

**SCHEDULE -IV**

**SYLLABUS FOR DIRECT RECRUITMENT OF GRADE V (GROUP 'A' GAZETTED) OF  
THE MIZORAM HORTICULTURE SERVICE UNDER HORTICULTURE  
DEPARTMENT**

**COMPULSORY SUBJECTS**

(1)	General English Paper-I		
	<b>ESSAY TYPE</b>	:	<b>100 Marks</b>
	a) Essay Writing	:	25 Marks
	b) Precis Writing	:	15 Marks
	c) Letter Writing	:	15 Marks
	d) Idioms & Phrases	:	15 Marks
	e) Expansion of passages	:	15 Marks
	f) Comprehension of given passages	:	15 Marks
(2)	General English Paper _ II		
	<b>OBJECTIVE TYPE</b>	:	<b>100 Marks</b>
	a) Grammar : Parts of Speech, Nouns, Adjective, Verb, Adverb, Preposition, etc.	:	40 Marks
	b) Compositions	:	30 Marks
	i. Analysis of complex and compound Sentences.		
	ii. Transformation of sentences		
	iii. Synthesis of sentences.		
	c) Correct usage and vocabularies	:	30 Marks
(3)	Technical Subjects	:	600 Marks
	(a) Paper - I	:	200 Marks
	(b) Paper - II	:	200 Marks
	(c) Paper - III		
	i. Technical	:	150 Marks
	ii. Aptitude	:	50 Marks
(4)	Interview (Viva Voce)	:	100 Marks
			<b>TOTAL : 900 Marks</b>

## **PAPER -I**

### **1. Basic Horticulture**

Economic importance and scope, classification of horticultural crops and their culture, nutritive value, Horticulture zones of India, soils and climate, planning and layout, management of orchards, importance, objectives, merits and demerits, clean cultivation, planting systems and planting densities. Canopy management of fruit crops, types and use of growth regulators in horticulture, cropping systems, inter cropping, multi-tier cropping, mulching, bearing habits, factors influencing fruitfulness and unfruitfulness, rejuvenation of senile orchards.

Growth and development-definitions, components, photosynthetic productivity, leaf area index (LAI) - optimum LAI in horticultural crops, canopy development; different stages of growth, growth curves, growth analysis in horticultural crops. Plant bio-regulators - auxin, gibberellins, cytokinin, ethylene inhibitors and retardants, basic functions, biosynthesis, role in crop growth and development, propagation, flowering, fruit setting, fruit thinning, fruit development, fruit drop and fruit ripening. Flowering-factors affecting flowering, physiology of flowering, photoperiodism-long day, short day and day neutral plants, vernalisation and its application in horticulture, pruning and training physiological basis of training and pruning-source and sink relationship, translocation of assimilates. Physiology of seed development and maturation, seed dormancy and bud dormancy, causes and breaking methods in horticultural crops. Physiology of fruit growth and development, fruit setting, factors affecting fruit set and development, physiology of ripening of fruits-climateric and non-climateric fruits

### **2. Organic : farming**

Introduction, concept, relevance in present context; Organic production requirements; Biological intensive nutrient management-organic manures, vermicomposting, green manuring, recycling of organic residues; Soil improvements and amendments; Integrated disease and pest management -use of biological agents, bio-pesticides, pheromones, trap crops, bird perches; Weed management; Quality considerations, certification, labeling and accreditation process, marketing, exports. Sustainable horticulture.

### **3. Fruit crops**

Origin, Classification of economic importance, export potential, varieties, climate and soil requirements, propagation techniques, planting density and systems, after care, training and pruning, self-incompatibility and pollinisers. Management of water, nutrient and weeds, special horticultural techniques including plant growth regulators. Physiological disorders. Post harvest technology, harvest indices, harvesting methods, important insect-pests and diseases and their control measures of tropical, sub-tropical, temperate, arid, semi-arid and minor fruits.

### **4. Plantation Crops**

Scope and importance, export and import potential, role in national and state economy, uses, industrial importance, by-products utilization, soil and climate, varieties, propagation: principles, and practices of seed, vegetative and micro-propagation, planting systems and method, gap filling, systems of cultivation, mulching, shade regulation, weed and water management, training, pruning and handling, nutrition, foliar feeding, soil management, liming practices, tipping practices, top working, physiological disorders, harvesting, post-harvest handling and processing, packaging and marketing, yield and economics.

## **5. Plant Propagation and Nursery Management**

Need and potentialities for plant multiplication, sexual and asexual methods of propagation, advantages and disadvantages. Seed dormancy (scarification & stratification) internal and external factors, nursery techniques, apomixes - mono-embryony, polyembryony, chimera & bud sport. Propagation structures: Mist chamber, humidifiers, greenhouses, poly-houses, nursery (tools and implements), use of growth regulators in seed and vegetative propagation, methods and techniques of cutting, layering, grafting and budding. Physiological & biochemical basis of rooting, factors influencing rooting of cuttings and layering, graft incompatibility. Selection and maintenance of mother trees, collection of scion wood, scion-stock relationship, and their influences, bud wood certification, techniques of propagation through specialized organs, corm, runners, suckers. Micrografting, hardening of plants in nurseries. Nursery Registration Act. Insect/ pest/ disease control in nursery.

## **6. Water Management**

Importance of water, and water resources in India. Water requirement of horticultural crops - factor for crop growth stages - critical stages of crop growth for irrigation. Irrigation scheduling - different approaches - methods of irrigation - Sprinkler and drip irrigation, their suitability, merits and limitations, economic use of irrigation water. Water management problem, quality of irrigation water, irrigation management practices for different soils and crops. Layout of different irrigation systems - surface and sub-surface systems.

## **7. Bee Keeping**

Importance and scope of apiculture, different species of bees, life cycle, bee keeping equipment, reproduction, queen rearing, seasonal management, bee pasturage, economics of bee-keeping, Bee-enemies, disease of bee, role of bees in increasing the productivity of horticultural crops in India economy, bee products and their uses-Recent advances in apiculture research.

## **PAPER - II**

### **1. Vegetable Crops**

Origin, Economic importance, export potential, varieties and hybrid, climate and soil requirements, seed rate, preparation of field, nursery practices, transplanting of vegetable crops, planting for directly sown/ transplanted vegetable crops, spacing, planting systems, water and weed management, nutrient management and deficiencies. Physiological disorders and remedies. Cropping systems, harvest, yield and seed production, post-harvest handling and storage of tropical, sub-tropical, temperate vegetables & potato and tuber crops.

### **2. Floriculture and Landscaping**

Scope of gardening, aesthetic values, types of gardens, landscaping. Importance of floriculture and industry, industrial importance in India. Landscaping, basic principles and components. Principles of gardening, garden components, adornments, lawn making, methods of designing rockery, water garden etc. Types of Trees, their design values in landscaping, propagation, planting shrubs and herbaceous perennials, propagation, planting, climbers and creepers, palms, ferns, grasses and cacti, succulents. Flower arrangement: importance, Culture of bonsai, art of making bonsai. Parks and public gardens.

Principles and elements of landscape design, layout of formal gardens, informal gardens, special types of gardens (bog garden, sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house. Bio-aesthetic planning, definition, need, round country planning, urban planning and planting avenues, schools, villages, beautifying dam sites, hydroelectric stations, colonies, river banks, planting material for play-grounds.

Scope and importance of commercial floriculture, production techniques of ornamental plants and commercial flowers like rose, anthurium, gerbera, orchid, liliun, gladiolus, chrysanthemum, carnation, bird of paradise for domestic and export market, growing of flowers under protected environments such as glass house, polyhouses etc., post-harvest technology of commercial cut flowers, dehydration technique for drying of flowers, production techniques for bulbous flowers.

### **3. Medicinal And Aromatic Plants**

Scope, opportunities and constraints in the cultivation and maintenance of medicinal and aromatic plants in India. Importance and uses, origin, distribution, climatic and soil requirements, propagation and nursery techniques, planting and after care, cultural practices, training and pruning, nutritional and water requirements. Plant protection, harvesting and processing.

### **4. Spices and Condiments**

Scope and importance, uses, export potential and role in national economy. Classification, soil and climate, propagation, and methods of planting. Nutritional management, irrigation practices, weed control, mulching and cover cropping. Training and pruning practices, role of growth regulators, shade crops and shade regulation. Harvesting, post-harvest technology, packaging, storage, value added products, methods of extraction of essential oil and oleoresins

### **5. Protected cultivation of horticultural crops**

Introduction, scope and importance , problems and prospects of protected culture in India , growing structures - green house , polyhouse , net house , basic considerations in establishment and operation of green houses, maintenance, advantages of growing plants in a green house, functioning and maintenance, water management, nutrient management. Crop regulation, special horticultural practices - harvesting methods, postharvest handling, standards, grading, packing and marketing.

### **6. Mushroom**

Species of Mushroom, Importance and uses, Production Practices, Pest and diseases of mushroom and their management, Spawn production.

## **PAPER - III**

### **A. TECHNICAL**

#### **1. POST - HARVEST TECHNOLOGY**

Importance of post-harvest technology in horticultural crops. Maturity indices, harvesting, handling, grading of fruits, vegetables, cut flowers, plantation crops, medicinal and aromatic plants. Post-harvest treatments of horticultural crops. Structure of fruits, vegetables and cut flowers, related to physiological changes after harvest. Pre-harvest treatment and pre-cooling, pre-storage treatments. Different systems of storage, packaging methods and types of packages, recent advances in packaging. Types of containers and cushioning materials, vacuum packing, cold storage, ply shrink packaging, grape guard packing treatments, modes of transport.

Importance and scope of fruits and vegetable preservation industry in India, food pipe line, losses in post-harvest operations, unit operations in food processing. Principles and methods of preservation by heat pasteurization, canning, bottling. Methods of preparation of juices, squashes, syrups, cordials and fermented

beverages, jam, jelly and marmalade. Preservation by sugar and chemicals, candies, crystallized fruits, preserves chemical preservatives, preservation with salt and vinegar, pickling, chutneys and sauces, tomato and mushrooms, freezing preservation. Processing of plantation crops, products, spoilage in processed foods, quality control of processed products, Govt. policy on import and export of processed fruits. Food Laws.

## **2. Plant Breeding**

Plant breeding as a dynamic science, genetic basis of Plant Breeding-classical, quantitative and molecular, Plant breeding in India - limitations, major achievements. Sexual reproduction (cross and self pollination), asexual reproduction, pollination control mechanism (incompatibility and sterility and implications of reproductive systems on population structure). Genetic components of polygenic variation and breeding strategies, selection as a basis of crop breeding. Hybridization and selection - goals of hybridization, selection of plants; population developed by hybridization - simple crosses, bulk crosses and complex crosses. Breeding techniques. Heterosis - concepts, estimation and its genetic basis.

## **3. Plant Biotechnology**

Concepts of plant Biotechnology, importance; Plant tissue culture and plant genetic engineering, Totipotency and morphogenesis, Techniques of *in vitro* cultures, micro-propagation, Anther culture, Pollen culture, Ovule culture, Embryo culture, Test tube fertilization, Endosperm culture, Applications and achievements; Somaclonal variation; Protoplast isolation; Somatic hybrids and cybrids - applications in crop improvement. Genetic engineering; Restriction enzymes; Gene cloning and gene transfer methods; Cryopreservation; Biosafety Rules and Intellectual Property Rights. Future scope and present trends.

## **4. Crop Physiology**

Role of water in plant metabolism, osmosis inhibition, diffusion water potential and its components, measurement of water potential in plants, absorption of water, mechanism of absorption and ascent of sap. Stomata: Structure, distribution, classification, mechanism of opening and closing of stomata. Osmotic pressure, guttation, stem bleeding, transpiration methods and mechanism and factors affecting transpiration. Different types of stresses - water, heat and cold tolerance; mechanism of tolerance. Plant nutrition: Essentiality, mechanism of absorption and its role in plant metabolism. Photosynthesis; Photorespiration; Phytohormones, physiological role in controlling plant processes.

## **5. Extension Education**

Meaning, definition, nature, scope, objectives, principles, approaches and history. Rural Development: meaning, definition, objectives and genesis. Transfer of technology programmes like Lab to Land Programme (LLP), national demonstration (ND), Front line demonstration (FLD), T & V System, Krishi Vigyan Kendras (KVK), Technology Assessment and Refinement Programme [TARP] etc. of ICAR. Scope and importance of Participatory Rural Appraisal (PRA) and Rapid Rural Appraisal (RRA). Concepts of human resource development [HRD], rural leadership.

## **6. Farm Power and Machinery**

Basic concepts of various forms of energy, unit and dimensions of force, energy and power, calculation with realistic examples. I.C. engines: Basic principles of operation of compression, ignition and spark ignition engines, two stroke and four stroke engines, cooling and lubrication system, power transmission system, broad understanding of performance and efficiency, tractors, power tillers and their types and uses. Tillage: objectives, method of ploughing. Primary tillage implements, secondary tillage implements. Sowing and transplanting equipment. Grafting, pruning and training tools and equipments. Inter-culture equipment, crop harvesting equipments.

### **7. Soil fertility and nutrient management**

Introduction to soil fertility and productivity, factors affecting, essential plant nutrient elements - functions, deficiency symptoms, transformations and availability, acid, calcareous and salt affected soils - characteristic and management. Role of microorganisms in organic matter decomposition-humus formation. Importance of C:N ratio and pH in plant nutrition. Integrated plant nutrient management, soil fertility evaluation methods, deficiency of plant nutrient elements and deficiency symptoms, manures and NPK fertilizers - composition and application methodology, micronutrients, application of fertilizers, time of manure and fertilizer application. Fertigation - soluble fertilizers, compatible fertilizers.

### **8. Weed Management in Horticultural crops**

Introduction, harmful and beneficial effects, classification, propagation and dissemination; Crop-weed association, crop-weed competition and allelopathy. Concepts of weed prevention, control and eradication; Losses caused by weeds, herbicide classification, formulations, weed management common herbicides used in horticultural crops, common name, trade name, time of application and rate of application, types of herbicide, Integrated Weed Management, advantages and limitation of herbicide usage in India. Compatibility of herbicides with other agro chemicals.

### **9. Horti-Business Management and Entrepreneurship Development**

Definition, nature, characteristics and scope. Farm management principles, production function, technical relationships, cost concepts, factors relationship, product relationship. Cost of cultivation and production, break even analysis, decision making under risk and uncertainty. Farm planning, budgeting, organizations and management. Financial management and project management.

Globalisation and emerging business/entrepreneurial environment. Concept of entrepreneurship; entrepreneurial and managerial characteristics; managing an enterprise; motivation and entrepreneurship development; SWOT analysis; Govt. schemes and incentives for promotion of entrepreneurship. Export and import policies relevant to horticulture sector. Venture capital; Contract farming and joint ventures, public-private partnership. Overview of Horti inputs industry. Organizing seminars and conferences.

### **B. APTITUDE**

- \* Logical reasoning and analytical ability.
- \* Decision making and problem solving.
- \* General mental ability.
- \* Data interpretation (Charts, Graphs, Table, etc. of Class X level).
- \* Basic arithmetic (Class X level).

Questions under the “Aptitude” section may be set in objective type multiple choice patterns.

### **INTERVIEW (VIVA VOCE)**

Candidates will be called for Interview (Viva voce) purely on the basis of merit position in the written examination. The maximum marks carried by an interview will be 100 marks which is 12.5% of the total marks of 800 in the written examination. The final result will be based on the total marks obtained by the candidate in the written as well as in the interview. Recommendation shall be made in order of merit for the number of vacancies available.