DETAILED SYLLABUS FOR THE POST OF MANAGER
KERALA FOREST DEVELOPMENT CORPORATION LIMITED
(Cat.No. : 170/2021, 171/2021 & 172/2021)

(Total Marks - 100)

1. SILVICULTURE – GENERAL (10 marks)

Definitions, objectives and scope of silviculture. Site factors - climatic, edaphic, physiographic, biotic and their interactions. Classification of climatic factors. Edaphic factors -influence of biological agencies, parent rock, topography on the soil formation. Soil profile - physical and chemical properties, mineral nutrient and their role, soil moisture and its influence on forest production. Physiographic factors - influence of altitude, latitude, aspect and slope on vegetation. Biotic factors - influence of plants, insects, wild animals, man and domestic animals on vegetation. Classification of forests- High forest and coppice forest - virgin forest - second growth forest. Pure and mixed stands. Even and uneven aged forests. classification- based on objects of management, based on ownership and legal status, based on growing stock. Site quality – site index. Stand density vs. stocking - density indexes. Tolerance. Silvicultural characteristics of stands and trees. Stand development - development of `normal' even-aged stands - crown class differentiation - growth in uneven-aged stands. Stand reactions to various types of cuttings. Plant succession, competition and tolerance. Forest types of India and their distribution.

Regeneration of forests - ecology of regeneration- factors governing the choice of regeneration techniques. Natural, artificial and mixed regeneration. Natural regeneration - seed production, seed dispersal, germination and establishment. Requirement for natural regeneration. Advance growth, coppice, root sucker, layering. Regeneration survey- Natural regeneration supplemented by artificial regeneration. Artificial regeneration - object of artificial regeneration - advantages. Choice of species - factors that govern - hardwoods, softwoods, fast growing exotic and indigenous species. Sowing v/s planting - different kinds of sowing. Preparation of planting material- field planting site preparation- marking- boundary demarcation, fencing, alignment and staking-kinds of pit making-patterns of planting-stump, seedling, Taungya. Cultural and tending operations- weeding, cleaning, climber cutting, singling, pruning. Density management in plantations- thinning- kinds of thinning- thinning intensity, thinning cycle, improvement felling- salvage cuttings. Artificial regeneration in problem areas.

2 – SILVICULTURE- SYSTEMS & TREES (10 marks)

Silvicultural system -definition, scope and classification. Even aged and uneven aged forests and their crown classes. Detailed study of the silvicultural systems: Clear felling systems including clear strip, alternate and progressive strip systems. Shelterwood system -Uniform system, Group system, Shelterwood strip system, Wedge system, Strip and group system, Irregular shelterwood system, Indian irregular shelterwood system. Seed tree method. Selection system and its modifications. Accessory systems. Coppice system -Simple coppice system, Coppice of the two rotation system, Shelterwood coppice system, Coppice with standard system, Coppice-with reserve, Coppice selection system, Pollard system. Conversion and its implications. Choice of silvicultural

system. Dauerwald concept. Culm selection system in Bamboo, Canopy lifting in Andaman. Silvicultural systems followed in other countries - changing concepts. Silvicultural practices for short rotation forestry.

Silviculture of important trees, *viz., Tectona grandis, Gmelina arborea, Eucalyptus tereticornis, E. camaldulensis, Dalbergia latifolia, Dalbergia sissoo, Azadirachta indica, Santalum album, Albizia lebbeck, Pterocarpus marsupium, Melia dubia, Acrocarpus fraxinifolius, Neolamarckia cadamba, Ailanthus triphysa, Bambusa bambos, B. vulgaris, B. tulda, Dendrocalamus strictus, D.stocksii, D. longispathus, D. asper, D. brandisii, Guadua Angustifolia, Thyrsostachys oliveri, Ochlandra sps. Shorea robusta, Populus deltoides, Casuarina equisetifolia, Pinus roxburghii, Pterocarpus santalinus, Quercus leucotrichophora, Cedrus deodara, Abies pindrow* and *Picea smithiana.*

Plantation forestry – Planning, appraisal and execution of plantation projects- Energy and industrial plantations - Afforestation in wastelands and inhospitable sites - Precision silviculture - Mechanization of silvicultural practices - Certification of industrial plantations. Trees outside forests (TOF)- Climate Change Mitigation- Carbon sequestration- AR- CDM projects- Carbon trading.

3 - FOREST BIOLOGY AND TREE IMPROVEMENT (10 marks)

Importance and applications of reproductive biology - Flower types - Pollination system - Sex expression - Floral biology and characteristics - Fertilization - Dispersal and gene flow. Forest genetic resource and diversity (FGR) - In situ and ex situ conservation of gene resources - On farm conservation - Handling and storage of FGR. Intellectual property rights - Quarantine laws and FGR exchange. Genetic constitution of trees - General concepts of forest genetics - Variation. Tree improvement - Concept of seed source/Provenance/Progeny/Clone - Breeding methods - Selection - Hybridization - Mutation – Migration. Genetic testing - GXE interactions. Seed Production Areas and Seed Orchards. Mating designs - Clonal technology - Macro propagation in trees - Traditional cloning techniques - Protocols for micro propagation - Cryopreservation - Somaclonal variation - Anther and pollen cultures - Meristem culture - Embryo culture - Protoplast culture and cybrids - Forest biotechnology and its applications in forestry.

Forests -Biotic and abiotic components, forest eco-systems; forest community concepts; vegetation concepts, ecological succession and climax, primary productivity, nutrient cycling and water relations; physiology in stress environments (drought, water logging salinity and alkalinity). Forest types of India - Distribution and types. Forest ecosystems - Structure and functions. Forest succession and climax - Forest vegetation dynamics. Conservation of forest ecosystems. Ecology and Biodiversity - Hotspots. Ecosystem services - Inter-governmental Science Policy Platform on Biodiversity and Ecosystem Services and Millennium Ecosystem Services Assessment. Quantification of ecosystem services - Eco certifications.

4 - AGROFORESTRY (10 marks)

Agroforestry – definition and scope – Social, ecological, and economic reasons for agroforestry. Agroforestry systems and practices- Classification of agroforestry systems- structural, functional, socio-economic and Ecological basis. History of agroforestry. Components of Agroforestry- Provisioning and regulator services of agroforestry- Nutrient cycling, Soil improvement, Increased production and productivity, Microclimate amelioration and carbon sequestration – Tree-crop interaction in agroforestry– Definition, kind of interaction – Positive interactions- complementarity - compatibility - mutualism, commensalism - Negative interactions – allelopathy and competition-Interaction management - Aboveground and belowground interactions- Manipulation of density, space, crown and roots. Tree Management – structure and growth of trees, crown and root architecture, agroforestry practices to minimize negative interaction – coppicing, thinning, pollarding and pruning – crop planning and management –selection of suitable crops – management of nutrients, water and weeds – National Agroforestry Policy 2014—National and International organizations in Agroforestry.

Land use and land capability classification- prospects of agroforestry as a land use practice in India. Classification of agroforestry systems – structural, functional, agroecological, socio-economic and physiognomic basis. Agrosilvicultural systems – Improved fallows in shifting cultivation – soil dynamics in shifting cultivation – Taungya systems – Alley cropping –structural and functional attributes. Multipurpose trees and shrubs on farmlands, agricultural fields- Plantation crop combinations- coconut based agroforestry systems. Commercial crops under shade of planted trees and natural forests- Windbreaks & Shelterbelts. Silvopastoral systems – protein banks, Live fence of fodder trees and hedges, trees and shrubs in pastures. Pastoral silviculture systems- grassland and tree management in the humid, arid and semi- arid regions. Agrosilvopastoral systems – tropical homegardens –structural and functional attributes. Other systems – apiculture, sericulture and mixed woodlots. Industrial agroforestry- agroforestry practices for wasteland reclamation- agroforestry practices for salt affected soils, wetlands and waterlogged areas. Ecosystem services from agroforestry- Soil fertility improvement and water conservation through agroforestry.

5 - FOREST PRODUCTS AND UTILIZATION (10 marks)

Timber - Physical, mechanical, anatomical, chemical, electrical, acoustic and thermal Properties of Wood - Standard tests of timber - Mechanics and rheology of wood. Grading of timber (Teak, Rosewood, Sal, Redsanders and Sandal). Wood conversion - Wood working machineries used for primary and secondary conversion. Wood seasoning and preservation. Modified wood - Wood physics and Chemistry. Pulp and paper technology - Composite wood - Types - Wood adhesives and polymers - Biomass gasification and saccharification. Nanotechnology in wood and wood products - Value addition techniques - Briquettes - Biochar - Activated carbon. Non-Timber Forest Products - Classification, distribution, sustainable harvesting, processing, value addition and marketing of Gums, Resins, Katha and Cutch, Fibres and Flosses, Dyes, Tannin, Essentials oils, TBOS, Drugs, Bamboos, Canes and other NTFP Products - Role of tribal co-operative societies in NWFPs.

6 - FOREST RESOURCE MANAGEMENT (10 marks)

Definition, scope, objective and principles of forest management, organization of state forests sustained yield-definition, principles and limitations. Sustainable forest management-criteria and indicators-Increasing and progressive yields-Rotation -definitions-various types of rotations-length of rotations-choice of type and kind of rotation. Normal forest-definitions basic factors of normality. Factors governing the yield and growth of forest stands-Working plan-preparations-objectives and uses-forest maps and their uses. Joint forest management-concept and principles- Modern tools in forest management. Introduction to the concept of forestry as a common property resource– Definition, Scope and necessity of community forestry-Forests and man- Forestry in support to agriculture, animal husbandry and horticulture – development of cottage industry in rural environment-NFP 1988 and the importance of people in forest conservation. Community forest management, Community forest development, social economical and environmental aspects, Community forest development through NGOs, civil societies, citizen groups-. Joint Forest Management- Participatory Forest Management. Social Forestry- definition –NCA report of 1976- need and purpose- Social Forestry for – fodder production – fuel wood – leaf manure –timber production. Integrated rural development approach – with proper marketing facility – employment generation in raising, tending and harvesting of tree crops. Place of social forestry in the national forest policy of India-role of forest department-Gender dimensions in FM, Introduction to the concept of SFM and multiple use forest management.

7 - WILDLIFE AND HABITAT MANAGEMENT (10 marks)

Definition of wildlife, free living, captive, domesticated and feral animals. Wildlife Ecology: Biotic factors, Biological basis of wildlife, Productivity; Effect of light and temperature on animals; Wildlife Habitat: Niche, Territory, Home Range, Territoriality, Edge, Cruising Radius, Carrying Capacity; Animal behavior: instinctive behavior, learned behavior, dispersal behavior, individual and social behavior and adaptations –cursorial, saussorial, fossorial, scansorial, volant, gliding or passive flight and aquatic adaptations; Communication, Mimicry. Wildlife populations and their interactions – mortality, natality, sex ratio, associations. Biogeographic zones of India - trans-Himalayan, Himalayan, Indian desert, semi-arid, Western Ghats, Deccan peninsula, Gangetic plain, North East India, islands, coasts. Red Data Book and red listing, IUCN revised red list categories – Extinct, Extinct in the wild, Vulnerable, Near Threatened and Least concerned. Wildlife census: Purpose, techniques. Direct and indirect methods of population estimation. Sample and total counts, indices, encounter rates and densities, block counts, road side counts, dung counts, pug mark census, water hole census, line transect- statistical analysis. Telemetry- transmitters, receivers, analysis of data, visual tagging and marking. Captive wildlife: Zoos and safari parks. Captive breeding for conservation. Central Zoo Authority of India. Wildlife (Protection) Act, 1972. Special projects for wildlife conservation. Project Tiger and Musk Deer Project. Introduction and reintroduction of species. Wildlife corridors. MAB, CITES. Wildlife Damage - Appraisal, Control and Management. Healthcare, Disease Management and Nutrition in Wild Animals Protected areas concept, wildlife sanctuaries and national parks, biosphere reserves, major protected areas of India.

8 - FOREST POLICY, LEGISLATION AND CONVENTIONS (7 marks)

History of forest development; Indian Forest Policy of 1894, 1952 and 1990. National Forest Policy, 1988 of People's involvement, Joint Forest Management, Involvement of women; Forestry policies and issues related to land use, timber and non-timber products, sustainable forest management; industrialization policies; institutional and structural changes. Decentralization and Forestry Public Administration. Forest laws, necessity; general principles, Indian Forest Act 1927; Kerala Forest Act, 1961. Forest Conservation Act, 1980; Wildlife Protection Act 1972 and their amendments; Application of Indian Penal Code to Forestry - Biodiversity act, 2002 - Scheduled Tribes Act, 2006 - National Agroforestry Policy 2014 - International treaties (CITES, IUCN, RAMSER, CBD). Global climate change - Greenhouse gases - Carbon budget - Kyoto protocol, Paris agreement - UNFCCC, IPCC, CoP, LULUCF, REDD++ and CDM. Carbon foot prints – Carbon forests.

9. FOREST MENSURATION, YIELD REGULATION AND REMOTE SENSING (13 marks)

Forest Mensuration - Definition and objectives - Scales of measurement- Units of measurements - Precision, bias and accuracy- Diameter and girth measurements- Breast height measurements instruments used- Measurement of height-Definitions- Methods of measurement of height-occular-non instrumental and instrumental methods- Sources of error in height measurements-leaning trees. Tree stem form-Metzgr's theory –form factor- types of form factor-form height for quotient-form class. Volume measurements of standing trees-logs-branch wood- formulae-involved Definitions - Volume tables preparation of volume tables-graphical method-regression method-Determination of growth of trees- Increment-CAI & MAI- increment percent-increment borer- Stump analysis- Stem analysis. Measurement of tree crops-objects-crop diameter-crop height-crop age-crop volume

Yield - In regular forests-In Irregular forests. Estimation of growth and Yield of stands - Forest Inventory - Point sampling Forest Inventory - Definition-objectives- Kinds of enumeration-Tree assessment techniques- Measurement of wood volume, tree volume & tree volume tables - Kinds of sampling -Sampling design - Kinds of sampling units- Fixed area and point sampling units - Plots, strips, topographical units - sampling intensity- Inventory designs used in India - Sampling errors and non-sampling errors- Point sampling- Concept of horizontal point sampling . Estimation of growth and yield prediction in forest stands- Stand structure - Growth of stand - Methods of predicting future growth of stands - Stand density - Canopy density -Crown competition factor- Yield tables- definition- Preparation of yield table - Application and use of yield tables - Stand table-definition and use.

Remote sensing - classification based on source: Active and passive remote sensing; Aerial and space remote sensing; Interaction of electromagnetic radiation with atmosphere and earth surface; Aerial photographs - types, equipment and planning; Instruments for photogrammetry; Photo interpretation - Measurements of tree and stand characteristics on aerial photographs; use of aerial photographs in forestry; Satellite remote sensing - platforms and sensors; Satellite systems. Indian Remote Sensing Programme; Visual and digital image processing; Application of satellite based remote sensing techniques in forestry - vegetation mapping using satellite imagery; Forest cover

monitoring and damage assessment; Microwave remote sensing. Introduction to GIS. Differences between GIS and conventional cartography. Spatial and non-spatial data- Integration of attribute data with spatial data. Spatial data - Raster and Vector data-Thematic over lays in GIS- topology building and calculation of area and length etc. Application of GIS in forestry – using imageries and integration with GIS data. Toposheet and their reading.

10. FOREST PROTECTION (10 marks)

Introduction – importance of protection in Indian forestry – classification of injurious agencies. Injury to forest due to fires, causes and character of forest fires – fire prevention activity – fire suppression – fire-fighting equipment – fire control policy and objectives.

Fungi, Definition, nutrition, reproduction and classification - Causes and symptoms – Importance of forest pathology, land marks, losses due to forest tree diseases, root diseases (wilt, root-rot), stem diseases, heart rots, stem blisters, rusts, cankers, pink diseases, gummosis and foliar diseases (rust, powdery mildew, leaf spot, needle blight etc.) of important trees - etiology, symptoms, mode of spread, epidemiology and management including chemical, biological, cultural and silvicultural practices. Nursery diseases of tree species - their management - chemical, biological, cultural practices. Pathogens affecting timber – Timber decay, white fibrous rot, white pocket rot, brown cuboidal rot, dry rot - their management. Beneficial fungi of forests - Mycorrhizal association of forest trees, their importance in disease management - Edible mushroom from forests and their ecology differentiating characters of edible and poisonous mushrooms. Disease due to physiological causes

Definition, importance and scope of Entomology. Morphology, growth and development, reproduction of typical insect. Metamorphosis and various stages of insect, taxonomical classification of class Insecta, Methods and principles of pest control: Mechanical, physical, silvicultural, legal, biological and chemical. Principles and techniques of Integrated Pest Management in forests. Classification of forest pests: types of damages and symptoms; factors for outbreak of pests. Nature of damage and management: Insect pests of forest seeds, forest nursery and standing trees of timber yielding species of natural forest (*Tectona*, *Dalbergia* sp., *Albizia* sp., Sandal, *Gmelina*, *Terminalia*, deodar, sal, pines etc); Plantation forest species (eucalyptus, bamboo, *Ailanthus*, *Acacia*). Insect pests of freshly felled trees, finished timbers and their management. Insects of commercial value-honey bees and apiculture; silk- worms and sericulture, lac insect and lac culture.

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.