

**Broad Outlines of Syllabus for Masters Degree Programme- 2022:**

**Objective of such type of Entrance Test is to select the best candidates; therefore, no syllabus can be prescribed, however, broad outlines are given as follows:**

**A. Pre-PG Agriculture**

**1. Agronomy**

**(Question 14)**

Agro-climatic zones of India and Rajasthan, adaptation and distribution of crops. Weather and climate. Basics of weather forecasting. Modern concepts of tillage. Management of crop residue, soil organic matter, bio-fertilizers, green manuring, oil cakes, fertilizers. Consumption of straight and complex fertilizers, foliar application. Plant nutrients: occurrence, cycling in soils and their availability. INM concept and vermi-compositing. Cropping and farming systems. Sustainable agriculture: concept and details. Organic farming: principles, objectives, certification, labeling and accreditation process. Water resources of India and Rajasthan. Methods of irrigation. Irrigation efficiencies. Water management in crops. Quality of irrigation water. Agricultural drainage: methods. Dry land agriculture in India and Rajasthan. Concept, importance, objectives and benefits of watershed. Agronomy of important crops of *kharif, rabi and zaid* seasons of Rajasthan. Weed biology and ecology, crop-weed association. Problem of weeds in Rajasthan and their physical, cultural, biological and chemical control. Integrated weed management. Herbicide selectivity. Adjuvants. Geo-informatics, nano- technology and precision farming; concepts, techniques & their applications in agriculture.

**2. Genetics and Plant Breeding**

**(Question 12)**

Variation – its causes and importance. Pollination and fertilization. Cell structure and division. Mendel and his work. Gene interactions. Multiple alleles and blood groups. Linkage, crossing over and mapping of chromosomes. Gene mutations, chromosomal aberrations, polyploidy and their role in crop improvement. Cytoplasmic and chromosomal inheritance. Sterility and incompatibility and their application in plant breeding. Heterosis and its exploitation for crop improvement. Germplasm conservation and exploitation. Breeding methods of self, cross and vegetatively propagated crops. Breeding for biotic and abiotic stresses. Application of genetic engineering and biotechnology in crop improvement. Seed, its types and classes. Seed certification: principles and procedures. Minimum seed certification standards. Seed production of important field crops.

**3. Soil Science and Agricultural Chemistry**

**(Question 10)**

Soil as a medium for plant growth, soil composition, formation, profile, rocks and minerals. Soil survey, classification and Remotesensing. Physical properties of soil-texture, structure, soil moisture, air and temperature in relation to plantgrowth. Chemical properties of soil-clay minerals, organic and inorganic colloids, cation exchange phenomenon. Soil reaction and buffering capacity. Soil erosion, conservation. Problematic soils. Essential nutrients, their functions, deficiency symptoms and their availability. Soil fertility evaluation, nutrient recommendations. Manures and fertilizers.

**4. Plant Pathology + Nematology**

**(Question 10)**

Importance of microbes and plant pathology in agriculture. Micro-organisms (Fungi & bacteria) and their classification, nutrition, growth and reproduction. Host-pathogen relationship. Morphology, reproduction, nutrition and nomenclature of fungi. Classification of plant pathogenic fungi. Symptomology, disease cycle. Important disease and their management- cereals, pulses, oil seeds, fruits, vegetables, spices, medicinal and aromatic, forest plant and cash crops. Integrated disease management

and principles of plant disease control and novel approaches for disease management.

Introduction and brief history of plant parasitic nematodes, their morphological structure, biology, ecology and various physiological process. Symptomatology and nematode diseases with special reference to root-knot, reniform, citrus, ear cockle, tundu and molya and their management. Interaction of plant parasitic nematodes with other micro-organisms like fungi, bacteria and viruses, etc.

## **5. Horticulture**

**(Question 10)**

Floriculture- History of ornamental gardening, garden styles, garden features and important commercial cut flowers and loose flowers cultivation. Uses of ornamental annuals, trees, shrubs and climbers. Vegetables- importance in human diet, type of farming and classification. Raising of seedling in nursery and pro-tray. Cultivation of important vegetables. Protected cultivation. Pomology- Selection of site, preparation and layout of orchard, planting system. Principles of fruit production, propagation, cultivation of important fruits of Rajasthan. Methods of preparation of juices, squashes, jams, jellies and marmalades, preserves, squashes and pickles, canning and dehydration of fruits and vegetables. Seed spices – production technology. Important medicinal and aromatic plants of Rajasthan.

## **6. Entomology**

**(Question 10)**

Animal kingdom- Classification and nomenclature. Economic importance of Arthropods, insects and mites in particular. Management of insect-pest and mites in agriculture. Ecosystem and wild life preservation. Insect dominance. Anatomy and morphology of grass hopper. Insect reproduction and development; identification. Lac culture, sericulture and apiculture. Physical, mechanical, cultural, chemical, biological, legal and other modern approaches of insect pest management.

## **7. Biochemistry + Biotechnology +Plant Physiology**

**(Question 8)**

Chemistry of carbohydrates, lipids, proteins and amino acids. Chemistry of Nucleic acids and their functions. Outlines of metabolism of carbohydrate, lipid and protein. General characteristics of enzymes, coenzymes and secondary metabolites terpenoids, alkaloids and phenolics. Brief out lines of plant tissue culture and plant biotechnology DNA recombinant technology, transgenics Molecular markers and their application in Agriculture.

Cell: an overview, physiological functions of cell organelles, plant water relations, photosynthesis and photorespiration, Respiration, Transpiration, plant nutrition, physiology of flowering. Physiology of growth, PGRs and their role, biosynthesis and physiological responses. Post-harvest physiology, Seed development, germination and dormancy. Climate change and stress physiology, hydroponics.

## **8. Extension Education**

**(Question 8)**

Extension Education- Definition, objectives and principles. Rural sociology: Meaning, definition, scope, social control and social change. Rural institutions- caste and family, rural leadership. Teaching-learning process. A.V. aids, teaching methods and their use in different situations. Programme planning and evaluation in extension education. Communication process and its elements. Diffusion and adoption of agriculture innovations. Pre-independence extension programmes in India: Gurgoan, Marthandam, Shriniketan and Sewagram projects. Developmental programmes and institutions- IRDP, CD, NES, Panchayati Raj System, T & V system, NATP, PMRY, Swarn Jayanti Gram Swarojgar Yojna, KVK, ATIC, IVLP and ATMA. Entrepreneurship development: concept and meaning. Government schemes and incentives for promotion of entrepreneurship. Contract farming and joint ventures, public private

partnership.

## **9. Agricultural Economics + Agricultural Statistics**

**(Question 7)**

Meaning of utility, factors of production and their characteristics. Classical production function and law of diminishing returns. Factors affecting demand and supply. Price determination. Concept of elasticity and its measurement. Agricultural finance. Credit and credit institution. Agricultural cooperation. Nature and problems of agricultural marketing and prices. Regulated market. Marketing channels and price spread. Cooperative marketing. Nationalization of commercial banks. Economic principles of farm management, financial tools of farm management and farm planning and budgeting. Risk and uncertainty in agriculture. Importance of agri-business in Indian Economy. Discounted and undiscounted methods of project analysis. Marketing management.

Meaning and scope of statistics. Data summarization. Measures of central tendency and dispersion. Elementary idea of correlation and regression. Tests of significance. Field experimentation. Analysis of variance and its application in basic design of experiments.

## **10. Agriculture Engineering**

**(Question 5)**

Introduction to Soil and Water Conservation, soil erosion, types, and method for control of soil erosion. Status of Farm Power in India, Sources of Farm Power, different type of engines, Familiarization with Power transmission system: clutch, gear box, differential and final drive of a tractor, Tractor types and farm implements. Familiarization with sowing and planting equipment, Familiarization with harvesting and threshing equipment. Classification of energy source agricultural sector, Familiarization with biomass utilization for biofuel, biogas plants, biodiesel and biooil production. Introduction of solar energy. Green house technology, green house equipment, materials of construction for traditional and low-cost green houses. Irrigation systems used in greenhouses, Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation. Drying and dehydration.

## **11. Animal Husbandry**

**(Question 4)**

Importance of Livestock and poultry in national economy. Cattle management and housing of cattle, buffalo, sheep, goat, poultry and camel. Prevention and control of common livestock diseases. Classification of feeding stuff and computation of balanced ration. Important breeds of farm animals and poultry. Methods and systems of breeding. Principles and methods of selection. Purchase of dairy animals. Infertility and sterility, their causes and prevention. Hatching, brooding and feeding management in poultry. Hay and silage making.

## **12. Forestry**

**(Question 2)**

Status of forests in India and Rajasthan. Forest: importance, types, classification, ecosystem, biotic and abiotic components, ecological succession and climax. nursery and planting technique, social forestry, farm forestry, urban forestry, community forestry, forest management, silvicultural practices, forest mensuration, natural regeneration, man-made plantations, shifting cultivation, taungya, dendrology, hardwoods, softwoods, pulp woods, fuel woods, multipurpose, tree species, wasteland management. Agroforestry– importance and land use system, forest soils, classification and conservation, watershed management, forest genetics and biotechnology and tree improvement, tree seed technology, rangelands, wildlife- importance, abuse, depletion, management, major and minor forest products including medicinal and aromatic plants, forest inventory, aerial photo interpretation and remote sensing, forest depletion and degradation – importance and impact on environment, global warming, role of forests and trees in

climate mitigation, tree diseases , wood decay and discolorations, tree pests, integrated pest and disease management, biological and chemical wood preservation, forest conservation, Indian and Rajasthan State forest policies and acts, forest economics, joint forest management and tribology.

## **B. Pre-PG Horticulture**

### **1. Fruit Science**

**(Question 24)**

Scope and importance of Horticulture, classification of horticultural crops, area and production, exports and imports of fruits, soil and climatic requirements of horticultural crops, vegetable gardens, planting systems, pruning and training of fruit crops, types and use of growth regulators in horticulture, water management, fruitfulness and unfruitfulness, rejuvenation of old orchards.

Propagation, sexual and asexual methods of propagation, graft incompatibility, seed dormancy and methods to overcome dormancy, phytotrons nursery, micro grafting, meristem culture, callus culture, anther culture, organogenesis, somaclonal variation, hardening of plants in nurseries, nursery registration act.

Tropical, sub-tropical and temperate horticultural systems, crop models and crop regulation in relation to fruit orchard, climate aberrations and mitigation measures of fruit crops.

Production technologies of tropical, sub-tropical and temperate fruits, nuts and plantation crops.

Weeds- Introduction, harmful and beneficial effects, weed management in major horticultural crops, shift of weed flora in cropping systems, aquatic and problematic weeds and their control.

Genetic basis of plant breeding, pollination, incompatibility and sterility, breeding strategies, selection, hybridization, heterosis, heterobeltiosis, GCA, SCA, inbreeding depression, heritability and genetic advance, breeding for resistance of biotic and abiotic stresses. Physical basis of heredity, cell reproduction, mitosis, meiosis and its significance, mendelian genetics, chromosome theory of inheritance, chemical basis of heredity, structure of DNA and its replication. Domestication and adaptation of commercially important fruits, breeding methods, bud mutations, mutagenesis and its application in crop improvement, ploidy manipulations, in-vitro breeding tools in important fruit and plantation crops.

Definition, importance, limitation and management of dry land horticulture, watershed development, soil and water conservation methods, impounding of run-off water, water harvesting methods, water use efficiency, characters and special adaptation of dryland horticultural crops.

### **2. Vegetable Science**

**(Question 17)**

Origin, distribution of species, wild relatives, Area, production, economic importance and export potential of vegetable, tuber and spice crops. Description of varieties and hybrids, climate, soil requirements, seed rate, field preparation, nursery practices, sowing/transplanting, spacing, planting systems, mulching, water requirement, weed management; nutrient management, PGRs, physiological disorders, harvesting, post-harvest handling, economics and marketing of tropical, sub-tropical and temperate vegetables and tuber and spice crops. Role of spice board and pepper, export promotion council, institutions and research centres in R&D.

Breeding objectives and important concept of breeding self-pollinated, cross pollinated and vegetatively propagated vegetable crops. Plant genetic resources, their conservation and utilization in crop improvement, breeding for biotic (insect, diseases) and abiotic resistance. Male sterility, incompatibility and their utilization in development of hybrids. Breeding procedures for development of hybrids and varieties in self and cross pollinated vegetables. Genetic basis of adoptability and stability.

Introduction and history of seed industry in India, types of seed. Principles of vegetable seed production. Role of temperature, humidity and light in vegetable seed production. Land requirement, climate, season, planting time, nursery management, seed rate, isolation distance, rouging, seed extraction and storage of vegetable crops. Field and seed standards. Seed drying and extraction. Seed legislation.

Precision farming, greenhouse technology, passive solar green house, hot air greenhouse, heating systems,

greenhouse drying. Choice of crops for cultivation under greenhouse. Problems/constraints of greenhouse cultivation and future strategies. Growing media, nutrient film technique (NFT) of hydroponics. Cost estimation and economic analysis.

### **3. Floriculture and Landscaping Architecture**

**(Question 12)**

Historical importance of Indian and ancient world gardens, Styles of garden, Use of Auto-CAD and Arch-CAD in designing gardens. Principles and elements of landscape gardens. Bio-aesthetic planning. Planning and designing of home gardens, colonies, country planning, urban landscape, institutional gardens, planning and planting of avenues, beautifying schools, railway lines & railway stations, factories, bus stands, air ports, corporate buildings, dams, hydroelectric stations, river banks, play grounds, gardens for places of religious importance, features of English, Japanese, Mughal, French, Persian, Italian, Hindu and Buddhist gardens, Xeriscaping. Propagation techniques for bulbous plants, History importance and scope, classification and general cultivation aspects of ornamental plants viz. annuals, biennales, herbaceous perennials, grasses and bulbous ornamentals, shrubs, climbers, trees, indoor plants, palms and cycads, ferns and sellagenellas, cacti and succulents, garden features/components; garden adornments. Lawn, flower arrangement, vertical garden, bottle garden and terrarium, Bonsai.

Scope and importance of commercial floriculture in India. Production technologies of commercial loose and cut flower crops, foliage and filler materials in open and protected conditions, Postharvest technology of commercial cut and loose flower crops. Dehydration techniques for drying of flowers. History, scope, cultivation and marketing of medicinal and aromatic plants, chemical composition, extraction and therapeutic and pharmaceutical uses of important medicinal and aromatic plants, Storage techniques of essential oils.

History of improvement of ornamental plants, centres of origin of flower and ornamental crops, objectives and techniques in ornamental plant breeding. Introduction, selection, hybridization, mutation and biotechnological techniques for improvement of ornamental and flower crops, breeding for disease resistance. Role of heterosis and its exploitation. Production of F<sub>1</sub> hybrids and open pollinated seed, utilization of male sterility, Harvesting, processing and storage of seed.

### **4. Post-Harvest Technology**

**(Question 7)**

Food and its function, physico-chemical properties of foods, food preparation techniques. Nutrition, relation of nutrition to good health. Role of fruits and vegetables in human nutrition. Energy: definition, determination of energy requirements, food energy and total energy needs of the body. Functions, source, requirements, digestion, absorption and utilization of Carbohydrates, Protein, Lipids, Minerals and Vitamins and effect of their deficiency on human health. Essential and non-essential amino acids, saturated and unsaturated fatty acids. Balanced diet: recommended dietary allowances for various age groups, common disorders due to malnutrition in population, assessment of nutritional status of the population.

Importance & scope of post-harvest management and processing of horticultural crops in India. Maturity indices, harvesting, post-harvest handling operations and treatments for fresh horticultural produce including precooling, sorting, grading, pre harvest sprays, curing, de-greening, waxing, fumigation, irradiations, VHT, etc. Pre and post-harvest factors affecting quality. Factors responsible for deterioration of horticultural produce. Physiological and biochemical changes during ripening. Hastening and delaying ripening process. Quality parameters and specifications. Structure of fruits, vegetables and cut flowers related to physiological changes after harvest. Different systems of storage including CA & MA storage, low cost cooling structures for fresh produces. Packaging, prepackaging treatments, types of packages, types of cushioning materials, and recent advances in packaging technology of horticultural crops. Transportation of fresh horticultural produce to local and export market. Food pipe line, unit operations in food processing.

General principles and methods of preservation of fruits and vegetables. Preservation by heat, pasteurization and sterilization, canning and bottling of fruits and vegetables. Preservation by chemical preservatives. Preparation and preservation of fermented and unfermented beverages. Preservation by sugar and preparation of Jam, jelly and marmalade, preserves, candies, crystallized fruits, etc. Preservation

with salt, spices, oil and vinegar, pickling, chutneys and tomato products. Freezing, drying & dehydration of fruits & vegetables. Spoilage in processed foods, utilization and disposal of waste from processing unit, quality control of processed products, Govt. policy on import and export of processed fruits. Food laws. Principles and guidelines for the establishment of processing units.

#### **5. Plant Protection (Pathology + Entomology + Nematology)**

**(Question 13)**

**Entomology-** Animal kingdom- Classification and nomenclature. Economic importance of Arthropods, insects and mites in particular. Comparative account of external morphology, structure and function of insect anatomy specially grass hopper. Types of reproduction. Postembryonic development-exclusion, Metamorphosis, Types of egg larvae and pupa. Classification of insects upto orders, sub-order and families of economic importance and their distinguished characters. Plant mites- morphological features, important families with examples.

Economic classification of insects; Bio-ecology and insect-pest management with reference to fruit, plantation, medicinal, aromatic, vegetable, ornamental, spice crops and storage products. Management of mites in horticulture. Ecosystem and wild life preservation. Insect dominance. Physical, mechanical, cultural, chemical, biological, legal and other modern approaches of insect pest management. Insecticide residue problems in fruit, plantation, medicinal, vegetable, ornamental and aromatic crops and their maximum residue limits (MRLs). Lac culture, sericulture and apiculture.

**Plant Pathology-** Importance of microbes and plant pathology in horticulture. Micro-organisms (fungi & bacteria) and their classification, nutrition, growth and reproduction. Host-pathogen relationship. Morphology, reproduction, nutrition and nomenclature of fungi. Parasitic causes of plant diseases (fungi, bacteria, viruses, phytoplasma, protozoa, algae and flowering parasitic plants), their characteristics and classification. Non-parasitic causes of plant diseases. Classification of plant pathogenic fungi. Symptomology, disease cycle. Fungicide's classification based on chemical nature, commonly used fungicides, bactericides and nematocides.

Etiology, symptoms, mode of spread, epidemiology and integrated management of the diseases and post-harvest diseases of fruit, plantation, medicinal, aromatic, vegetable, ornamental and spice crops. Principles and integrated plant disease management.

**Nematology-** History and development of nematology- definition, economic importance. General characters of plant parasitic nematodes, their morphology, taxonomy, classification, biology, symptomatology and control of important plant parasitic nematodes of fruits, vegetables, ornamental, spice and plantation crops. Role of nematodes in plant disease complex. Integrated nematode management.

#### **6. Natural Resource Management (Soil Science + Organic Farming + Ag. Engineering + Field Crops + Agro-meteorology + Environmental Studies + Agroforestry)**

**(Question 13)**

**Soil Science-** Composition of earth's crust, soil as a natural body- major components. Soil forming rocks and minerals; weathering and processes of soil formation. Physical parameters; texture, structure, particle density, bulk density, Pore space, Soil colour, Soil consistency, plasticity, Atterberg's constants, Soil air, Soil temperature and Soil water. Soil colloids, Ion exchange. Soil Classification-Taxonomy- soil orders & characteristics, land capability classification; soil of different eco-systems and their properties. Introduction to soil fertility and productivity- factors. Essential plant nutrient elements functions, deficiency symptoms, transformations and availability. Acid, calcareous and salt affected soils - characteristics and management. NPK, Secondary and micronutrient fertilizers: composition and application methodology. Manures classification and Biofertilizer. Quality of irrigation water. Soil and Water pollution. Soil, water and plant analysis. Management of poor-quality irrigation water in crop management. Organic farming- Introduction, concept, relevance in present context.

**Agricultural Engineering** -Available and unavailable soil moisture - water budgeting. lysimeter studies, pan evaporimeter, Irrigation scheduling & it's different approaches. Sprinkler and drip irrigation, their suitability, merits and limitations, fertigation, Layout of underground pipeline system. Basic principles and operation of IC Engines, two stroke and four stroke engines, cooling, lubrication & power transmission system of tractors. Tillage- types, implements- indigenous ploughs, mould board ploughs, disc and rotary

ploughs, harrows, levelers, ridgers and bund formers. Seed drills, Crop harvesting equipments.

**Agronomy-** Cultivation practices of kharif and rabi crops. Farming and cropping systems – mono, sole and multiple cropping, relay, sequential and inter cropping, green manuring, crop rotation. Integrated Nutrient Management. Weed control. Agricultural Meteorology, weather and climate- aspects involved in weather and climate, soil & atmospheric temperature, solar radiation, atmospheric pressure, humidity.

**Environmental Studies-** Multidisciplinary nature of environmental studies: Definition, scope and importance. Ecosystems, Structure and function of an ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Biodiversity and its conservation. Environmental Pollution: definition, cause, effects and control measures of Air, Water, Soil, Marine, Noise and Thermal pollution. Disaster Management.

**Agro-forestry-** Agroforestry definition, objectives and potential. Agroforestry system, sub-system and practice: shifting cultivation, taungya, home gardens, diagnosis & design methodology, multipurpose tree species and tree management practices in agroforestry

## **7. Basic Science (Statistics + Biochemistry + Microbiology + Crop Physiology & Growth and Development + Biotechnology) (Question 7)**

**Statistics-**Introduction to statistics, Basic concepts, data-classification and their graphic representation, measures of location, Dispersion, basics of Probability, additive and multiplicative laws. Distributions, Sampling methods, Tests of Significance, different tests, Correlation, regression, Experimental designs, Computer application: Introduction to computers, Windows, MS Word, MS Excel, MS Power point-preparation, Multi-media Internet.

**Biochemistry-**Structure, function and classification of Plant Biomolecules, and their metabolism. Water Relations in Plants, Drought, types of stresses & mechanism, Plant Nutrition, Biological Nitrogen Fixation, Photosynthesis, CO<sub>2</sub> fixation, Photorespiration.

**Microbiology** - History and Scope of Microbiology, germ theory of diseases, Development of microbiology, Microscopy and Specimen Preparation, staining. Types of culture media and pre-culture techniques, growth curve, viruses, bacteriophages, Sterilization methods, Mushrooms culture, production and applications.

**Crop Physiology and growth and development of horticultural crops**–Photosynthesis, respiration, plant water relation, crop Growth and development of Horticultural crops, Plant bio-regulators, vernalization, photoperiodism, pruning and training, Physiology of seed development, seed dormancy, fruit setting, physiology of fruits under post-harvest storage.

**Biotechnology** - Basic concepts and application plant Biotechnology, Plant Tissue Culture and Plant Genetic Engineering; Techniques of In-vitro cultures, Micropropagation, Somaclonal Variation, Somatic embryogenesis and synthetic seed production technology, Basics of gene cloning, gene transfer, PCR and other molecular techniques, Mapping QTL and MAS, and its application in crop improvement. Nanotechnology, types of nano material and their synthesis, Tools and techniques to characterize the nano particles, Applications in agriculture and Nano toxicology.

## **8. Social Science (Extension + Economics + Business Management) (Question 7)**

**Extension Education:** meaning, definition, scope, objectives & principles. Motivation, Pre-independence & Post independence rural development programme, TOT programmes, Communication, Audio-visual Aids, Adoption & diffusion, Teaching & learning, Programme planning, Evaluation, PRA & RRA, Management & Administration, Human resource development, ICT, Entrepreneurship development process, Decision making, Business communication, Management, Planning, Monitoring, Evaluation, SWOT analysis, Institutes involved in EDP, Supply chain management, Note taking & record maintenance, Communication skills, Personality development, Abstracting, Individual & Group Presentation, Public speaking, Group discussion, Organizing seminar & conferences.

**Economics and Marketing-** Consumption – theory of consumer behaviour, laws of consumption, law of diminishing marginal utility, law of equi-marginal utility, indifference curve and its properties, consumer

equilibrium. Demand schedule and curve. Price, income and cross elasticities, consumer's surplus. factors of production – land and its characteristics, labour and division of labour, Capital and its characteristics – classification -Enterprises – forms of business organization – merits and demerits. Laws of return – law of diminishing marginal return – cost concepts. Law of supply – supply schedule and curve elasticities. - Classification of markets – Marketing of various channels – Price spread – Marketing Efficiency – Integration – Basic guidelines for preparation of project reports

**Horti-Business Management-** Farm management principles and decision making, production function, technical relationships, cost concepts, curves and functions – factors, product, relationship – factors relationship, product relationship, Farming systems and types. Planning – meaning, steps and methods of planning, organizational principles, Direction – guiding, leading, motivating, supervising, coordination – meaning, methods of controlling – evaluation, control systems and devices. Budgeting as a tool for planning and control. Functional areas of management – operations management – physical facilities, Materials management – types of inventories, economic order quantity (EOQ). Personnel management – recruitment, selection and training, Marketing management – definitions, marketing mix and four P's. Financial management – financial statements and ratios, capital budgeting. Project management – project preparation evaluation measures.

### C. Pre-PG Forestry

#### 1. Silviculture and Agroforestry

(Question 25)

**Forests, forestry and silviculture-** Objectives and scope, classification. Locality factors and their interactions. Growth and development of Trees. Silvicultural systems, Tending operations- Objectives, types and methods. Succession– types, stages and climax, Forest Regeneration- Artificial and Natural, methods, advantages and disadvantages, Regeneration Survey. Forest types of India, Silviculture of economically important tree species of Rajasthan and India, Tree Seed Technology – Seed collection, processing and storage, Seed dormancy- types and treatments, Seed testing, Tree seed pests and diseases and their control measures. Forest Nursery: Types, layout, soil mixture, Hi-tech Nurseries, raising seedlings, care and protection.

**Plantation:** Scope, types, site preparation, planting methods, Plantation management, Plantations of difficult sites, Industrial and Energy plantation- high density short rotation plantations- petro crops, avenue plantations and social forestry plantations.

National Forest policies, Indian judicial system- Legal definitions, application of IPC to forests, general principles of criminal law, punishment, criminal procedure code, Forest Laws - Indian Forest Act, 1927 - general provisions, FCA-1980, NGT, Forest Dwellers Act 2006 , EPA (1986), WPA (1972) and its amendments. National Agroforestry Policy 2014, Green highways-2015, Rajasthan State Forest Acts and Rules.

Injury to forests by fire, grazing, mining, man and his domestic animals, wild animals, weeds, Frost, flood, landslides, drought, etc. and protection measures. Principles, Classification, methods and control measures for major pests and diseases of Nursery, plantations and forests. Forest management- Scope, objectives and principles, organization of state forests, sustained and progressive yield, Normal Forest, Rotation – types, choice and factors affecting length of rotation. Working plan -preparations, objectives and uses, National working plan code 2014. JFM- concept, principles, rules, CFM, Scope and importance of PRA, Social Forestry- need and purpose.

**Forest Mensuration-** objectives and scope, Diameter, Height and Volume measurements of standing trees, logs -formulae involved and methods. Determination of growth of trees, Stump analysis and Stem analysis. Estimation of biomass. Crop age-crop volume. Yield regulation - In regular and irregular forests. Estimation of growth and Yield of stands. Forest Inventory -enumeration, Sampling, Sampling design , Stand structure - Growth and Stand density, Canopy density , Volume tables and Yield tables- types, preparation and uses.

**Agroforestry-** Benefits and Components. Soil improvement- Nutrient cycling, Microclimate amelioration and carbon sequestration, Tree-crop interaction. Classification of agroforestry systems, Major practices in



different agro ecological zones of India and Rajasthan - arid and semi-arid regions. Tree Management – practices in agroforestry, structure and growth of trees - crown and root architecture, Diagnosis and design methodology, National and International organizations in Agroforestry. Forest recreation –social and environmental aspects of recreation components. Principles and elements of landscaping. Landscape components. Urban forestry – definition, uses, scope and Management, Arboriculture, Nature park, nature trial, Biological park, Ecopark, BD park , Ecotourism, Signages, Restoration and rehabilitation of natural landscapes in India. Climatology – components and phenomenon, Climate change and global warming, Kyoto protocol, CDM, REDD+ etc.

## **2. Forest Products and Utilization**

**(Question 16)**

Wood anatomy (dicots and monocots). Simple and Complex tissues. Secondary growth. Anatomical features of common Indian timbers. Kinds of woods and their properties. Wood seasoning- defects, types and mechanism. Classification of timbers. Wood preservation, Wood machining. Various forest based industries. Composite and improved woods. Wood modification and types. Adhesives and their uses. Rayon manufacture and destructive distillation of wood. Logging and conversion. Felling rules and methods. Transport of timber. Grading and storage of timber. Ergonomics: components and provision of energy. Personal protective equipments.

Non timber forest products: classification like Gum, Resin, Dyes, Tannins, Fibres, Flosses, edible plants, Animal products, Grasses, bamboos and Canes etc., sources, extraction, storage and uses. Ethnobotany - Terms & Folk uses of plants for medicines, food, dyes, tans, etc. Medicinal and Aromatic plants in Rajasthan and India, origin, cultivation, Active principles and their uses. Anthropology: Terms and description. Distribution and classification of tribes in Rajasthan and India.

## **3. Forest Biology and Tree Improvement**

**(Question 12)**

Structure and functions of cell, Cell reproduction- Mitosis, Meiosis and its significance. Mendelism & Mutation, Modification to Mendalian inheritance, Chromosomes. Dendrology- ICBN. Families description of some important monocot and dicot plants. C3, C4 and CAM plants. Photosynthesis, Respiration, Plant water relations, PGR's, Tree improvement: Germplasm, Insitu and Exsitu conservation of forest germplasm and types, Biodiversity and conservation, Measurement of diversity and diversity indices. Incompatibility and sterility. Quantitative genetics. variability. Provenance trials, Selection methods, seed production areas, seed orchards. Progeny trial and improvement of seed orchards. Hybridization, back cross and heterosis breeding.

Ecosystem and its components, Forest Biomes. Nutrient cycling, Population ecology, Community ecology and species interaction, Ecological successions, Wetland and Ramsar sites of Rajasthan. Restoration of degraded lands. Weather and climate and their interactions with plants. Livestock management, important breeds of livestock, Fodder resources and grassland types of India.

## **4. Wildlife Sciences**

**(Question 7)**

Wildlife, Wildlife Ecology- habitat and its management. Edge effect, Cruising Radius, Carrying Capacity. Biogeographic zones of India, IUCN threat categories, Red data book, wildlife census. Telemetry, Conservation and its methods. Projects: Tiger, Elephant, Musk deer, Wildlife Corridors, MAB, CITES, Protected areas: National Parks, Sanctuaries and Biosphere Reserves. Important PA's of Rajasthan and India. Origin and classification of birds, Thermoregulation, Migration, Feeding, Song, Nests. Herpetology: Classification and origin of amphibians and reptiles. Nutrition and disease management in wild animals. Taxidermy and its techniques.

## **5. Natural Resource Management**

**(Question 24)**

**Agriculture Engineering**-Surveying - methods, uses, classification. Instruments used Scales, Measurement of linear distance. Surveying: Chain Surveying, Plane table and Contour surveying, Buildings materials- types, strength and characteristics, forest roads- alignment, construction and drainage. Hydrological cycle. precipitation- rain and snow hydrology. Interception, infiltration, evaporation and transpiration- surface water, run off processes. Watershed management- principles and practices, Methods for water conservation. Role of trees in water conservation, natural terracing, species suitability-

Recharging of water springs.

**Soil Science-** Forest soil formation and vegetation development, Essential nutrient elements – occurrence, function and deficiencies. Macro and micro nutrient fertilizers. Rocks- types, minerals classification, weathering of rocks and minerals. Physical parameters of soil – texture, structure, bulk density, particle density, porosity, soil colour, soil air, soil temperature and soil water. A brief overview of saline, sodic, acid and calcareous soils. Properties of soils under different forests. Site productivity and nutrient cycling. Role of micro-organisms in soil fertility. Bio-fertilizers – their importance. symbiosis, asymbiotic, Mycorrhizae: types, biology and importance in forestry. INM in plantation forestry. Aerial photographs and Photo interpretation, Remote sensing –classification, key elements; image processing; GIS and GPS – process, application and uses in forestry.

## 6. Basic Sciences and Social Sciences

(Question 16)

**Statistics-** Measurement of Central Tendency, Standard error and deviation, Correlation and regression, Tests of Significance- T, F and Chi square test, ANOVA, Experimental designs-CRD, LSD, SPD, RBD and Factorial experiments.

**Extension Education-** Basics of communication skills and personality development- Structural grammar and spoken English, Information technology and tools. Computer- Fundamentals, software, Hardware and languages, LAN, WAN, WWW and MS Office. Audiovisual aids.

**Biochemistry-** Chemistry of carbohydrates, lipids, proteins and amino acids. Nucleic acids and their functions. Outlines of metabolism of carbohydrates, lipids and proteins. Photosynthesis and plant hormones. Basics of forest Biotechnology and their applications in Forestry.

**Economics and Forest Business Management-**Definition and Basic concepts, Theory of consumption-Laws of utility, Consumer surplus, Demand and supply with reference to timber and non-timber products. Production –Meaning, factors & functions, Marketing- definition, process, Need, Role, functions and channels, Classification of markets, Price spread, Marketing Efficiency, Integration, Constraints in marketing of forest produce. SWOT analysis. Markets- features and classification, Market inefficiencies in timber and NTFP's and measures to check it. Essentials of WTO, GATT, Dunkel proposals, IPR and Patenting. ITTO and timber certification. Forest certification- Definition, Principal stages and Key aspects, Certification schemes in operation.

Entrepreneurship Development – Overview and concepts, Economic systems and their implications, Government schemes, Export import policies and business communication skills.

## D. Pre-PG Home Science/ Community Science (Community & Applied Science)

### 1. Family Resource Management:

(Question 18)

System approach to management. Management concepts: value, goals, standards. Management process. Resources-classification and characteristics. Communication–process, classification, barriers, Decision making process. Time management and work simplification. Money management. Housing and its importance, selection of site, orientation and zoning, factors considered while planning a house, building materials, house wiring-Electrical fittings and fixtures. Housing problems in India. Housing finance. Elements of art and principles of design, colour, home lighting, flower arrangement. Human wants and demands. Family budget, savings and investment. Consumer problems, consumers' rights and responsibilities, standardization, grading, labeling and packaging, unfair trade practices, consumer protection and welfare, right to information. Marketing mix and marketing environment, marketing research. Product planning. Sales management. Entrepreneurship-definition, classification, importance, Government support. Selection, use and care of household equipment.

### 2. Human Development and Family Studies:

(Question 18)

Meaning, purpose, scope and principles. Stages of growth and development. Developmental pattern and

task of children till adolescence. Physical and motor development, cognitive, mental development, emotional, social and personality development. Moral development and guidance. Family: meaning and definition, functions of traditional and modern family, stages of family, lifecycle, expectations and specific roles of family members of each stage. Importance of family and child welfare. Classification and various areas of family and child welfare services in India and role of National and International agencies. Theories of child development- Cognitive theory of Jean Piaget, Erikson's theory of psychological development. Early childhood care and development. Children with developmental challenges.

### **3. Food & Nutrition:**

**(Question 30)**

Functions, Sources, deficiency and excess intake of energy, carbohydrates, proteins, fat, fat soluble and water-soluble vitamins and minerals (Classification and chemistry of amino acids and carbohydrates). Interrelationship of nutrients. Cooking methods- merits and demerits. Methods, principles and advantages of food preservation. Meal planning: importance, factors to be considered, planning meals for family, modification of diet for various age, sex and income groups and physical and physiological conditions of body. Modification of normal diet to therapeutic diet. Diet during disease like fever, liver disease, cardiovascular diseases and metabolic disorders like overweight, underweight and diabetes. Assessment of nutritional status, nutritional problems arising from food habits. Role of National and International agencies for overcoming nutritional problems in India.

### **4. Home Science Extension and Communication Management:**

**(Question 17)**

Meaning, aims, philosophy and principles of Home Science Extension Education. Problems of rural society. Concept and need of rural development. Audio-Visual Aids-Role and classification. Teaching methods- classification, advantages and limitations of each method, principles of extension teaching. Difference in teaching in formal and informal situation. Achievements and failures of community development programme. Panchayati Raj, Voluntary organization and their role in rural development, rural leadership. Concept, importance, elements and problems of communication, Meaning of adoption and diffusion. Meaning and characteristics of innovation. Stages and factors affecting adoption. Nature, role, meaning, principles and process of programme planning. Characteristics of good programme, problems of extension work and ways to solve them. Concept, importance and methods of evaluation, use of evaluation result in programme planning. Rural development programmes-ICDS, IRDP, TRYSEM, *Swarn Jayanti Gram Swarozgar Yojna* and MGNREGA, India's five-year plans with special reference to rural development.

### **5. Textile and Apparel Designing:**

**(Question 17)**

Classification, properties and basic concepts of production of textile fiber, yarn structure, complex and textured yarns, various fabric construction processes. Loom and its parts. Basic and fancy weaves. Printing and their methods. Dyes and their application, general and special finishes. Principles and process of laundering, laundry equipment's, water, soaps and detergents, bleaches, blues, stiffening agents and their uses, laundering and stain removal of different fabrics. Dry cleaning and storage of cloths. Social-psychological aspects and needs of clothing in the family. Changing needs of the family. Study of ready-made and tailor-made garments in terms of finish, cost and quality. Clothing budget for the family of different income levels, size habits and needs. Principles in selecting fabrics, colours and textures for different age groups. Traditional textiles of India and embroidery. Flat pattern methods, shifting of darts by slash and pivot method. Principles and elements of design applied to apparel designing. Introduction of CAD, CAM. Application of CAD in Textile and Apparel Designing. Fashion Terminology, Fashion cycle, theories of fashion adoption, factors affecting fashion.