Syllabus of Ph.D. Entrance Examination

20. FORESTRY & ENVIRONMENTAL SCIENCE

1. **Forest ecology and environmental science:** Definition, basic concept and importance of ecology in forestry. Ecosystem and concept of energy flow. Biodiversity uses and its conservation, hotspots, threats to biodiversity and convention of biodiversity CBD). Biomass, productivity and forest floor mass, litter decomposition, forest soil and nutrient cycling. Concept and classical models of succession and climax. Factors of locality, basis of classification, distribution and forest types of India.Salient features of major world forest types. Role of forest in national economy, tribal and rural livelihoods. Natural resources, their management and ecosystem services. Environmental pollutions, global warming, effects of global warming, green house gases, ozone layer depletion and acid rain. Role of trees and forest in environmental conservation, environmental monitoring, concepts of sustainable development and Environmental Impact Assessment. Environmental policy and legislation in India- The Water (Prevention and Control of pollution) Act 1974, Forest Conservation Act 1980, The Air (Prevention and Control of pollution) Act 1981 and Environmental protection act 1986 and biodiversity conservation bill.

2. **Silviculture and silvics:** Scope and classification, form and growth of trees, natural regeneration and artificial regeneration. Tending operations-thinning, weeding, cleaning and lopping. Forest nurseries-selection and preparation of site, nursery bed, planting pattern, methods of planting and management of nursery, choice of species and afforestation of difficult sites- saline, alkaline, coastal sands, lateritic soils, sand dunes, dry and rocky areas, cold desert. Silviculture

systems- Clear felling, shelterwood, uniform, group system, irregular shelterwood system, strip system, selection system, group selection system, accessories system, coppice system, coppice selection system, coppice with standard system. Silviculure of important tree species- Acacia, Sal, Shisham, Teak, Pinus, Deodar, Abies, Eucalyptus and Popular, Quercus, Albizia and Bamboos.

3. **Concept of agroforestry, social forestry, community forestry and farm forestry: Benefits and constraints of agroforestry.** Historical development of agroforestry and overview of global agroforestry systems. Classification of agroforestry systems- Structural, functional, socio-economic and ecological. Diagnosis and design of agroforestry system. Land capability classification and land use. Criteria of an ideal agroforestry design, productivity, sustainability and adaptability. Multipurpose tree species and their characteristics suitable for agroforestry. Plant management practices in agroforestry, treecrop interactions, ecological and economic, water and nutrient competition in agroforestry, alley cropping and concept of allelopathy. Organic farming.

4. **Forest mensuration:** Definition, object and scope. Methods of measuring diameter, girth, height, bark thickness, stem form and volume of tree, classification of volume table, volume estimation of stands. Growth and increment of tree. Forest inventory, sampling methods, sample plot, survey, inventory preparation and photo interpretation. GIS and remote sensing- concept and scope. Frequency distribution, Mean, median, mode and standard deviation. Normal, binomial and Poisson distribution. Correlation, Regression coefficient and multiple regressions. Tests of significance- F and Chi square tests. Experimental designs -basic principles,

completely randomized, randomized block, latin square and split plot design.

5. **Forest Management:** Definition and scope. Concept of sustained yield, normal forest, rotation, estimation of growing stock, density and site quality. Management of even aged and unevenaged forest. Regulation of yield in regular and irregular forest by area, volume increment, working plan and joint forest management. National forest policy 1894, 1952, 1988 and Indian Forest Act 1927. Forest economics- introduction, definition and scope, economic growth and development, demand function, demand and supply, market equilibrium, market principle and market structure, perfect competition, monopoly and price control, timber product economics. Forest valuation- internal rate of return, present net worth and cost benefit analysis.

6. **Forest Protection:** Definition and factors effecting forest protection. Man as source of injury to forest, deforestation, shifting cultivation, encroachment, mining, forest fire, protection against injuries by animals and protection against injuries by diseases. Classification of forest tree diseases and their control, common diseases in forest trees- root rot, heart rot, wilt, stem cancer, stem rust, die-back, galls, leaf spots, leaf blight, powdery mildew and leaf rust. Protection against injuries by insects, defoliating, sap sucking and mites, shoot, twig and root insects, seed and cone insects, wood boring insects and gall makers.

7. **Forest utilization:** Felling and felling tools, logging, timber depot, storage and transportation of timber. Wood structure- physical and mechanical properties of wood. Defects and abnormalities of wood. Seasoning and preservation of wood. Non timber forest products such as gum, resin, tannin,

essential oil, spices, bamboos and cane and medicinal plants. Important forest industries.

8. **Forest genetics:** Introduction, scope of genetics and it's application in the tree improvement. Heredity and variation, causes and kinds of variation in natural and artificial stands, forces that shapes variation, heritability and genetic gains Weinburg Law. Provenience testing-collection, processing, storage of seed, seed dormancy, viability, pretreatment, seed testing. Progeny test and design. Methods of tree breeding. Seed orchardtype, establishment and management, seed production areas, clonal forestry, Vegetative propagation, role of growth substance in vegetative propagation and tissue culture.

9. **Wildlife ecology:** Scope of wild life management in India, limitations of management, problems of wildlife manager, rare, threatened and endangered species of India. Food chain, quality and quantity, food web, carrying capacity, niches, food size, pinch period, predation and shelter, territory and home range of animal. population – biological surplus, environmental resistance, gregarious and flocking, density and saturation point and population dynamics and zoogeographical regions of the world. Management and conservation of wildlife Sanctuaries, National parks, zoological parks and biosphere reserves. Techniques of wild life studies- census and estimates track and trails, importance animals of India, their distribution and importance, wild life values, wildlife and tourist, wild life as a land use. Wild life protection act 1972 as amended 1991.

10. **Watershed Management:** Introduction and scope, natural hazards in watershed management, extent and causes of land denudation, aspects of hydrological cycle, deforestation and

hydrologic change, impact of human activities on watershed, hill agriculture, erosion from mines and quarries, erosion hazards in road construction and scientific basis of watershed management. Role of forest in watershed management. Role of livestock in watershed management. Importance of the transfer of plant nutrients. Watershed management techniques. Wasteland their characteristics and reclamation.