection and despatch of materials for chemical examination, detection of frauds-doping, alternation of description, bishoping etc. Cattle slaughter and evidence procedure in courts. Provincial and Central Acts relating to animals. Glanders and Farcy Act 1899 (13 of 1899). Dourine Act 1910 (5 of 1910), Laws relating to offences affecting Public Health. Laws relating to poisons and adulteration of drugs. Livestock importation act, liability and insurance. Code of conduct and ethics for veterinarians - the regulations made under the Act.

Animal welfare organizations and its role in animal welfare, welfare assessment, behaviour and animal welfare, principles and philosophy of animal welfare, animal welfare ethics, improving animal welfare through legislation and incentives, assessment of physiological, behavioural, disease and production measures of animal welfare, assessing welfare in practice, environment enrichment, euthanasia, welfare of animals used in education and research and transportation, religion and animal welfare, human and animal welfare conflict, veterinary disaster management, humananimal interactions, economics and animal welfare and veterinarians as animal welfare educators

PART - V - FISHERIES SCIENCE- 16 MARKS

Module 1 Fisheries Resource Management - 2 Mark

Status and trends of major inland fisheries with special emphasis on estuarine and reservoir fisheries

of India.Fish diversity/Catch composition, major finfish & shellfish fisheries and problems of fisheries.Status and trends of major marine fisheries with special emphasis on pelagic and demersal fisheries of India.Fish diversity/Catch composition, major finfish & shellfish fisheries and problems of fisheries. Fishery Sustainability issues – Pollution, overexploitation, habitat degradation, satellite/computer assisted fishing, bye-catch and discards, transboundary issues. Sustainability Management –Responsible fishing, licensing & ban period, input control, laws and policies like minimum legal size, spawn aggregates, access right. Right based fishing. National and international treaties, National policy on marine fisheries 2017 and National policy on inland fisheries, 2019.

Module 2. Aquatic Environment Management - 1 Mark

Types of Aquatic resources: River, Ponds, Wetlands, Floodplains, Swamps, Estuaries and Mangroves. Man and aquatic environment: socio-cultural relationship. Services offered by aquatic environment. Ecological components: Abiotic factors (physic-chemical factors) and biotic factors. Primary productivity and Eutrophication.Biogeochemical cycles. Pollution: point and non-point sources and management of pollution.

Module 3. Aquaculture, Fish Nutrition & Breeding - 4 Mark

Principles of Aquaculture: Definition and History. Overview of inland aquaculture and mariculture. Significance and types of aquaculture. Farming systems: Traditional, intensive, extensive; Integrated and modern systems etc. Advancements in Culture systems. Aquaculture Operations: Water quality and management. Pond preparation and water management. Design and layout of ponds. Farm management. Feeding and management of production ponds. Harvesting and storage. Equipments in Farms.

Hatchery Technology: Brood stock management and breeding. Hypophysation and Eyestalk ablation. Different types of hatcheries. Lay out of hatcheries and hatchery management. Larval rearing and stocking. Live feed culture and algal culture. Fish nutrition and Health: Nutrition and bio-energetics, feed ingredients, feed formulation, feed preparation (pelletisation, extrusion), feed management. Diseases of fishes: Bacterial, viral, fungal, parasitic and nutritional diseases and management.

Breeding: Historical development of genetics and breeding. Domestication and breeding. Ethical issues. Brood stock rearing and management. Brood stock nutrition. Hatchery and hatchery complex. Layout and management of hatchery. Types of hatcheries. Techniques for artificial breeding-Hypophysation and eye stalk ablation.

Module 4. Fish Processing Technology - 2 Mark

Nutrition and quality of Fish. Rigor-mortis. Spoilage of fish. Assessment of spoilage, Potential control measures used in the industry to extend the shelf life of fresh fish. Icing: quality of ice, methods of icing. Freezing Technology: Basic principles, Freezing equipments used in seafood industry, Block freezing, Individual quick freezing (IQF), Cryogenic freezing, Cold store. Drying: Commercial fish drying methods, Salting, Smoking. Thermal processing. Canning: steps involved, containers, retorts, retort pouch. Modified Atmosphere Packaging. Freeze-drying of fishery products. Irradiation preservation of fish. Marine bye-products. Microbiology of fish and shellfish. Spoilage Bacteria. Bacteria of human health significance in seafood. Seafood quality standards. HACCP. Seafood processing plant layout.

Module 5. Fishing Technology & Engineering - 1 Mark

Crafts and gears. ISSCFG classification of gears. Design fabrication and operation of major gears in India. Important fishing boats its classification. Sea safety equipments. Communication devices, navigational devices. Fish finding equipment. Byecatch reduction methods. Prohibited fishing practices. Vessel monitoring system. Catch certification.

Module 6. Fisheries Economics, Extension & Entrepreneurship - 5 Mark

Need, Scope and importance of Fisheries/Aquaculture extension. Introduction to extension education, research and service; Review of philosophy, principles, concepts, and practices of fisheries extension systems and approaches; Overview extension systems in India. Fisheries legislation in India. Marine fishing policy 2004. Marine Fisheries Regulation Act (MFRI). Guidelines for fishing operations in Indian EEZ. Coastal Zone Management. The Coastal Aquaculture Authority Act 2005. Coastal Regulation Zone (CRZ) Notification, 2011. Island Protection Zone (IPZ) Notification, 2011. Aquaculture Regulations – Land lease and use of fish seeds, chemicals antibiotics etc. Wildlife (Protection) Act of India. National and state governmental organizations.

Deep Sea Fishing Policy of India. Fisheries policy of Kerala. KMFRA (Kerala Marine Fisheries Regulation Act) 1980. History and status of ban on trawling during monsoon. The Kerala Inland Fisheries and Aquaculture Act (2010). Entrepreneurship: Cost component analysis. Production function analysis. Preparation of financial statements. Planning and Budgeting: Income and budget estimate preparation. Resource, labour and financial management. Management risk and uncertainties. Preparation of project proposals. Value chain analysis and post-harvest operations management. Fishery trade, concepts of trade, GATT&WTO. Fishery export, import and procedures. Fishery co-operatives and co-operative institutions. Setting up of a fishery/aquaculture entrepreneurship.

Aquaculture Project valuation – Methods of valuation, Risk valuation and assessment. Business analysis requirements. Business analysis. Modelling and forecasting of business analysis. Marketing: Marketing intelligence and research. Marking research methods and data analysis. Report preparation of market analysis. Fishery development schemes and policies. Rural Development and women empowerment. Fisher folk and sociology. Fishery village concept.

Module 7. Fish Biotechnology - 1 Mark

Modern concept of gene. DNA replication and protein sysnthesis. Transfer and regulation of genetic information. Fish genome (Zebra fish). Chromosome and ploidy induction. Sex reversal. Chromasomal aberrations. Mutation. Population Genetics. Genetic drift and inbreeding and management. Pleiotropy, Penetrance. Fish Pedigree. Reproductive cycle and factors affecting sexual maturation. Genome and DNA library. Cloning and strategies. Vectors in genetic engineering.

PART - VI - CO - OPERATION & BANKING - 20 MARKS

SL. NO	Subject	Module	MARkS
1	Theory and Principles of Co-operation	Concept of Co-operation, Co-operatives and other forms of business-Institutional values and Enterprise values of co-operation. Pioneers of cooperative movement-Robert Owen, Rochdale Pioneers, Raiffeisen,Schultze, Wollemburg and Luzzati. Statement on co-operative identity: Definition, values and principles -History and Development of Co-operative movement in India: Pre and post-independence period developments- Role of ICA in co-operative development.	5
2	Co-operative banking	Co-operative banking structure in India-Organizations under short term and medium term credit structure - Primary Agricultural Credit Societies (PACS), District Cooperative Banks (DCB), State Cooperative Bank (SCB) - objectives,functions, resources, lending	5

		operations. Organizations under long term credit structure - Primary Co-operative Agricultural and Rural Development Banks (PCARDB), State Cooperative Agricultural and Rural Development Banks (SCARDB) - objectives, functions, resources, loan operations. Urban Co-operative Banks in India -evolution, objectives, functions, structure, resources, loan operations. Employees Credit Societies -objectives, functions, resources, loan operations. Role of NABARD in co-operative credit.	
3	Agri-business co-operatives	Concept of agri-business, agri-business co-operatives. Dairy co-operatives: history, Operation Flood Programmes, National Dairy Plan, types, objectives &structure of Dairy Cooperatives. Processing Co-operatives: need, objectives and functions. Marketing Co-operatives: importance, objectives, functions and types. Structure and special features of other types of co-operatives : Fisheries Co-operatives, Consumer Co-operatives, Labour Co-operatives, Weavers Co-operatives, Housing Co-operatives, Coir Co-operatives, College Cooperatives, Hospital Co-operatives. MARKETFED, KERAFED, RUBBERMARK, KCMMF, NAFED, NCDC, NCDFI, NDDB, IFFCO, KRIBHCO.	4
4	Co-operative Legal System	History of co-operative legislations in India: Co-operative Credit Societies Act1904- Co-operative Societies Act 1912. Multistate Co-operative Societies Act 2002-objects , need, application, registration, rights and liabilities of members, management, audit, inquiry and winding up. 97th Constitutional Amendment Act 2011- History of co-operative legislations in Kerala. Important provisions of Kerala Co-operative Societies Act and Rules 1969 : Registration, Amendment of bye-laws, amalgamation and division, Members-rights and liabilities. Management of societies: general body, representative general body, committee, election, supersession. Properties and funds of co-operative societies, Disposal of net profit, Investments, Audit, Inquiry, supervision and inspection, Settlement of disputes, winding up and dissolution of co-operative societies.	3
5	Accounting & Auditing in Co-operatives	Co-operative Accounting-Books and registers maintained by co-operative societies- daybook, ledgers. R & D Statement, Final Accounts. Audit : meaning, definition and objectives. Co-operative Audit: definition, features and objectives. audit memorandum, levy of audit fees, powers of co-operative auditor, procedures of audit, directorate of co-operative audit. Stages of audit work: audit programme, vouching, routine checking, verification and valuation of assets and liabilities, assets classification, reserves and provisions. Audit classification and Audit Certificate.	3

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.

****