



Headquarters Forest Protection Force, J&K.

**The Commissioner/Secretary to Govt.
Forest, Ecology & Environment Department,
Civil Secretariat, Jammu/Kashmir.**

No. DFPF- **ESTT/2/2022/I/28643/2022**

Dated **10 -09-2022**

**Subject:- Re-referring of 22 (twenty two) Gazetted vacancies to J&K
Public Service Commission under Direct Recruitment quota in
terms of S.O 192 of 2020 dated 17/06/2020.**

Sir,

Kindly refer your office letter No. FST-Gaz/4/2022-02-Forest Deptt
Dated 01/09/2022 regarding the subject cited above. The Syllabus as required
for the selection to the post of Assistant Director-I of Forest Protection Force
(copy enclosed) has been framed after proper deliberation and due
consideration of the job requirement.

Hence, submitted for favour of information and necessary action at your
end.

Yours faithfully,

Encls: 18-leaves.

**(J. Frankoi) IFS
Director**

OFFICE

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**SYLLABUS AND SCHEME OF EXAMINATION FOR ASSISTANT
DIRECTOR-I JAMMU & KASHMIR FOREST PROTECTION FORCE**

1. **Mode of Examination:** The examination for Assistant Director- I, Forest Protection Force shall be conducted in the following order:

- i. Written Test
- II. Viva Voce/ Interview
- III. Walking Test
- IV. Medical Test

10. **Pattern of Examination and Marks Distribution:** The pattern of examination with marks distribution is proposed as under:

Written Test (Main Examination) Essay Type			
Name of Subject	Max. Marks	Time Duration	Qualifying Marks
General English	100	2 hrs	40%
General Studies	200	3 hrs	40%
Optional Subject Any one of the following-	200	3 hrs	40%
1. Agriculture			
2. Botany			
3. Chemistry			
4. Environmental Science			
5. Forestry			
6. Horticulture			
7. Mathematics			
8. Physics			
9. Zoology			
Total (A)	500		
Interview/viva-voce			
Viva-voce (B)	100		
Grand Total (A) + (B)	600		

11. **Syllabus for the Written Examination:** The syllabi for written papers are proposed as under:

- i. **General English:** The paper shall be of 10+2 standard and shall consist of essay writing, paragraph writing, comprehension, precise writing, usage, vocabulary, idioms and phrases etc.
- ii. **General Studies:** This paper shall contain questions on Indian history of India, Indian national movement & Indian culture. Indian polity & constitution of India. Indian economy, Planning in India & Economic and Social development. World geography and geography of India. General Science, role & impact of science & technology in the development of India. Current events of national & international importance. General mental ability, logical reasoning, analytical ability, problem solving, basic

1

numeracy. Forest and wildlife Conservation- Climate change, International conventions and present legislations in India.

S.NO.	TOPIC	WEIGHTAGE
1.	Indian History, Indian National Movement & Indian Culture	25
2.	Indian Polity & Constitution of India	25
3.	Indian Economy, Planning in India, Economic and Social Development.	25
4.	World Geography & Geography of India	25
5.	General Science, role & impact of science & technology in the development of India.	25
6.	Current events of National & International importance	25
7.	Mental Ability and General Aptitude	25
8.	Forest and wildlife Conservation, Climate change, legislations and international conventions.	25
	Total	200

- iii. **Optional Subjects:** The syllabus of the optional subjects shall be of graduate degree level as under:

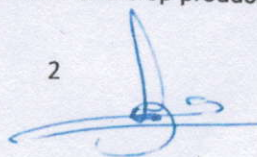
AGRICULTURE

PART-I

1. **Ecology and its relevance to man-** Natural resources, their management and conservation. Physical and social environment as factors of crop distribution and production. Climatic elements as factors of crop growth, impact of changing environment on cropping pattern, plants as indicators of environments. Environmental pollution and associated hazards to crops, animals and humans.
2. **Cropping patterns in different agro-climatic zones of the country** - impact of high yielding and short duration varieties on shifts in cropping patterns. Concepts and principles of multiple cropping - multistory, relay and inter-cropping and their importance in relation to food production; Package of practices for production of important cereals, pulses, oilseeds, fiber, sugar and commercial crops grown during Kharif and Rabi seasons in different regions of the country.
3. **Weeds-** their characteristics, dissemination and association with various crops; their multiplication; cultural, biological, chemical and integrated control of weeds.
4. **Soil-** processes and factors of soil formation, classification of Indian soils including modern concepts, mineral and organic constituents of soil and their role in maintaining soil productivity. Problem soils, extent and distribution in India and their reclamation. Essential plant nutrients and other beneficial elements in soils and plants, their occurrence; factors affecting their distribution, availability functions and recycling in soils; symbiotic and non-symbiotic nitrogen fixation. Principles of soil fertility and its evaluation for judicious fertilizer use.
5. **Watershed management-** Soil Conservation planning on watershed basis. Erosion and run of management in hilly, foothills and valley lands - processes and factors affecting them. Dry lands agriculture, its problems and crop production techniques.



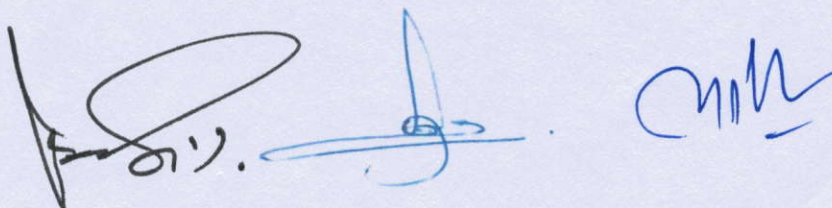
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6. **Water use efficiency** in relation to crop production, criteria for scheduling irrigation, ways and means of reducing runoff losses of irrigation water.
7. **Farm management**- scope, importance and characteristics, farm planning and budgeting. Economics of different types of farming systems. Agriculture extension—its importance and role. Extension techniques, methods of evaluation of extension programs, socio-economic survey and status of big, small and marginal farmers training programs for extension workers. Training and extension programs.

PART-II

8. **Heredity and variation**- Mendel's Law of inheritance, Chromosomal theory of inheritance. Cytoplasmic inheritance, Quantitative characters.
9. **Origin and domestication of field crop**- Morphology and patterns of variations in varieties and related species of important field crops. Causes and utilization of variations in crop improvement.
10. **Application of the principles of plant breeding to the improvement of major field crops**- methods of breeding of self and cross pollinated crops. Introduction, selection, hybridisation, heterosis and its exploitation. Male sterility and self-incompatibility, utilization of mutation and polyploidy in breeding.
11. **Seed and seed technology**- importance, types and seeds and their production, processing and testing of seeds of crops and seed certification regulation.
12. **Climatic requirements and cultivation of major fruits, plants and vegetable crops with special reference to commercial fruits and vegetables**- the package of practices and the scientific basis for same. Handling and Marketing problems of fruits and vegetables, principal methods of preservation of important fruits and vegetable products, processing techniques and equipment. Role of fruits and vegetables in human nutrition, landscape and floriculture, including raising of ornamental plants and design and lay out of lawns and gardens.
13. **Diseases and pests of fruits, vegetable, orchard and plantation crops of India and measures to control these**- Causes and classification of plant diseases. Principles of plant disease control including exclusion, eradication, immunization and production. Biological control of pests and diseases. Integrated management of pests and diseases. Pesticides and their formulations, plant protection equipment, their care and maintenance.
14. **Growth and Development of Vegetable Crops**.—Physiology of dormancy and germination of vegetable seeds and tubers. Tissue culture techniques.
15. **Post-harvest technology**.—Maturity and ripening process and factors affecting them. Quality evaluation for fresh market and processing. Factors responsible in deterioration of harvested fruits and vegetables, role of growth substances and irradiation in decay control, respiration and transpiration, storage of fresh fruits and vegetables, theories of chilling injury and symptoms of chilly injured. Modified gas storage.



BOTANY

PART-I


(MICROBIOLOGY, PATHOLOGY, PLANT GROUPS AND THEIR MORPHOLOGY, ANATOMY, TAXANOMY, EMBRYOLOGY OF ANGIOSPERMS)

1. **Microbiology.**—(Viruses and Bacteria). Their structure, classification, reproduction and physiology. Mode of infection of Viruses and Bacteria. Role of microbes in industry and agriculture.
2. **Pathology.**—Knowledge of common and important plant diseases caused by fungi and bacteria (Special reference to diseases common in Himachal Pradesh), mode of infection of fungi and control of disease.
3. **Plant Groups.**—Classification, structure, reproduction, life history and economic importance of Algae, Fungi, Bryophytes Pteridophytes and Gymnosperms (including comparative study of various groups). A general knowledge of distribution of important genera of principal subdivision of above groups in India (Emphasis of Western Himalayas).
4. **Morphology, Anatomy, Embryology and Taxonomy of Angiosperms.**—Morphology and Anatomy of Stem, Root, Leaf (excluding anomalous growth). Tissue and Tissue system. Structure of Anther and Ovule. Fertilization and development of seed. Classification of Angiosperms, Principles of Nomenclature. Modern trends in Taxonomy. A general knowledge of following families of Angiosperms: Ranunculaceae, Brassicaceae, Malvaceae, Rutaceae, Rosaceae, Leguminosea, Cucurbitaceae, Umbelliferae, Asteraceae, Solanaceae, Lamiaceae, Euphorbiaceae, Liliaceae and Gramineae.

PART-II

(CELL BIOLOGY, GENETICS AND EVOLUTION, PHYSIOLOGY, ECOLOGY AND ECONOMIC BOTANY)

5. **Cell Biology.**—Cell as a unit of structure and function. Ultra-structure of Cell and its various organelles. Chromosomes – the physical and chemical structure, its behaviour during mitosis and meiosis.
6. **Genetics and Evolution.**—Pre and Post Mandelian concept of Genetics. Development of Gene concept. Genetic code. Nucleic acids, their structure and role in reproduction and protein biosynthesis, Mutations. Role of mutations in plant breeding (wheat, gram, tobacco, cotton only). Organic evolution – evidences and theories.
7. **Physiology.**—Photosynthesis, Absorption and conduction of water, Transpiration, Mineral absorption, Role of elements, Enzymes, Respiration, Fermentation, Growth, Photo-periodism and Vernalisation. Plant Hormones – their type and role. Dormancy of seeds.
8. **Plant Ecology.** –Its scope, plant communities, plant succession, factors. Applied ecology with special reference to pollution and conservation.
9. **Economic Botany.**—Importance of plants, Important plants yielding food, fibre, wood and drugs.



CHEMISTRY

PART-I

1. **Atomic Structure and Chemical bonding.**—Quantum theory, Schrodinger equation, particle in a box, hydrogen atom. Hydrogen molecule. Elements of valence bond and molecular orbital theories (idea of bonding, non-bonding and anti-bonding orbitals). Sigma and Pi bonds.
2. **Chemical Kinetics.**—Kinetics of reactions involving free radicals, Kinetics of polymerisation and photochemical reactions.
3. **Surface chemistry and catalysis.**—Physical absorption, isotherms, surface area determination, heterogenous catalysis, acid bases and enzyme catalysis.
4. **Electrochemistry.**—Ionic equilibria; theory of strong electrolytes; Debye, Huckel theory of activity coefficients; electrolytic conduction, galvanic cell, membrane equilibrium and fuel cells. Electrolysis and overvoltage.
5. **Thermodynamics.**—Laws of Thermodynamics and application to physiochemical processes systems of variable compositions.
6. **Electronic structure of transition metal complexes.**—Crystal field theory and modifications, complexes of Pi-acceptor ligands, organo-metallic compounds of transition metals.
7. **Lanthanides Actinides.**— Separation Chemistry, Oxidation state, magnetic properties. Reaction in non-aqueous solvents.

PART-II

8. **Electronic displacements.**—Inductive, electromeric, mesomeric and hyper-conjugative effects. Electrophiles, nucleophiles and free radicals. Resonance and its application to organic compounds. Effect of structure on the dissociation constants of organic acids and bases. Hydrogen bond and its effects on the properties of organic compounds. Modern concepts of organic reaction mechanisms, addition, substitution, elimination and rearrangement. Reaction involving free radicals. Mechanisms of aromatic substitution. Benzene intermediates.
9. **Aliphatic Chemistry.**—Chemistry of simple organic compounds belonging to the following classes —alkanes, alkynes, alkyl halides, alcohol, thiols, aldehydes, ketones, acids and their derivatives, ethers, amines, amino acids, hydroxy acids, unsaturated acids, dibasic acids.
10. **Synthetic uses of the following—** Aceto-acetic and malonic esters, organo-metallic compounds of magnesium and lithium, ketene, carbene and diazomethane.
11. **Carbohydrates.**—Classification and general reactions of simple monosaccharides, chemistry of glucose, fructose and sucrose.
12. **Stereo Chemistry.**—Elements of symmetry and simple symmetry operation, Optical and geometrical isomerism in simple organic molecules, E,Z and R,S notations. Conformations of simple organic molecules. Stereochemistry of inorganic co-ordination compounds.
13. **Atomic Chemistry.**—Benzene, toluene and their homologues, hydroxy, nitro and amino derivatives, Sulphuric acid, Xylenes, Benzaldehyde, Salicylaldehyde, acetophenone, Benzoic, phthalic, salicylic, cinnamic and mandelic acids. Reduction products of

nitrobenzene, Diazonium salts and their synthetic uses. Structure, synthesis and important reactions of naphthalenes anthracene, Phenanthrene, Pyridine and quinoline.

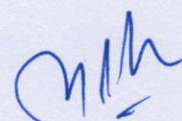
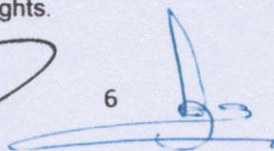
14. **Basic concepts regarding the following materials of economic and medical importance.**— Cellulose and starch, coal tar, chemicals, organic polymers. Oils and fats, petrochemicals, vitamins, hormones, alkaloids (fermentation products including antibiotics, proteins).
15. **Organic Photochemistry.**—Energy level diagrams, quantum yield, Photochemistry of simple organic molecules.
16. **Polymers.**—Physical chemistry of Polymers. Molecular weight averages and group analysis, sedimentation light scattering and viscosity of Polymer solutions. Alloys and inter-metallic compounds.

ENVIRONMENTAL SCIENCE

PART-I

Life Sciences (Basic Biology and Natural Resources)

1. **Basic Biology-** introduction to biology, branches, scope and importance from environmental point of view. What is life?
2. **The evolution of life on earth:** Origin of life - Microbes, Plants and Animals, fossils and sediments, distribution and pattern of life in past, Paleontological evidences, Mass extinction Life forms on Earth (all forms of plants and animals), Life in Water, Life on Land, Microbial life in air, water and soils, microbes and diseases, decomposing soil microbes, marine biology.
3. **Taxonomic principles:** History, aims, objectives, hierarchy and kingdoms, identification and nomenclature.
4. **Classification of plants and animals based on form-relationship,** species concept, organization of living things, microbial classification, Ecological Classification Systems, Collection and Herbarium, Preservation, flora, fauna, preservation of insects Ecological adaptation under various environmental conditions, Hydrophytes, Xerophytes, Halophytes, Mesophytes, Epiphytes Distribution of life on earth and factors responsible for present day distribution. Continental drift.
5. **Natural Resources-** Introduction, scope and importance of natural resources, biotic and abiotic resources Renewable and nonrenewable natural resources and their limitations.
6. **Renewable resources:** Forest and wildlife resources, forest wealth of India, animal resources, livestock and fisheries.
7. **Food Resources:** World food problems, agricultural resources, agricultural potential of India, effects of modern agriculture.
8. **Non-renewable resources:** Fossil fuels – coal, oil and natural gas, Consequences of rapid consumption of fossil fuels.
9. **Fresh and marine Water resources:** global distribution of fresh water and its limits. The sources of fresh water for terrestrial life, fresh water resources of India, mans water requirement, floods and droughts.

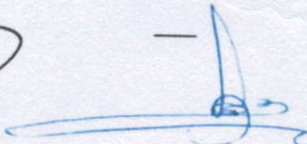


10. **Soil and Mineral resources:** global status, mineral resources of India, metals and minerals.
11. **Energy resources:** Global energy consumption, energy needs, conventional and nonconventional energy sources, alternative energy sources, energy resources of India.

PART-II

Earth Sciences (Environmental Chemistry and Basic Geosciences)

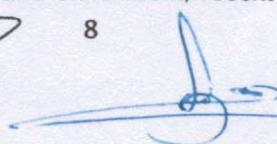
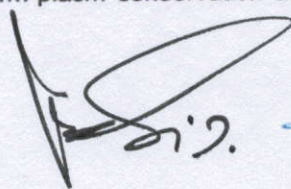
12. **Environmental Chemistry-** Chemistry of atmosphere, Chemical reactions involved in atmosphere, chemistry in ozone depletion, chemical reactions of global warming.
13. **Chemistry of water:** physical properties, changes in water properties by addition of solute, hydrogen bonding, gases present in water, basic reversible and irreversible reactions in water, sources of cations and anions in water, changes in water properties by addition of solute. **Stichiometry, Gibb's energy, chemical potential, chemical equilibria, acid-base reactions, solubility product, carbonate system.**
14. **Chemistry of carcinogenic compounds and their effects on human body.**
15. **Surfactants:** Cationic, anionic and non-ionic detergents, modified detergents.
16. **Pesticides:** Classification, degradation, analysis, pollution due to pesticides and DDT problems.
17. **Lead and its compounds:** Physical and chemical Properties, behaviour, human exposure, absorption, influence. **Mercury and its compounds:** Physical and chemical Properties, behaviour, human exposure, absorption, influence.
18. **Hydrocarbons:** Chemistry of hydrocarbon decay, environmental effects, effects on macro and microorganism.
19. **Destruction of some hazardous substances:** acid halide, anhydrides, cyanides and cyanogens bromides, chromium, aflatoxins, halogenated compounds.
20. **Basic Geosciences-Atmosphere:** Evolution, structure and chemical composition of atmosphere.
21. **Temperature measurement and controls,** Environmental lapse rate, dry and wet adiabatic lapse rate, inversion of temperature and atmospheric stability.
22. **Atmospheric pressure and winds,** factors affecting on wind, Forms of condensation, precipitation, hydrological cycle.
23. **Internal structure of earth,** Geological evolution, plate tectonic, formation of lithosphere. Continental and oceanic crust formation.
24. **Rocks:** Types of rocks, Rock cycle, basic minerals of rock, clay minerals, mineral chemistry.
25. **Soil and its formation:** weathering processes, soil profiles, physical and chemical properties of soil, composition of soil. **Macro and micro plant nutrients in soil, Soil classification, Soils of India.**



FORESTRY

PART—I

1. **General Silviculture Principles.**— ecological and physiological factors influencing vegetation, natural and artificial regeneration of forests; methods of propagation, grafting techniques, site factors, nursery and planting techniques, nursery beds polybags and maintenance, water budgeting grading and hardening of seedlings special approaches, establishment and tending. Cold desert- characteristics, identification and management of species.
2. **Silvicultural Systems.**— clear felling uniform, shelter wood, selection, coppice, and conversion systems, Management of silvicultural system of temperate, subtropical, humid tropical, dry tropical and coastal tropical forests with special reference to plantation silvicultural choice of species, establishment and management of standards, seeding thinning. Silviculture of some of the economically important species such as *Acacia catechu*, *Acacia nitotica*, , *Albizia lebbek*, *Azadirachta indica*, Bamboo spp, *Butea monosperma*, *Cedrus deodara*, *Eucalyptus* spp, *Lagerstroemia Lanceolata*, *Pinus roxburghi*, *Populus deltoides*, *Populus ciliata*, *Salix alba*, *Ulmus wallichiana*. *Pinus wallichiana*, *Prosopis juliflora*, *Santalum album*, *Shorea robusta*, *Tectonagrandis*, *Terminalia tomentosa*, and *Tamarindus indica*.
3. **Forest Ecology and Ethno-botany:** Biotic and abiotic components, forest ecosystems, forest community concepts; vegetation concepts, ecological succession and climax primary productivity, nutrient cycling and water relation; physiology in stress environments (drought, water logging salinity and alkalinity). Forest types in India, identification of species, composition and associations; dendrology; taxonomic classification, principles and establishment of herbaria and arboreta, Conservation of forest ecosystems. Clonal parks. Role of Ethno-botany in Indian Systems of Medicine; Ayurveda and Unani-Introduction, nomenclature, habitat, distribution and botanical features of medicinal and aromatic plants, factors affecting action and toxicity of drug plants and their chemical constituents.
4. **Environmental Conservation and Biodiversity:** Environment-components and importance, principles of conservation, impact of deforestation, forest fires and various human activities like mining, construction and developmental, projects, Population growth on environment. **Bio diversity:** concepts and principles, importance of bio-diversity conservation, in-situ and ex-situ method of conservation, measurement of diversity, diversity indices, Biosphere concept, hotspots of bio-diversity, Indian bio-diversity and gene pool. Conservation efforts in India and world-wide, bio-diversity conventions and treaties.
5. **Pollution.**—types, global warming, green house effects, ozone layer depletion, acid rain, impact and control measures, environmental monitoring, concept of sustainable development. Role of trees and forests in environmental conservation control and prevention of air water and noise pollution, Environmental Impact Assessment,
6. **Tree improvement, Seed Technology and Biotechnology:** General concept of tree improvement, methods and techniques, variation and its use provenance, seed source, exotics, quantitative aspects of forest tree improvement, seed production and seed orchards, progeny tests, use of tree improvement in natural forest and stand improvement genetic testing programming, selection and breeding, for resistance to diseases, insects, and adverse environment, the genetic base, forest genetic resources and gene conservation in situ and ex-situ Cost benefit ratio economic evaluation.
7. **Biotechnology.**—Historical developments, scope of biotechnology in agriculture, forestry and industry, Plant tissue culture, response patterns, Application of plant tissue culture in plant improvement, in vitro selection, micro propagation of forest trees and medicinal plants germ-plasm conservation and enrichment, recent developments, Gene regulation,



genetic engineering techniques, transgenic plants and animals, case studies with special reference to genetic modification of tree species to diseases, pest and other forms of stress. Medication of plant species to practice desired products, Bio-degradation of agriculture and forestry wastes through genetically engineered microbes.

8. **Forest Pathology.**—Importance and brief history of Forest pathology, terminology concept, causes and classification of plant diseases, symptomatology, stages in disease development; dissemination of pathogens; inoculums and inoculums potential; pathogenesis/role of toxins and enzymes; variability in pathogens; disease resistance; plant disease epidemics; disease forecasting; management of disease through regulatory, cultural, physical, chemical and biological methods; integrated disease management; biotechnology in plant pathology Common forest fungi diseases and methods of control. Nursery diseases of important tree species. Principal of Forest disease management Definition and scope of disease management of forestry. Importance of disease cycle and economic threshold in disease management. Principles of disease management such as exclusion, cultural, chemical, biological and immunization, Nature of disease resistance. Fungicides and their use in nurseries and plantations. Integration of cultural, chemical, biological and host resistance in effective disease management, Meristem and tissue culture techniques in disease management. Bio-degradation of wood in use. Types of wood decay, gross characters of decay, sap-stain, different types of rots in hardwoods softwoods and their prevention, Graveyard test and decay resistant wood.
9. **Forest Entomology.**—Definition importance and scope of Entomology, Definition of insect and its position in the Animal kingdom. Important characters of phylum arthropoda and class insect. External morphology of generalized insect. Insect growth and development, reproduction in insects immature states (Egg, Larvae/ nymph and pupae), metamorphosis in insects. Taxonomic classification of class insects, diagnostic characters of the orders and major families of economic importance. History and importance of Forest Entomology in India, methods and principles of pest control; Mechanical, physical, silviculture legal, biological and chemical principles and techniques of integrated pest management in forests. Classification of forest pests; Types of damages and symptoms; factors for out break 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. Albiziaspp. Sandal, Deodar, Pines); Insect pests of freshly felled trees, finished timbers and their management. Morphology of plant parasitic nematodes, brief classification of important genera of nematodes, important diseases caused by different genera and their management practices.
10. **Wildlife Management and Conservation.**— History of wildlife management and conservation in India; cultural background, Habitat management: purposes, principles, practices and tools- fire, cutting, grazing, Habitat interspersion and edge effect. Provision of water saltlicks and food. Zoning core, buffer, tourism and multiple use in protected areas. Wildlife damage control; Mitigating, human, wildlife conflict-fences, trenches, walls, lure crops, repellents, translocation and compensation. Captive wildlife; Zoos and safari parks, Captive breeding for conservation, Role of Central Zoo Authority of India. Wildlife census; Purpose, techniques, Direct and indirect methods of population estimation, Sample and total counts, indices, encounter rates and densities. Wildlife (Protection) Act, 1972, Protected areas - Sanctuary National Park and Biosphere Reserves, Special projects for Wildlife conservation. Project Tiger and Musk Deer Project. Introduction and reintroduction of species, Wildlife corridors, MAB, Red Data book, Category of threat, CITES, Conservation, meaning, principles and strategies, in-situ and ex-situ conservation, conserving biodiversity, Politics-socio-economic, role of education and extension.
11. **Forest Management and Management Systems:** Objective and principles; techniques; forest management systems - their evolution and application world forestry systems, Forest sources and forestry practices in different regions of the world, international forestry organizations; stand structure and dynamics, sustained yield relation, rotation normal forest growing stock regulation of yield; management of forest plantations, commercial forests, forest cover monitoring. Approaches, viz. (1) site - specific planning (ii) strategic

planning (iii) Approval, sanction and expenditure (iv) Monitoring (v) Reporting and governance.

Range land management-need and importance. Distribution, characteristics, status and management of range lands, ecology and range lands and impact of grazing, range land inventory methods, range equipment techniques, alpine pastures, their importance in nomadic grazing and growth of medicinal shrubs and herbs.

Forest Working plans.— Forest Planning evaluation and monitoring tools and approaches for integrated planning, multipurpose development of forest resources and forest industries development; working plans and working schemes, their role in nature conservation, bio-diversity and other dimensions; preparation and control. Divisional Working Plans, Annual plan of Operations.

Forest mensuration- Inventory and Statistics.—Methods of measuring - diameter girth height and Volume of trees; form -factor; volume estimation of stand, current annual increment; mean annual increment, Sample methods and sample plots. Yield calculation; yield and stand tables,

Forest inventory —definition, object, kind of enumeration, Sampling-advantages, kinds of sampling, random sampling simple, stratified, multiphase sampling non-random sampling selective, Systematic and sequential sampling. Sampling design, size and shapes of sampling, units. Point sampling; horizontal and vertical point sampling, forest cover monitoring through remote sensing; Geographic, Information Systems for management and modeling,

Forest surveying- Definition and scope, collection of data and their presentation, measures of central tendency; laws of probability, linear correlation and its measure, tests of significance, sampling methods and designs, analysis of variance. Forest surveying - different methods for surveying maps and map reading,

Forest Engineering-Basic principles of forest engineering, Building materials and construction, Roads and Bridges; General principles; objects, types, simple design and construction of timber bridges.

12. **Forest Protection.**—Injuries to forest, abiotic and biotic actors, destructive agencies, insectpests and disease, effects of air pollution on forests and forest die back. Susceptibility of forests to damage, nature of damage, cause, prevention, perfective measures and benefits due to chemical and biological control. General forest protection against fire equipment and methods, controlled use of fire, economic and environmental cost; timber salvage operations after natural disasters, Role of afforestation and forest regeneration in absorption of CO₂. Rational and controlled grazing, different methods of control against grazing and browsing animals; effect of wild animals on forest regeneration, human impacts; encroachment, poaching, grazing, live fencing, theft, shifting cultivation and control.
13. **Forest Soils, Soil Conservation.**—Forest Soils, classification, factors affecting soil formation; physical; chemical and biological properties, Soil Conservation- definition, causes for erosion; types-wind and water erosion; conservation and management of eroded soil/ areas wind breaks shelterbelts sand dunes; reclamation of saline and alkaline soil water logged and other waste lands. Role of Forests as conserving soil organic matter, provision of lopping for green leaf manuring; forest leaf litter and composting; Role of micro- organisms in ameliorating soils N and C cycles, VAM.
14. **Watershed Management and Hydrology.**— concepts of watershed: role of mini-forests and forest trees in overall resource management, forest hydrology, water development in respect of torrent control, river channel stabilization, avalanche and landslide controls, rehabilitation of degraded areas; hilly and mountain areas; watershed management and environmental function of forests; water-harvesting and conservation; ground water

recharge and watershed management; role of integrating forest trees, horticulture crops, field crops, grass and fodders, Hydrology, Water resources and Engineering-Hydrological cycle, precipitation, evaporation, transpiration, depression, storage, infiltration, overland flow, hydrograph, flood frequency analysis, flood estimation, flood routing through a reservoir Water logging-its causes and control, design of drainage system, soil salinity, river training- principles and methods.

PART-II

15. **Social, Agro and Farm Forestry: Social Forestry.**—Objective, scope and necessity, evolution of social forestry in India, people participation, experiences of Social Forestry Projects in India.

Agro - Forestry.—scope and necessary, place of Agro-forestry in National Forest Policy, role in the life of people and domestic animals and integrated land use, planning especially related to (i) soil and water conservation: (ii) water recharge; (iii) nutrient availability to crops; (iv) pasture and eco-system preservation, including ecological balances through pest-predator relationships and (v) providing opportunities for enhancing biodiversity, medicinal and other flora and fauna, Agro forestry systems under different agro-ecological zones; selection of species and role of multipurpose trees and NTFPs techniques, food, fodder, fodder and fuel security. Research and Extension needs, social forestry in Himachal Pradesh, Van mahotsava and Chipko movement.

Farm Forestry.—definition, its resemblance and difference from agro-forestry, farm wood lots. High-density plantations. Economics of farm forestry; Different farm forestry systems - tagunya, shifting cultivation, alley cropping, wind braks, shelterbelts, dryland and wetland farm forestry.

Tribology.—tribal scenario in India; tribes, concept of rages, principles of social grouping, stages of tribal economy, education, cultural tradition, customs, and participation in forestry programmes with special reference to Himachal Pradesh.

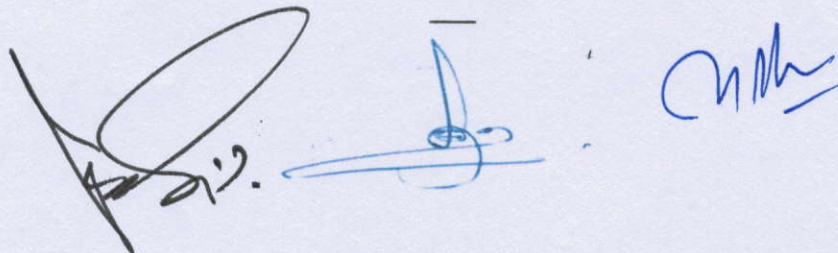
16. **Joint Forest Management.**— Need principles, objectives, methodology, scope, benefits and role of NGOs, SHG's, mahila mandals and other voluntary organizations, details of steps involved such as formation of Village Forest Committees, Joint Forest participatory Management committees.
17. **Forest Resources and Utilization.**— Environmentally sound forest harvesting practices; logging and extraction techniques and principles, transportation systems, Storage and sale of Non-Timber Forest Products (NTFPs) definition and scope.

Need and importance of wood seasoning and preservation; general principles of seasoning, air and kiln seasoning, solar dehumidification, steam heated and electrical kiln's, Composite wood adhesives —manufacture, properties, uses, plywood manufacture-properties, uses, fibre boards-manufacture properties, uses; particle hoards manufacture properties, uses. Present status of composite wood industry in India in future expansion plans. Pulp-paper and rayon; present position of supply of raw material to industry, wood substitution, utilization of plantation wood; problems and possibilities. Anatomical structure of wood, defects and abnormalities of wood timber identification - general principles.

18. **Wood science and Technology.**— Wood as raw material, kinds of wood-hardwood, softwood, bamboos and palms, wood as raw material. The physical features of wood. Mechanical properties of wood. Suitability of wood for various end-uses based on mechanical and physical properties. Electrical and acoustic properties of wood. Wood water relationship-shrinkage, swelling, movement, fibre saturation, and equilibrium moisture contract, Wood seasoning - merits, principles and types - air seasoning, kiln seasoning, chemical seasoning, Refractory classes of timbers kiln schedules, Seasoning defects and their control. Wood preservation-principles, processes, need, Types of wood

preservatives (Water-soluble, oil based, etc.) classification of timbers based on durability. General idea about fire retardant and their usage. Non-pressure methods - steeping, dipping, soaking open tank process, Boucherie process, pressure methods - full cell process, empty cell process (Lutory and Ruping) Wood machining. Sawing- techniques, kinds of saws-cross cut saw, edging saws, cudless saws; handsaw, and circular saw, quarter sawing bow saws, Wood working, tools used in wood working (parting tools, slicing tools, shaping tools, measuring and marking tools, various stages of wood working. Dimensional stabilization of wood by surface coating method bulking method and impregnation of resins and polymers.

19. **Non-Timber Forest Products.**—Introduction, fodder, grasses and tree leaves, canes and bamboos, and their uses, methods of collection of Non-timber Forest products (NTFPs), Essential Oils, extraction classification. Storage and uses, Non essential oils –nature, occurrence, methods of extraction of oils from seeds, important oil yielding trees. Gums and Resins- sources, collection and uses, the occurrence and origin of gums in plants, properties of gums, important Indian gums, uses of gums, resins and oleoresins, formation of resins in plants, classification of resins, Tans and Dyes nature and kinds of tannins, Dyes-classification and sources of dyes, Beedi leaves, sources collection and processing, Fibres and Flosses, Cutch and Katha –sources, extraction and uses, Drugs, Spices, poisons and Bio-pesticides.
20. **Forest Policy & legislation.**—Policy-definition, necessity and scope Legal and institutional approaches to forest resource management. History of development of Forest policy of 1894 & 1952. National Forest Policy, 1988, Forest Law, Objects of special forest Law- Indian Forest Act, Forest Conservation Act, Wildlife Protection Act, Biodiversity Act and Forest Rights Act; *T.N. Godavarman vs Union of India*- landmark case, origin and its significance. Joint Forest Management, involvement of women; Village Forest Committees & Joint Forest participatory Management committees etc.
21. **Extension & Education.**— meaning definition nature; scope objectives; principles approaches and history, Forestry extension; process principles and selected programmes, ICFRE and its institutes; People's participation in forestry programmes; motivation of women community; children youth and voluntary organizations for forestry extension work, Rural Development, meaning , definition, objective and genesis. Transfer of technology programmes like ORP, LLP, ND, FLD, KUK, TARP etc. of ICAE.
22. **Remote Sensing and GIS in Forestry.**—Principle, forest cover mapping through remote sensing, use of remote sensing in forest inventories, GIS fundamentals, GIS in modeling and management of forest resources.



HORTICULTURE

PART-I

1. **Fruit Industry in India and its potential.** General principles of cultivation. Method of propagation. Physiological basis of rooting. Special plant growing structures – mist propagation, green house and glass house. Promising root stocks for fruit crops. Plant growth regulators, retardants and inhibitors relating to flowering, sex expression, fruit set, fruit development and ripening. Dormancy and rest and rest period. Pollination and fruit set. Growth and fruiting habits of fruits and nut species. Parthenocarpy. Orchard management practices, manure and manuring, irrigation, training and pruning high density planting. Fruit thinning and fruit drop.
2. **Origin, history, pomological description,** climatic requirements and production techniques of important temperate, sub-tropical and tropical fruit crops. Important pests, diseases and physiological disorders and their management. Integrated management of pests and diseases. Harvesting and harvest maturity indices. Handling and marketing problems of major fruits. Special problems of production.
3. **Principal methods of preservation.** Important fruit and vegetable products. Processing techniques and equipments. Wastes from processing factory and their impact on environment. By- products and utilization. Nutritive value of fresh and processed fruits and vegetables. Standards of fruit and vegetable products.
4. **Economic principles in fruit and vegetable production.** Use of planning and budgeting techniques. Efficiency measures of orchard management.
5. **Extension education and its importance.** Methods of evaluation of extension programmes. Socioeconomic survey and status of different categories of farmers. Training programmes for extension workers. Lab to field and T&V programmes.

PART-II

6. **Importance, nutritive value and classification of vegetables.** Types of vegetable gardening. Principle of vegetables, cultivation including nursery management. Climatic requirement and cultivation of major summer and winter vegetable crops. Off-season vegetable production. Diseases and pests of vegetable crops and measures to control.
7. **Weeds, their characteristics and association with various vegetable crops.**
8. **Principles of plant breeding in the improvement of major vegetable crops.** Methods of breeding of self, cross-pollinated and vegetatively propagated crops. Seed technology and its importance. Production, processing, testing and marketing of vegetable seeds.
9. **Plant physiology and its significance.** Growth and development factors affecting growth. Absorption and translocation of water transpiration and water economy. Modern concepts of photosynthesis and respiration.
10. **Processes and factors of soil formation.** Mineral and organic constituents of soil and their role in maintaining soil productivity. Plant nutrient elements in soils and their availability. Nitrogenous, phosphatic potassic and micronutrient fertilizers and their use.

Problem soils and their reclamation. Water conservation and watershed management. Water use efficiency in relation to crop production. Criteria for scheduling irrigation, ways and means of reducing run off losses.

11. **Importance and scope of floriculture**- landscaping and interior-scaping. History, theory and principles of landscape, planting and lawns. Beautification of slopes, forests and wastelands. Layout of home gardens and public parks. Propagation of ornamentals. Cultural requirement of ornamental trees, shrubs, climbers, bulbs and annuals for winter and summer season. Production technology and post harvest management of cut flowers, bulbs, house plants and bedding plants.

MATHEMATICS

PART-I

MATHEMATICS PURE

1. **Algebra.**—Sets, Union, Intersection difference and complementation properties, Venn Diagram. Properties of natural numbers. Real numbers and their representation by decimals. Complex number, Argand Diagram. Cartesian Product Relation. Mapping. Function as a mapping. Equivalence relation. Groups, Isomorphism or groups. Sub-groups, Normal sub-groups. LAGRANGE'S theorem. Frobenius theorem.

The definitions and illustrations of rings and field. Divisors of zero and Homomorphisms. Vector spaces.

Determinants addition, subtraction, multiplication and inversion of matrix. linear homogeneous and non-homogeneous equations, Cayley Hamilton theorem.

Elementary number theory. Fundamental theorem of arithmetic. Congruences. Theorems of Fermat and Wilson. Inequalities. Arithmetical and Geometrical means. Inequalities of Cauchy, Schwarz, Holder and Minkowsky.

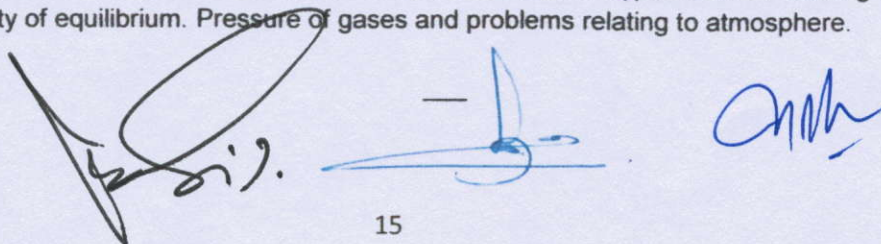
2. **Infinite sequences and series.**—Concept of limit infinite series. Convergent, divergent and oscillatory series. Cauchy's general principle of convergence. Comparison and ratio test. Gauss's test. Absolute convergence and de-arrangements of series.
3. **Trigonometry.**—De Moivre's theorem for rational index and its applications. Inverse, Circular and Hyperbolic functions. Expansions and summation of trigonometrical series. Expressions for sine and cosine in terms of infinite products.
4. **Theory of Equation.**— General properties of polynomial equation. Transformation of equations. Nature of the roots of cubic and bi-quadratic, Cardan's solution of the cubic, Resolution of bi-quadratic into quadratic factors. Location of roots and Newton's method of divisors.
5. **Analytic Geometry of two and three dimensions.**— Straight lines. Pair of straight lines, Circle, system of circle. Ellipse, Parabola, Hyperbola, Reduction of second degree equation to a standard form. Plane, straight lines, sphere, cone, and their tangent and normal properties (Vector methods will be permissible).

6. **Analysis.**— Concept of limit, continuity, derivation, differentiability of a function of one real variable, properties of continuous functions. Characterisation of discontinuities. Mean value theorems. Evaluation of indeterminate forms. Taylor's and Maclaurin's theorems with Laran's and Cauchy's form of remainders. Maxima and minima of function of one variable. Plane curves, singular points, curvature curve tracing. Envelopes, Partial differentiation. Differentiability of function of more than one real variable. Standard methods of integration. Rieman's definition of definite integrals of continuous function. Fundamental theorem of integral calculus. First mean value of theorem of integral calculus. Rectification, quadrature volumes and surfaces of solids of revolution and their applications.
7. **Differential Equation.**— Formation of ordinary differential equation order and degree. Geometrical demonstration of the existing theorem for $sx/sy = S(x,y)$. First order linear and nonlinear equations. Singular points. Singular solutions. Linear differential equations and their important properties. Liners differential equations with constant co-efficient. Cauchy-Euler type of equations. Extra differential equations and equations admitting integrating factor. Second order equations. Changing of dependent and independent variables, Solution when integral is known variation of parameters.

PART-II

MATHEMATIC APPLIED

8. **Vector Analysis.**— Vector Algebra, Differentiation of Vector function of a scalar variable. Gradient, Divergence and Curl in Cartesian, cylindrical and spherical co-ordinates and their physical interpretation. Higher order derivatives. Vector identities and Vector equations. Guess and Stocks theorems.
9. **Static.**—Fundamental laws of Newtonian Mechanics. Theory of Dimension. Plan Statics. Equilibrium of system of particles. Works and potential energy, Centre of mass and centre of gravity. Frictions, common Catenary, Principle of virtual work. Stability of equilibrium. Equilibrium of forces in three dimensions. Attraction potential of rods, rectangular and circular discs, spherical shell, spherical equipotential surfaces and their properties. Properties of potentials. Greens equivalent stratum. Laplacels and Poisson's equations.
10. **Dynamics.**—Velocity vector, Relative velocity. Acceleration. Angular velocity. Degrees of freedom and constraints. Rectilinear motions; Simple harmonic motion. Motion in a plane. Projectiles. Constrained motion. Work and energy. Motion under impulsive forces. Kepler's laws, Orbits under central forces. Motion of varying mass. Motion under resistance. Moments and products of inertia. Two dimensional motion of a rigid body under finite and impulsive forces. Compound pendulum.
11. **Hydrostatics.**—Pressure of heavy fluids. Equilibrium of fluids under given system of forces. Centre of pressure. Thrust on curved surfaces. Equilibrium of floating bodies. Stability of equilibrium. Pressure of gases and problems relating to atmosphere.



PHYSICS

PART—I

1. **Mechanics.**—Galileans, Transformation, concept of mass and Newton's laws of motion conservation laws, Motion of rigid bodies, Coriolis Forces, Kepler's laws of gravitation, measurement of 'F' of Artificial satellites. Fluid motion, Bernoullis theorem, circulation, Reynold number, turbulence. Viscosity, surface tension, Elasticity, Relativistics mechanic and simple applications, elements of general relativity.
2. **Thermal Physics.**—Perfect gas, Vander Weals equations. Laws of Thermodynamics. Production and measurement of low temperatures. Kinetic theory of gases; Brownian motion. Black body radiation. Plank's law. Specific heat of gases and solids. Thermionic emission. Fermi Dirac and Bose- Einstein distribution laws. Thermal ionization. Elements of irreversible thermodynamics. Solar energy and its utilisation.
3. **Waves and Oscillations.**—Oscillations with one and two degrees of freedom, forced vibrations and resonance wave motion. Phase and group velocity. Huygen's Principle, Reflection, refraction, interference, diffraction and polarization of waves, Optical instruments and resolving power. Multiple beam interference. Ex-M. wave equation, Fresnels formula, normal and anomalous dispersion coherence. Laser and its application.

PART-II

4. **Poisson's and Laplace's equations and simple applications.** Dielectric and polarization, capacitors. Dia-para and ferromagnetic materials. Kirchhoffs laws. Amperes law, Faradays laws of electromagnetic induction. L.C.R. circuits, alternating currents, Maxwll's equations.
5. **Atomic Physics.**—Bohr's theory, Electron spin, Lande's factor. Paul's principle. Spectre of one electron system. Zeeman effect, wave particle. Elements of X-ray spectra. Compton scattering. Wave particle duality, Schrodinger's equation and simple applications. Uncertainty principles.
6. **Basic properties and structure of nuclei,** mass spectrometry, radio activity, mechanism, band and decay, properties of neutron, 'electron microscope, nuclear fission and reactor, nuclear fusion, cosmic ray showers, pair production. Simple properties of elementary particles. Symmetry in physical laws.
7. **Electronics.**—Electron emission from solids, Child-Langmuir Law, Static and dynamic characteristics of diodes, triodes, tetrodes and pentodes; thyatron. Band structure of metals and semiconductors, doped semi-conductors; P-N diodes, transistor.
8. **Simple (vacuum tubes and transistor) circuits** for Rectification, amplification, oscillation, modulation and detection of r.f. waves. Basic principles of radio reception and transmission. Television. Elementary principles of microscope solid state device.

ZOOLOGY

PART-I

(NON-CHORDATE AND CHORDATE)

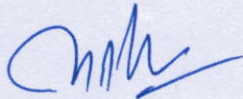
1. **A general survey, classification and relationship of various phyla.**
2. **Protozoa** - Study of structure, life history of Paramecium, Vorticella, Monocytis, Malarial Parasite, Euglena, Trypanosoma.
3. **Porifera** - Study of structure of cycon, canal system and skeleton in porifera.
4. **Coelenterata** – Obelia, Aurelia (Structure and Life History), polymorphism in Hydrozoa, coral formation, metagenesis.
5. **Helminthes** - Planaria, Fasciola, Taenia, Ascaris (Structure and Life History). Parasitism and Parasitic adaptation, Evolution of Parasitism. Helminths in relation to man.
6. **Annelida** - Neries, Earthworm, Leech (detailed history)
7. **Arthropoda** - Palaemon, Scorpion, Cockroach, Crustacean Larvae. Economic importance of insects.
8. **Mollusca** - Unio, Pila, Torsion, and detossion in Gastropoda.
9. **Echinodermata** - Starfish, larval form of Echinodermata.
10. **Structure and bionomics and classification of the following:** Balanoglossus, Herdmania, Branchiostoma/ Scoliodon, Frog, Uromastex, Pigeon, Rabbit.
11. **Comparative account of the various systems of a vertebrate** (Digestive system, Respiratory system, Nervous system, Receptor system, Circulatory system, Urinogenital system).
12. **Retrogressive Metamorphosis**, Coclom in Branchiostoma.

PART-II

(CELL BIOLOGY, CYTOGENETICS, ANIMAL PHYSIOLOGY, EVOLUTION, EMBRYOLOGY AND HISTOLOGY)

13. **Cell Biology** - Cell theory, structure and function of cell and cyto-plasmic constituents; structure of Plasma Membrane, Endoplasmic reticulum, Golgi Bodies, Mitochondria, Ribosomes, Nucleus. Cell division - Mitosis and Meiosis. Gene structure and Function; Watson and Crick Model of DNA, replication of DNA.
14. **Cytogenetics** – Menedlian Laws of inheritance, recombination, multiple alleles, Mutation – natural and induced. Polyploidy. Sex determination, Cytoplasmic inheritance.

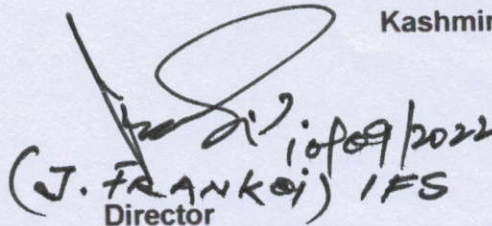
15. **Physiology** – Chemical composition of protoplasm. Animal Physiology; Digestion and Absorption; Respiration (including Cell Respiration). Kidney and physiology of excretion. Physiology of nerve's impulse; Physiology of muscular contraction; Physiology of Endocrine glands, Physiology of osmoregulation.
16. **Evolution** - Origin of life, history of evolutionary thought. Evidences of evolution (Anatomical, embryological, comparative physiology evidence for geographical distribution, palaeontological evidence). Theories of evolution-Lamarckism, Neolamarckism, Darwinism, New Darwinism, Hardy-Weinberg law.
17. **Embryology and Histology** – Gametogenesis, fertilization, types of eggs, cleavage, development upto gastrulation in Branchiostoma, Frog and Chick. Fate maps of frog and chick; Metamorphosis in Frog; Formation and fate of extra embryonic membranes in chick; formation of amnion, allantois, and types of placenta in Mammal.
18. **Histology of the following Tissues and Organs of Mammals:** Epithelial Tissue, Connective tissue (connective tissue proper, cartilage, bone, blood and lymph). Muscular tissue and nervous tissue.
19. **Histology of skin, stomach, intestine, liver, pancreas, lung, kidney, testis, ovary, spleen.**



Joint Director
Jammu FPF



Joint Director
Kashmir FPF


(J. FRANKOI) IFS
Director

Forest Protection Force, J & K
