

Syllabus for Examination of Fisheries Inspector

- 1. Principal of Aquaculture and FreshWater Aquaculture:** Basics of aquaculture, History of aquaculture, Systems Principles of organic aquaculture, Pre-stocking and post stocking pond management, Criteria for selection of candidate species for aquaculture, Major candidate species for aquaculture. Waterquality management, Use of agro-industrial waste and biofertilizers in aquaculture, Composite fish culture system of Indian and exotic carps-competition and compatibility, Exotic fish species introduced to India, Culture of other freshwater species, Medium and minor carps, catfish and Murrells, Species of fish suitable for integrated aquaculture.
- 2. Ornamental Fish Production and Management:** Different varieties of exotic and indigenous Ornamental fishes. Principles of a balanced aquarium. Fabrication, setting up and maintenance of aquarium. Water quality management. Water Filtration system. Aquarium plants and their propagation methods. Aquarium fish feeds. Breeding and rearing of ornamental fishes. Brood stock management. Management practices of ornamental fish farms. Common diseases and their control.
- 3. Genetics and Breeding:** History and present status of selective breeding programs in aquaculture. Selection methods and mating designs. Principles of genetics and breeding, Mendel's law of inheritance. Hardy-Weinberg law and its significance. Chromosomal structure and aberrations. Chromosome manipulation techniques - androgenesis, gynogenesis and polyploidy and identification of ploidy. Sex determination. Cross breeding (hybridization) – types of cross breeding, heterosis and design of cross breeding programmes, hybridization in different fishes.
- 4. Fish Nutrition and Feed Technology:** Fundamentals of fish nutrition and growth in fish. Principal nutrients and nutritional requirements of cultivable fish and shellfish. Methods of feed formulation and manufacturing. Forms of feeds. Feed storage and Feed evaluation. Digestive enzymes, feed digestibility.
- 5. Aquaculture in Reservoirs:** Definition of reservoirs in India its nature and extent of reservoirs, topography and species diversity; importance of morpho-edaphic index in reservoir productivity and classification; factors influencing fish production; trophic phases in reservoir; pre-impoundment and post-impoundment stages and their significance in establishment of reservoirs fisheries. management of small, medium and large reservoirs; present status and future prospects in reservoirs fish production. Advances in reservoirs fisheries management and Fish stocking in Reservoirs.
- 6. Finfish Breeding and Hatchery Management:** Freshwater fish seed resources. Natural breeding of finfishes. Sexual maturity and breeding season of various cultivable species. Development of gametes in male and female. Fish egg and embryonic development. Hypophysation of fishes. Fish pituitary gland – its structure, collection, preservation and preparation of extract for injection, dosages and methods of injection. Brood-stock management and transportation of brood fish. Different types of fish hatcheries-traditional, Chinese, glass jar and modern controlled hatcheries. Breeding techniques for Indian major carps, exotic carps, mahaseers, trouts, tilapias.
- 7. Shellfish Breeding and Hatchery Management:** Natural seed resources, site selection and collection methods. Life cycle of important shellfish (*Penaeus monodon*, *P. indicus*, *Macrobrachium rosenbergii*, *P. Vannamei*, *Scylla serrata* etc) Sexual maturity and breeding seasons of different species. Breeding and hatchery management of *Penaeus* and crabs lobster, mussel. Food and feeding of larval stages of important shellfishes.
- 8. Taxonomy of Finfish:** Principles of taxonomy. Nomenclature, types. Classification and interrelationships. Criteria for generic and specific identification.
- 9. Inland Fisheries:** Global inland fish production data. Capture fishery resources of India. Potential of inland water bodies with reference to respective state. Problems in the estimation of inland fish catch data. Major riverine and estuarine systems of India. Cold water fisheries of India.
- 10. Limnology:** Introduction to limnology: inland water types, their characteristics and distribution; ponds and lakes; streams and rivers; dynamics of lentic and lotic environments. nature of Lake Environment; morphometry, physical and chemical conditions and related phenomena; biological relations: influence of physical and chemical conditions on living organisms in inland waters. Plankton: planktonic organisms; classification of plankton; distribution of plankton: geographic, vertical, horizontal and seasonal distribution of phytoplankton and zooplankton; seasonal changes of body form in planktonic organisms;

- food of planktonic organisms; primary productivity: Aquatic plants: characteristics, classification, zonation, seasonal variations, quantity produced chemical composition distribution in different waters, limnological role.
11. **Soil and Water Chemistry:** Analytical chemistry: principles, applications and types. Chemistry of water. Dissolved gases: Factors affecting natural waters. Acid, base, salts: Hydrogen ions, modern concept of pH and buffer and Water analysis. Soil Characteristics: origin and nature of soils. Physical properties of soil. Soil chemistry. Soil quality criteria/ requirements for aquaculture.
 12. **Fundamentals of Microbiology:** Milestones in microbiology. Contributions of Leeuwenhoek, Louis Pasteur, Robert Koch, Alexander Flemming, Joseph Lister, Winogradsky. Microscopy- Principle and construction of bright field, dark field, phase contrast, stereo, SEM and TEM. Microbial taxonomy – Bergy's and molecular taxonomy Types of Microorganisms. General features, types and importance of viruses, Cyanobacteria, actinomycetes, archaea, mycoplasma, rickettsiae. Microbial genetics- general principles, genetic recombination, transformation, transduction and conjugation. Aquatic Microbiology: Introduction and scope of aquatic microbiology. Nutrient cycles-carbon, nitrogen, sulphur, phosphorus, iron, and manganese cycles.
 13. **Meteorology, Climatology and Geography:** Nature of Atmosphere: weather and climate; composition of atmosphere; structure of atmosphere. Heat energy of atmosphere: process of heat transmission; heating of atmosphere; disposal of insulation; irregular heating of atmosphere. Temperature: Temperature instruments; periodic, horizontal and vertical temperature variations; effects of vertical air motion on temperature. Humidity and water vapour: relationship between temperature and humidity. Condensation and precipitation. Clouds and thunderstorms, classification of clouds; conditions of cloud formation; reporting and identification of clouds; thunderstorms. Weather forecasting.
 14. **Aquatic Ecology, Biodiversity and Disaster Management:** Aquatic environment, Flora and fauna: Components of aquatic systems, Aquatic productivity, nutrient cycles, energy flow, food chain. Animal associations. Aquatic biodiversity- its importance. Threats to biodiversity. Basic concepts of Disaster Management. Types of natural and manmade hazards in fisheries and aquaculture.
 15. **Fish and Shellfish Pathology & Microbial and Parasitic Diseases of Fish and Shellfish:** Significance of finfish and Shellfish diseases in aquaculture. Disease development process. Pathological processes. Case history and clinical sign in disease diagnosis. Role of physical chemical soil and water parameters in fish health. Nutritional diseases. Non-infectious diseases. General characteristics, life cycle, diagnosis, prevention and treatment of parasitic, bacterial, fungal and viral diseases of finfish and shellfish. Quarantine and health certification in aquaculture. SPF and SPR stocks –development and application. Biosecurity principles, Sanitary and Phytosanitary Agreement, Disease control through environmental management. Principles of disease diagnosis, conventional, based diagnostic methods, Rapid diagnostic methods.
 16. **Fish Immunology:** Introduction, brief history to immunology. Types of immunity. Antigens – structure and types. Antibody – fine structure, classes with structure and functions, antigenic determinants on immune globulins. MHC complex. Antigen-antibody reaction - Precipitation reactions, agglutination reactions, Microorganisms associated with fishes in health and disease.
 17. **Fish Pharmacology:** Introduction to Pharmacology: History, Importance, Terms and Definitions, Drug development, Screening and Nomenclature, Scope of pharmacology in fishes. Route of Administration and Method of application to fish.
 18. **Fundamentals of Biochemistry:** A brief introduction to developments in biochemistry and its transformation to molecular biology. Cell structure, water and major molecules of life. Protein chemistry: classifications and functions. Classification, structure, function and properties of amino acids. Essential and non essential amino acids. Significance of Omega-3 and Omega-6 fatty acids. Nucleic acids: Structure function and importance genetic code. Transcription and translation. Protein synthesis. 3
 19. **Fish in Nutrition:** Composition of fish with emphasis on nutritional value. Concept of Biological value, Protein Efficiency ratio, Net protein utilization. Amino acids of fish and shellfishes and importance of essential amino acids. Fish lipids: fatty acids, nutritional quality. Role of fish lipids in human nutrition. Non-protein nitrogen substances in fishes. Minerals in fish: micro- and macro-elements, trace elements,

- significance in human nutrition. Other functional bio-molecules in fish – peptides, collagen and squalene. Effect of different kinds of cooking fish.
20. **Food Chemistry:** Seaweed polysaccharides – sources and uses. Moisture in foods. Deamination reactions and nitrogen excretion with special reference to fish. role in hydration. Food additives -types and their chemical nature, emulsifiers and antimicrobial additives.
 21. **Fishing Craft Technology:** Introduction: History & development of fishing crafts. Traditional fishing crafts of India. Classification of fishing crafts based on fabrication dimension, nature of fishing, depth of operation. Preservation and maintenance of hull. Boat building materials: Choice of construction materials: Wood, properties, advantages and disadvantages. Introduction of Outboard and inboard engines.
 22. **Fish Canning Technology:** Introduction of canning and its historical developments. Advantage and disadvantage. their characteristics and suitability for canning. Canning process, process flow steps involved HTST and aseptic canning. General steps in canning procedure and importance.
 23. **Fishing Gear Technology & Fishing Technology :** Development fishing gears and Fishing Technology. Classification of fishing gears and methods. International Standard Statistical Classification of Fishing gear. Fishing gear materials-their classification. Types and important synthetic materials used in fishing gears. Floats – buoys – its materials, types their properties; Classification of floats: based on shape and materials; calculation of buoyancy. Structure of various commercial fishing gears. Rigging of fishing gears. otter door. Constructional details of single boat purse seine; two boat purse seine and method of operation. Types of gillnet. Line fish and its type. Deck equipment and their types.
 24. **Refrigeration, Equipment Engineering & Freezing Technology :** Fundamentals: Force, work, power, energy, volume, pressure, temperature. Thermodynamics, Refrigeration: History of refrigeration ,Definition, principle, classification. Vapour compression refrigeration system. Compressors: Definition, Types of compressor, construction, working principle advantages and disadvantages. Condenser, Expansion valve, Refrigerant, Study of auxiliary equipment, Ice-plant, Freezers. Introduction to freezing technology; characteristics of fish and shellfish. Handling of fresh fish; sanitation in processing plants. Principles of low temperature preservations. Chilling of fish – methods and equipment for chilling. Freezing of fish fundamental aspects; heat units.
 25. **Aquaculture Engineering:** Fish Farm- Definition, objectives, types of farms. physical features of the ground, detailed survey viz. site condition, topography, soil characteristics. Land Surveying-definition, principles of surveying, classification of surveying, instruments used for chaining. Chain surveying-definitions, instruments used for setting out right angles, basic problems in chaining, cross staff survey. Compass surveying. Calculation of area of regular and irregular plane surfaces, Trapezoidal and Simpson's rule, volume of regular and irregular shape as applied to stacks and heaps, calculation of volume of pond. Water distribution system.
 26. **Microbiology of Fish and Fishery Products & Fish Products and Value Addition & Fish By-Products and Waste Utilization:** Introduction and history of microorganisms in foods. Sources and types of microorganisms in fish and fishery products. Factors (intrinsic and extrinsic) affecting the growth and survival of microorganisms in food. Indicators of microbiological quality of fish and fishery products. what is a food borne pathogens. Principle of fish preservation and processing. Processing of fish by traditional methods. Drying and dehydration and its theory theory. Fish preservation by smoking-chemical composition of wood smoke and their role in preservation. Hurdle technology in fish preservation and processing. Fish meal. Dry reduction and wet reduction methods – specification – packaging and storage. Fish oil – body oil – liver oil – extraction – purification – preservation – storage – application. Shrimp wastes – chitin – chitosan-production – uses. Fish hydrolysate, partially hydrolyzed and deodorized fish meat. Fish silage. Utilization of seaweeds.
 27. **Fish Packaging Technology:** Introduction to packaging, Importance of packaging in fish processing, functions, objectives and requirements. Properties of packaging materials and their use in protective packaging with special reference to food. Packaging equipment and machinery. Retort pouch packaging - advantages and disadvantages.
 28. **Statistical Methods & Fish Population Dynamics and Stock Assessment:** Definition of statistics, Concepts of population, sample, Census and sample surveys, Classification of data, frequency and cumulative frequency table. Diagrammatic and graphical representation of data. Important measures of

- central tendency. Important measures of dispersion. Definitions of probability, mutually exclusive and independent events, conditional probability, addition and multiplication theorems Permutation and combination. The concept of population and unit stock. Biological structure of fisheries resource in space and time. Indicators of dynamics in a fishery resource. Characteristics of unit and mixed stock. Data requirements for stock assessment. Estimation of total fishing and natural mortality.
29. **Information and Communication Technology:** IT and its importance. IT tools, IT-enabled services and their impact on society; computer fundamentals; hardware and software; input and output devices; word and character representation; features of machine language, assembly language, high-level language and their advantages and disadvantages; principles of programming- algorithms and flowcharts. Introduction to MS Office - Word, Excel, Power Point. Audio visual aids - definition, advantages.
30. **Fisheries Economics:** Introduction to fisheries economics, basic economic terminologies – micro and macro economics, positive and normative economics, environmental economics, resource, scarcity, farm-firm relationships, production Contribution of fisheries sector to the economic development of the country. Farm production economics. contribution of fisheries to GNP and employment.
31. **Fisheries Entrepreneurship and personality development:** Concept of entrepreneurship; entrepreneurial and managerial characteristics; managing an enterprise; motivation and entrepreneurship development; importance of planning, monitoring, evaluation and follow up; managing competition; entrepreneurship development programs; Generation, incubation and commercialization of ideas and innovations. Government schemes and incentives for promotion of entrepreneurship. Preparation of enterprise budget for integrated fish farming. Fiscal and monetary policies and its impact on entrepreneurship. Infrastructural and other financial requirement for fishery entrepreneurship Government policy on Small and Medium Enterprises (SMEs)/SSIs. Venture capital. Introduction to fish business management. Globalization and the emerging business /entrepreneurial environment. Social Responsibility of Business.
32. **Fisheries Extension Education:** Introduction to extension education and fisheries extension - concepts, objectives and principles. History and role of fisheries extension in fisheries development. characteristics of technology, transfer of technology process. role of NGOs and SHGs in fisheries; Fisheries co-management; Adoption and diffusion of innovations.
33. **Fisheries Policy and Law:** Introduction to public administration, principles of organization and management of public enterprise. Central and State responsibilities for fisheries development, organizational set up of fisheries administration at the Centre and state levels. Present relevance of past fisheries policies and recent policies in fisheries sector. Different central and state level fisheries institutions. Role of Central and State Government in the regulatory activities of Aquaculture and fisheries. Implementation of community based resource management plans. Historical review of fisheries development and management in India and world. International agencies / organizations for promotion of fisheries worldwide. Indian Fisheries Act, 1897. Environmental legislation. Recent changes in land reforms. Judicial judgments relating to Aquaculture.
34. **Fisheries Co-operatives and Marketing:** Principles and objectives of co-operation, co-operative movement in fisheries in India, structure, functions, status and problems of fisheries co-operatives management in relation to resources, production and marketing. Role of NABARD in fisheries development; role of insurance in fish and shrimp farming and industry. Basic accounting procedures, profit and loss account. Introduction to marketing management; core marketing concepts: market structure, functions and types, marketing channels and supply chain, marketing margins, marketing environment, marketing strategies, product development and product mix, consumer behavior and marketing research. Export and import policies relevant to fisheries sector.

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