

**DETAILED SYLLABUS OF EXAMINATION FOR THE POST OF AGRICULTURAL
ASSISTANT GRADE II IN AGRICULTURE DEVELOPMENT & FARMERS WELFARE
DEPARTMENT**

CAT NOS: 528/2023, 529/2023

(TOTAL MARKS 100)

Module 1: Crop production Principles, Practices

Marks:10

1. ***Fundamentals of crop production:*** Agronomic classification of crops- Cereals - Pulses - Millets - Oil seeds -Tuber crops - Fruits - Vegetables - Spices and Condiments - Plantation crops - Medicinal and aromatic plants -Fibre crops - Sugar crops - Fodder crops - Narcotic crops - Green Manure crops. Elements of crop production – factors affecting crop production- -crop yield contributing characters-biological and economic yield- harvest index. Tillage and tilth – characteristics of good tilth — types of tillage- primary and secondary tillage implements. Seeds and sowing – seed definition – methods of sowing - seed drills and other implements - transplanting. Vegetative propagation of field crops –spacing - planting geometry. Soil fertility vs soil productivity –organic manures – bio-fertilizers – green manures - forms of fertilizers-time and methods of application. Calculation of fertilizers for important crops – methods to improve FUE .
2. ***Farming systems:*** Cropping pattern - terms and definition - multiple cropping and various forms of inter cropping- sequential cropping- crop rotation- catch cropping and cover cropping- strip cropping- nurse cropping- trap cropping. Cropping systems in various parts of Kerala- multi-tier cropping system - crop cafeteria - multiple cropping. Rice based cropping systems. Important cropping systems in India. Farming system – components -livestock- poultry- aqua culture -duck- pig etc. Integrated farming systems in Kerala .Agro climatic classification of Kerala Concept and different types of farming system with examples Their merits and demerits - Monocropping - Crop rotation - Inter cropping - Mixed cropping - Ratoon cropping - Multitier cropping - Relay cropping - Mixed farming - Homestead farming. Integrated Farming System-Concepts -Goals - Components –Mushroom, Vermiconpost, Azolla, Fundamentals of Livestock, Poultry & Aquaculture, Common livestock & poultry breeds Biogas Plant - Advantages and disadvantages. Organic farming and related concepts and processes; Sustainable Agriculture-concept and themes- environmental health- profitability - strategies for realizing sustainable agriculture- low and high input agriculture. Alternate agricultural systems-biodynamic farming -natural farming- permaculture- organic farming and other systems. Organic farming tools and practices-planned crop rotation- green manures and cover crops- multiple cropping. Importance of organic matter – types of organic manures-Green manuring and crop residue management- Organic recycling and waste management. Organic systems-models for wetlands- dry lands and homesteads. Organic farming accreditation and certification agencies. Precision farming and other innovative methods. Dry Farming and Agro-forestry- tree species- nursery management in agro forestry. Bio diesel plants and other economic plants
3. ***Watershed management:*** Land use capability classification. Measurement of slope of an area and preparation of contour bunds. Locating major irrigation dams in Kerala. Resource appraisal-basic and secondary data collection-water resources. Familiarization

of cadastral and contour maps and delineation of watersheds. Soil and water conservation structures- percolation pits- renovation of existing ponds etc. Agronomic measures- contour bunds- strip cropping- afforestation- vegetative fencing. Opening basins around coconut and areca nut. Water harvesting structures- Ferro cement tank- ground level tank- mechanical measures. Methods of ground water recharge- roof water harvesting- percolation pits etc. Monitoring ground water level. Preparation of watershed development plan of a village. Watershed characteristics-physical and geomorphological analysis of data for watershed management Watershed programs

Module 2: Agrometeorology

Marks: 05

1. **Meteorology:** Agricultural meteorology-definition, weather and climate, microclimate, meteorological observatory and instruments to measure weather elements, automated weather stations, weather forecasting, and its role in crop production. Atmosphere – composition — global warming and climate change. Meteorological observatory and instruments-lay out of Agro met observatory. Drought – types of drought – disaster management –mitigation
2. **Agricultural Seasons:** Crop seasons in India and Kerala - *Njattuvela*, Monsoons in Kerala, Climate change adaptation, mitigation, vulnerability

Module 3: Soil Health and Fertility Management

Marks:10

1. **Fundamentals of soil:** Definition of soil – earth-origin-earth crust-composition. Rocks and minerals– different kind of- rocks- minerals-formation and classification. Weathering of rocks and minerals-type and classification. Soil formation (horizons, monolith etc) and profile development. Properties of soil -physical properties –texture, structure-classification etc. Soil chemical and biological properties. Soil colloids-colloidal properties-different kind of colloids. Layer silicate clay minerals-genesis –classification and source of charges. Soil water and soil air. Soil taxonomy and its characteristics -Soil classification-different systems of classification. Remote sensing and GIS. Land capability classification. Soils of Kerala. Soils of India. Soil acidity, liming materials and lime requirements. Soil salinity and soil alkalinity and its amelioration
2. **Soil erosion and conservation:** Soil erosion- Definition, nature and extent of erosion-types of erosion-splash- sheet - rill- gully and landslides; water erosion- Wind erosion. Soil and water conservation-agronomic measures. Mechanical measures of soil conservation. Water harvesting techniques, types of erosion Soil and water conservation-agronomic measures- mulching, contour farming, strip cropping, alley cropping, multitier cropping, mixed cropping, intercropping, crop rotation, grass/fodder cultivation, cover cropping, zero tillage, biofencing/ vegetative fencing.
3. **Engineering conservation measures:** Percolation pits/ soak pits, contour bunding, making basins around trees, trenches, bench terracing, check dams, gabions, inward and outward terracing, brushwood check dams, gabion checkdams, artificial water holding structures and renovation of existing bunds, weirs, sidewalls, geotextiles.
4. **Plant nutrition:** Arnon's criteria of essentiality and essential and beneficial elements. Forms of nutrients in soil-Essential elements-macro and micro, Functions, Deficiency and toxicity symptoms of N, P, K. Manures and fertilizers-classification, Organic manures-bulky and concentrated- FYM, compost, different composting methods, green manuring - mechanisms of nutrient transport to plants-factors affecting nutrient availability to plants.

Metabolic functions of nutrients. Deficiency and toxicity of nutrients and their correction. Causes, practices to maintain soil health, Soil quality monitoring- Soil testing- Chemical methods-critical levels of nutrients in soil. Plant analysis-critical levels of nutrients in plants. Biological methods of fertility analysis. Chemical fertilizers-straight, complex and mixed fertilizers-trace element fertilizers. Organic manures-bulky and concentrated. Bio-fertilizers-group of bio-fertilizers. Integrated nutrient management- Integrated plant nutrient management system. Nutrient cycles in soil- C,N,P,S. Organic farming-concepts and components. Soil health card, Remote Sensing and GIS.

- 5. Tillage:** Definition and objectives, types and effects of tillage in soil- zero tillage, minimum tillage, primary and secondary tillage implements, and small farm machinery
- 6. Fertilizers & manures:** Chemical fertilizers-straight, complex, mixed fertilizers, biofertilizers- examples and use. Integrated Nutrient Management, Methods of fertilizer application, , Soil fertility evaluation- soil testing, plant tissue analysis-DRIS methods, critical levels in plants, rapid tissue test, indicator plants, biological methods of soil fertility evaluation, Calculation of fertilizer requirement, KAU Fertulator
- 7. Organic nutrient management:** Soil based plant nutrient management information system. Organic farming and sustainable agriculture- Component of organic farming and their role in sustainable crop production, nutrient management in organic farming, preparation and use of *panchagavya* and *jeevamruth*, disease and pest management in organic farming, biofertilizers

Module 4: Field crops and production practices

Marks:10

- 1. Rice:** Climatic requirements - Soil - Season - Varieties (Recent varieties and Geographic Indexing) - Seed rate - Seed Treatment - Nursery preparation - Wet – Dry – Dapog - Spacing - Fertilizer Recommendation -cultural practices, Common weeds in Rice fields - Kole, Kuttanad, Pokkali, Kaipad cultivation - Transplanting – IPDM- System of Rice Intensification (SRI) technique - Scope of farm Mechanization in rice cultivation and Post Harvest Handling-Value addition-Current Trends in Rice production. Distribution of cereals and millets- differences between cereals and millets. Botany and growth phases- climate and soil requirement- land preparation- seeds and sowing – varieties – fertilizer management- irrigation- weed control- value addition and marketing of maize-sorghum- barley and oats -other millets-
- 2. Tapioca:** Climatic requirements - Soil - Varieties - Propagation - Mini sett propagation technique - Preparation of Land - Season and Planting - Manuring - Irrigation - Intercropping - Value addition - Pests and Diseases - Biopesticide from Tapioca. Current trends in Tapioca production.
- 3. Fodder Crops:** Guinea grass - Hybrid Napier - Congo Signal Grass - Subabul - Agathi - Stylo - Mention Silo, Silage, Haylage-Planting material-Fertilizer recommendations -Harvesting -Yield-varieties.
- 4. Other crops:** Sugar crops-sugarcane-sugar beet-fibre crops-cotton- jute and other minor fibre crops-fodder and forage crops. -sweet potato - potato-yams-aroids-coleus-other minor tuber crops-pulses- cowpea-green gram - horse gram- - black gram-red gram- chick pea- soybean and other pulses-oil seeds - ground nut, sesamum-sunflower-other oilseed crops.

1. ***Vegetable production:*** Solanaceous vegetables. Brinjal – Tomato – Chilli, Varieties -Seed rate -Spacing - Manuring - Pest and Diseases Cucurbitaceous vegetables Bitter gourd – Snake gourd - Bottle gourd – Ash gourd – Pumpkin – gherkins, Varieties - Seed rate - Spacing - Manuring - Pest and Diseases Cool Season Vegetables Carrot – Cabbage – Cauliflower, Varieties - Seed rate- Spacing - Manuring - Pest and Diseases. Amaranthus, Bhindi, Cow pea Varieties - Seed rate- Spacing - Manuring -Pest and Diseases, Kitchen Garden, Terrace Cultivation Protected cultivation, open precision farming
2. ***Plantation crops:*** **Coconut** - botany-varieties-selection of mother palm- seed nut collection production and selection of seedling- climate and soil-site selection-layout and planting- care and management of young and adult palms-manuring- irrigation- moisture conservation intercropping-coconut based cropping system-major pest and diseases and their management harvesting- tapping- products and by products-coconut based industries. **Areca nut:** importance-botany and varieties- climate and soil-mother palm selection-nursery technique selection of seedlings- site selection-land preparation-lay out and planting- management of palms- major pest and diseases and their management-areca nut based cropping systems harvesting -processing-marketing. **Oil palm:** botany and varieties- seed germination and other nursery techniques- climate and soil-site selection- lay out –planting- management of palms harvesting -processing. **Rubber:** botany and varieties-clones-nursery techniques- climate and soil-site selection-layout and planting- management of plantation- management of trees before and after commencement of tapping-cover cropping-intercropping-systems of tapping- latex stimulation-major pest and diseases and their management-processing of latex –products. **Cashew:** botany and varieties- nursery technique- climate and soil-site selection-layout and planting-cultural practices-intercropping-harvesting- major pest and diseases and their management-processing of nut and apple. **Tea:** botany-clones- climate and soil- nursery techniques-site selection-land preparation-lay out and planting- shade regulation-climate and soil-cultural practices-systems of training and pruning- harvesting and processing. **Coffee:** botany and varieties- nursery technique- climate and soil- layout and planting-management training and pruning-manuring-irrigation- flowering- harvesting- processing. **Cocoa:** botany and varieties- climate and soil- nursery techniques- lay out-land preparation- planting manuring and other management-training and pruning- harvesting and processing
3. ***Spices- medicinal and aromatic plants:*** Introduction: spices- condiments- culinary herbs- medicinal and aromatic plants-definition-classification and uses. **Pepper:** botany and varieties-climate and soil propagation and nursery techniques-site selection- layout and planting of standards and pepper- crop management including manuring-irrigation-shade regulation-harvesting processing-pest and diseases management. Cultivation practices of **betel vine. Ginger, turmeric-** varieties- climate and soil-site selection-land preparation-planting-cultural and manurial practices-harvesting-pest and diseases management - rhizome curing—storage products. **Cardamom:** varieties- climate and soil- propagation – nursery techniques planting Manuring-weeding-trashing-mulching-irrigation-shade regulation-harvesting- processing-pest and disease management. **Nutmeg:** propagation-climate and soil-planting and after care cultural practices- crop management-flowering – harvesting-processing. **Cinnamon- clove-all spice and minor spices:-**propagation-

climate and soil-planting and after care-harvesting – processing. **Vanilla** - propagation-climate and soil-planting and after care -flower induction hand pollination- harvesting and processing. Importance and scope of medicinal plants-active principles. Varieties-cultivation- post harvest handling- active principles and uses of major medicinal plants. **Aromatic plant cultivation**- varieties- planting- management and harvesting of major aromatic crops- **lemon grass- palmarosa-- citronella- vetiver**. Other minor medicinal and essential oil yielding plants

4. ***Fruit Culture and propagation:*** Importance- production and productivity-commercial importance- classification of fruits based on climatic requirements-nutritive value of fruits-

Mango-varieties-climatic and soil requirements-problem and prospects of mango cultivation. Propagation methods/major pre planting and post planting operations-manurial requirements of mango-plant protection flowering-factors affecting flowering-fruit set and fruit drop-use of growth regulators-harvest indices- ripening- harvesting-grading-packing- storing and transporting-post harvest utilization.

Banana- Scientific name - Soil - Site selection - Important Varieties, GI varieties genomic classification-scoring- climate and soil requirements-propagation-selection of suckers-planting in commercial plantations- manuring- irrigation and other post planting operations-flowering and factors affecting flowering and fruiting-harvest indices-harvesting- grading-packing ratooning - plant protection.

Pineapple- varieties- general plant description-flowering and fruit characters- climate and soil-propagation-systems of planting-population density-manuring and inter cultural operations- flowering - manipulation of flowering through bio-regulator application-harvest indices-yield- ratooning-staggering production-physiological disorders major pests and diseases-Varieties-climatic requirements- cultivation practices etc of papaya, jack and sapota.

Grapes- climatic and soil requirements-peculiarities of south Indian viticulture- varieties-commercial classification-propagation- planting- training-objectives- important systems-pruning methods and seasons types and season-flowering and fruit set-GR applications-harvest and handling of fruits.

Citrus- propagation- species and varieties commercial cultivation practices.Under exploited and unexploited minor tropical and sub-tropical fruits-anonas- aonla- jamun-west indian cherry- garcinia- tamarind- passion fruit litchi- rambutan- mangosteen-avocado- durian etc-general aspects of cultivation. etc Major temperate fruits-apple- pear-peach- plum- apricot etc -varieties- propagation and planting high density planting-orchard management –plantation and orchard management. Cultivation of fruits and vegetables in deserts. Organic management of fruit crops

5. ***Commercial Floriculture and Ornamental Gardening:*** Scope of Floriculture. Varieties-propagation- cultivation and post-harvest handling of orchids – anthuriums- rose-jasmine-- gerbera- chrysanthemum-gladiolus- tube rose, carnation-heloiconia- alpinia-crossandra- marigold and other annual flowers. Value addition of flowers. Protected cultivation. Landscape designing and preparation of landscape plan- Principles, components, common garden layout and styles; Types of propagation-sexual propagation-Asexual propagation methods - cutting, layering, budding, grafting, tissue culture,

vegetable grafting. Classification and production of garden plants. Establishment and maintenance of lawn. Production of potted plants. Establishment and maintenance of gardens. Indoor gardening, Use of rooting hormones in propagation - Land preparation - Spacing - manuring - Irrigation - Pruning - Intercultural operation - Weed control - Pest and diseases - Value added products

6. ***Nursery techniques and plant tissue culture:*** Components of nursery. Nursery implements. Nursery structures. Potting mixture preparation and potting. Seed bed preparation and sowing. Propagation with cuttings. Propagation through different methods of layering. Budding. Grafting. Plant growth regulators preparation and use for plant propagation. Care and management of nursery plants. Visit to commercial nursery. Tissue culture; Contamination checking. Media preparation. Stock preparation. Explant selection of banana. Initiation of banana. Subculturing and multiplication of banana. Hardening of banana. Explant selection of pineapple. Initiation of pineapple. Subculturing and multiplication of pineapple, Hardening of pineapple.
7. ***Seed production:*** Classes of quality seed. Requirements for quality seed- purity – genetic and physical- moisture- germination. Germination and purity standards of important crops. Operations essential to seed industry- breeding new variety seed multiplication- seed processing-storage and marketing. Quality seed production isolation- cultivation- field management. Post harvest management-precautions for harvesting and threshing. Seed processing and storage-drying –cleaning –grading- seed treatment- seed storage. Seed testing- germination- purity- moisture tests. Seed standards for genetic purity-maintenance of genetic purity– nucleus seed production. Seed Legislation and Certification- Principles of Seed Production, Seed certification certification standards-field inspection- roguing Classes of seeds-nucleus seed- breeder seed- foundation seed. Seed production techniques for important cereal crops- rice- maize, pulse- oil seeds and others. Hybrid rice seed production techniques. Seed production programmes of state and central government qualities of good seed, classes of seed, sowing methods, seed propagation- seed bed preparation, hybrid seed propagation, vegetable seedling production, portray seedling production. Seed testing- methods of testing germination percentage.

Module 6: Plant Breeding & Plant Physiology

Marks:10

1. ***Genetics and plant breeding:*** Introduction- history- objectives and activities of plant breeding. Basic principles of genetics. Basis of heredity- chromosome- DNA- gene. Taxonomy of important crops. Qualitative and quantitative characters – genotype-phenotype- inheritance. Biometrical techniques. Ideotype concept. Centres of origin of important crops. Biodiversity and germplasm conservation. Organizations involved in crop improvement – National and International organizations. GI, IPR and related laws. Mode of reproduction and pollination in crop plants. Self incompatibility and male sterility. Breeding techniques for self pollinated crops – selection pure line theory-varieties developed- merits and demerits. Hybridization – techniques consequences- wide hybridization- varieties developed. Mass selection and pureline selection- varieties developed- merits and demerits. Pedigree selection- bulk method - varieties developed- merits and demerits. Back cross method- single seed decent – varieties developed- merits and demerits. Breeding techniques for cross pollinated crops heterosis and inbreeding depression. Population improvement. Hybrids and synthetics - varieties developed- merits

and demerits. Breeding techniques for clonally propagated crops- varieties developed- merits and demerits. Breeding for resistance and quality. Mutation breeding in crop improvement- varieties developed. Polyploidy breeding in crop improvement- varieties developed. Modern techniques in plant breeding – biotechnology, Bioinformatics. Plant introduction agencies in India and purpose of introduction- varieties developed- merits and demerits

2. **Plant physiology:** Transport and translocation of water and solutes in plants. Physiological disorders of rice- vegetables and fruits. Photosynthesis- general principles- physiological and ecological considerations. Respiration- assimilation of mineral nutrients. Plant defense: surface protection and secondary metabolites. Growth regulators – auxin and gibberellins - mode of action and practical applications. Cytokinin and ethylene - mode of action and practical applications. Abscissic acid and other growth regulators - mode of action and practical applications. The control of flowering. Seed physiology. Herbicide physiology. Water deficit and salinity - physiology - management aspects. Submergence - chilling and freezing- physiology - management aspects. High temperature physiology - management aspects. Air pollution physiology - management aspects.

Module 7: Crop health management

Marks:18

1. **Crop pest management:** Insects- definitions- their characters. Classifications of insects based on legs, wings- mouthparts and metamorphosis. Types of insects based on its orders. Economic insects- honey bees- types and rearing. Economic insects- sericulture- and other beneficial insects. Pests: definition and categories.

Pest-definition, classification with examples, General and economic Entomology, Common crop pests and their management, Insect Damage symptoms- - Life stages and management of insect and non insect pests of Cereals (rice- wheat- sorghum-maize and minor millets). Plantation crops (coconut, areca nut- oil Palm- cashew). Fruits (mango- sapota- guava- jack- banana- grapes - dates -pineapple- citrus), vegetables (Brinjal- bhindi- tomato- cucurbits- crucifers- chillies- pulses- root vegetables). sugarcane- cotton- ground nut and oil seeds- spices (pepper, ginger, cardamom) Flower crops- Medicinal and Aromatic plants- Tuber crops. Pests of stored materials and their management. Nematode pests of cereals- fruits- vegetables- Rodent and bird pests and their management Pest outbreaks and threshold levels. Pests monitoring- surveillance and forecasting. IPM techniques-Bio-pesticides, bacteria- fungus- viruses- EPN and mode of action. Pesticides- its classifications and mode of action. Principle methods of pesticide applications. Insect attractants and repellents. Insect pheromones- types with examination and its role in IPM. Insect growth regulators. Pesticides act and modern trends in IPM. Modern techniques in pest control. IPM, popular biocontrol agents and their use, E- Crop Doctor, Crop diagnostic centres.

2. **Plant Diseases management:** Introduction to plant pathology- definition- terms. General characters and classification of fungi- methods of reproduction. Key to divisions and subdivisions with examples of fungi of plant pathological and other significance. General characters of bacteria- structure- reproduction and symptoms of bacterial diseases. General characters of virus- classification and symptoms of virus diseases- virus vector relationship. Phanerogamic parasites. Epidemiology. Crop loss assessment and disease forecasting.

Diseases of major crops and their management, Symptoms- etiology and control measures of the following crop diseases - Diseases of rice and wheat- millets- maize- sorghum- bajra- Diseases of vegetables - solanaceous crops, cucurbits- bhindi- cool season vegetables- leafy vegetables- diseases of cowpea and pulses, diseases of sesamum- sunflower- sugarcane- tobacco and diseases of tuber crops. Diseases of coconut, oil palm- areca nut- cocoa- rubber- cashew- tea- coffee- cardamom- diseases of spices- pepper, ginger- turmeric- vanilla- tree spices. Diseases of fruits- banana- pineapple- mango- jack, sapota- grapes- citrus fruits- dates- guava- papaya - ornamental plants.

Bio-control agents in Pests and disease management - important bio-control agents for crop pest and disease management - *Trichoderma*- *Pseudomonas fluorescens*, *Trichogramma*- *Verticillium*- *Beauveria*. Mushroom cultivation- preparation of culture media, Culture techniques, spawn production, Paddy straw mushroom

3. **Weed Management:** Weeds – definition – classification – noxious and parasitic weeds. Crop – weed association and competition - critical stages of crop weed competition. Weed management — methods of weed control – mechanical- cultural- biological- chemical and IWM. Herbicides – classification – mode of action – selectivity. Formulations - application of herbicides and their fate in soil- plant and water. Weed management in rice, coconut – banana – vegetables – oil seeds and plantations. Weed management in other crops. Weeds-uses and harmful effects, dryland and wetland weeds, Common crop weeds and their control, bio-control of weeds, aquatic weeds, invasive weeds,

Module 8: Agro-machinery, Power & Irrigation

Marks:10

1. **Primary tillage implements-** MB plough-disc plough- subsoiler- chisel plough. Secondary tillage implements – cultivators- harrows- bund former and furrower- definitions- field capacity draft- field efficiency. Rotavator- puddlers -earth drills and terracer blade. Sowing methods-implements and machines for seed and fertilizer drilling- seeding and planting of seeds. Transplanting implements and machines- principle of operation of rice transplanter mat nursery preparation. Different types of rice transplanting machines. Weeding implements for garden land and rice-rotary weeders- brush cutter-slasher. Principle of operation of hydraulic and pneumatic sprayers. Power sprayers and blowers. Reaping, threshing and winnowing machines. Combine harvesters. Straw harvesting-balers-chaff cutters and other latest machines on paddy cultivation. Unit operations in post harvest processing of rice- cleaning, grading- parboiling- drying and storage. Milling of paddy products and by product utilization of paddy. Calculation of cost of operation of machines Breakeven analysis.
2. **Concept of work- power and energy-** different forms-energy efficiency. Energy use in agriculture-equivalent energy coefficients-calculation of energy input. Energy and environment- global warming- need for energy conservation. Classification of energy sources-concept of renewable energy. Power sources in the farm- requirements for various applications. Electricity-basic electrical engineering concepts. Electric motors-basic principles-different types. Mechanical power- IC engines. Working principle of CI engine parts. Working principle of SI engine-parts. Engine systems. Tractors and their systems. Power tillers and their application for different agricultural operations. Energy from biomass- improved biomass stoves. Principles of anaerobic digestion technology- biogas plants- basic design principles. Factors affecting performance of biogas systems- popular biogas plant models. Solar energy fundamentals- solar thermal devices- Basic

principles of PV systems- applications and gadgets. Studies on engineering properties of agricultural crops-roundness- sphericity- angle of repose-coefficient of friction-terminal velocity. Studies on various types of driers and preparation of drying curves-traya-cabinet drier-fluidized bed drier.

- 3. *Irrigation***-definition, objectives, methods of irrigation- surface, subsurface, micro irrigation, special methods (drip, sprinkler, mist, bubbler, pivot), fertigation, chemigation, quality of irrigation water and its management, drainage- importance in crop production, Different methods of drainage. Rainwater harvesting-techniques and structures-ferrocement tank, percolation pits (emerging innovative models). Systems of micro irrigation methods-sprinkler- drip- bubbler-basic requirements, Components of sprinkler irrigation systems-mains-sub mains- laterals- filters -sprinkler heads-maxi- mini- micro. Components of drip irrigation systems- mains-submains-laterals, filters-drippers/emitters-fertigation- chemigation-pivot irrigation. Irrigation water-quality of irrigation water-Indian standards of water quality, soil moisture constants- Field capacity- Permanent Wilting Point- Available Water. Scheduling of irrigation- IW/CPE ratio Evapo-transpiration- Potential Evaporation- Crop Co-Efficient-etc critical stages - depth of irrigation. Water management of major crops.

Module 9: Agricultural Extension and technology transfer

Marks: 07

- 1. *Agricultural development***: Agriculture-definition, branches, milestones in agriculture development in India, Important Agricultural Institutions- teaching and research institutions, extension centres, agri based government and semi government organisations. Agricultural development programme of Kerala & India, Five-year plans (history, goals, current relevance), Monitoring, evaluation, and program planning in extension, concepts, processes, principles and its importance.
- 2. *Diffusion and Adoption of innovations***: Stages of adoption, adopter categories, and diffusion process. Indigenous Technical Knowledge (ITK) integration. Public participation and management in extension organizations First-line TOT programmes-KVK, ATIC, ATMA, VFPC, AHADS etc. New ICAR initiatives for technology dissemination. Extension Communication Methods, principles of layout and design of and Audio-Visual Aids and Instructional materials, Group methods, Digital methods including social media in TOT, Agri-business and farm Services, Agripreneurship development, Food and Nutrition concepts, Communication - Definition, importance, process, and key elements; Constraints and key concepts in communication. Interpersonal, intrapersonal, group, and mass communication; Public speaking types, purposes, and presentation methods, Scientific writing and effective data presentation. Extension Methods: Individual, group, and mass contact methods. Audio-visual aids: classification, selection, and preparation. Farm and photo journalism techniques. Cyber extension models and their use in India. Traditional media for rural communication. Expert systems in agriculture, e-learning, and distance education.
- 3. *Principles and practices of Agricultural Extension***: Education- meaning- definition-types-formal- informal and nonformal education. Extension education and Agricultural Extension- meaning definition- concepts- objectives, process and principles. Teaching – learning process- learning situation and steps in teaching. Rural development- objectives-importance- problems in rural development. Pre independence extension efforts in India. Community development and national extension service. Recent approaches in rural

development programme. Self-help groups and models. Present research- client and education system. Present extension system in India. Method of data collection. Training in extension. Leadership-types of leaders- classification and importance in agricultural extension. Motivation –types and application in extension work. Project preparation. Functions of Kerala Agricultural University

Module 10: Agricultural Production Economics and Marketing

Marks: 05

- 1. Rural Economy:** Mixed Economy - Definition, features, relevance to India. Rural Challenges: Population growth, land issues (classification, reforms), employment, income disparity, inflation's impact. Development Strategies: Government & public-private partnerships, rural finance (sources, credit systems, NABARD), globalization's impact.
- 2. Agricultural Production:** Major Crops: Area, production, productivity in India and Kerala (focus), economics of production & marketing, cost-benefit analysis. Production Factors: Land (classification, reforms), labor (types, characteristics, minimum wages), capital (importance, needs, sources), organization (government & private roles). Cost & Investment: Relevant cost concepts, capital needs & challenges. Farm management-principles and practicescrop calendar- farm plan preparation. Farm records and maintenance. Labour management.
- 3. Marketing:** Scope, Needs & Problems, Types, structures, specific challenges for agricultural commodities. Grading & Standardization: Agmark, commercial grading. Marketing Costs & Margins: Price spread issues, contract farming, cooperatives. Marketing Channels: Regulated markets, State & national movements (NAFED, ENAM). Support Mechanisms: Specialized agencies (FCI, CWC, SWC), price support, buffer stock operations. Market Information & Input Marketing: Seeds, fertilizers, chemicals, implements.

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