

**ANNEXURE-II**  
**SYLLABUS**  
**Paper-I**  
**ZOOLOGY**  
**(PG DEGREE STANDARD)**

SUBJECT CODE:271

**UNIT I**

Non-chordate: General Organization - classification upto class level, Modern taxonomy. Shelled Protozoans, Economic Importance, Fossil Protozoans and their importance, Neuromotor system in ciliates. Origin of Metazoa - Theories and Evolution, Economic importance of Porifera, Polymorphism in Hydrozoa. Coral reefs – structure, formation and theories. Origin and evolution of Coelenterates. Origin and types of coelom in Bilateria. Effects of parasitism on the parasites and hosts in Helminthes and larval forms. Coelom and metamerism in Annelida, Mode of life in polychaetes. Larval forms and parasitism in Crustacea. Adaptive radiation in Gastropods. Larval forms of Echinodermata and their Significance. Retrogressive Metamorphosis, Neotany and affinities of Ascidian.

**UNIT II**

Chordate: Migration in Fishes, Accessory respiration in fishes. Adaptation in deep sea fishes. Electric Organs and electro-receptors in fishes. Origin and evolution of Amphibia. Conquest of Land - Adaptations to live on land – evolutionary significance of crocodiles. Adaptive radiation in birds - Migration in Birds.

Evolution: Origin of life - Bio-chemical evolution - cultural evolution. Present status of Natural Selection. Adaptation and evolution in mammals.

Wild life mammals in India and Conservation measures. Endanger species and current status. Wild life Act.

**UNIT III**

Cell and Molecular Biology: Cellular organization-Membrane, intercellular-structure and function-cellular organelles. Chromosomes, types and Organization of genes. Cell division, cell cycle and regulation. Cell communication and cell signaling. Structure of DNA and RNA. Genetic code, Replication and protein synthesis.

Bio-Chemistry: Structure of carbohydrates, amino acids, proteins, lipids - Glycolysis and Krebs cycle - oxidation, reduction - oxidative phosphorylation energy conservation and release - cyclic AMP-ATP - saturated and unsaturated fatty acids - cholesterol – enzymes, mechanism, action and kinetics. Vitamins, trace elements and micronutrients and coenzymes. Antioxidant enzymes. Hormones-classification, biosynthesis and functions.

**UNIT IV**

Bio-Physics: Microscopy-Principles of Phase, Electron Microscope, Polarising, Fluorescent, Interference Microscope. Photo – Electric Calorimetry, Freeze drying - freezing, Microtome, Fixation, staining techniques. X-ray - Diffraction, Ultra - Violet

and infrared, Spectroscopy and Autoradiography. Instrumentation methods: Centrifugation, Electrophoretic and Chromatographic techniques. PCR, DNA finger printing, RFLP, RAPD, AFLP, FISH and GISH.

### **UNIT V**

Genetics: Gene concept, one Gene - one polypeptide - concept, Enzyme regulation - Operon concept - GAL and LAC - Operon System. Population Genetics - Hardy - Weinberg Law Genetic Equilibrium. Radiation Genetics - mechanisms of Chromosomal breakage - Mutagens and Mutagenesis - Carcinogens and carcinogenesis - Human Genetics. Karyotype - Variation in Karyotypes with special reference to syndromes, Genetic counseling. Genetic Engineering - Present Status and its uses. Human genome project.

### **UNIT VI**

Bio-Statistics: Collection of data. Primary and secondary - compiling and sampling methods - frequency distribution, frequency tables - diagrammatic representation - variables - measures of central tendency. Standard deviation, Standard error - Correlation, regression, regression analysis - student's "*t*" test and *chi*-square test. Bio-informatics: DNA and Protein sequence analysis, Prediction functional structure, protein folding, Molecular docking, Metabolic and regulatory networks, General challenges and applications. SwissProt, NCBI: GENBANK, BLAST; Multiple Sequence Alignments.

### **UNIT VII**

Physiology: With reference to mammals digestion, role of salivary gland liver, pancreas and intestinal glands in digestion, nutrition, balanced diet in man-assimilation, intermediary metabolism. Composition of blood- coagulation - Transport of oxygen, carbon dioxide, blood pigments-mechanism of respiration. Muscles, mechanism of muscle contraction, temperature regulation, acid, base balance and homeostasis. Nerve impulse conduction, neurotransmitters - receptors, photo, phono and chemo reception. Nephron and urine formation. Kidney stone formation. Comparison of excretion in fish, reptiles and mammals. Endocrine glands-testis, ovary and hypothalamo-hypophyseal gonadal relationship. Pheromones and reproduction. Bioluminescence, biological rhythms.

### **UNIT VIII**

Immuno-Biology: Immune responses - Primary, Secondary and Theories. Immunity types - Innate - Acquired- cell mediated and Humoral immunity-Autoimmunity, Types of Antigens and immuno globulins. Vaccinations - ELISA, RIA Techniques. Developmental Biology: Gametogenesis, Fertilization: Significance, polyspermy Gynogenesis, Androgenesis, Parthenogenesis, Polarity, Symmetry, Radiant, Embryonic fields, Differentiation - Nuclear and Chemical factors, Inductors and organizers, Genes and organizers, Regeneration - Polarity and Gradient in regeneration. ART. Stem cell biology-sources, types and applications.

**UNIT IX**

Resource Ecology and Management, Renewable and Non-Renewable natural resources. Energy resources - conventional and non-conventional. Bioremediation. Habitat ecology. Wild Life conservation, Management and Acts. Air, Water, Soil, Sound pollutions. Laws related to Environment and Environmental Protection Act. Space ecology and Radiation ecology. Climate changes and Global warming.

**UNIT X**

Economic Zoology: Parasitism and commensalism - protozoan parasites and diseases-helminthes parasites and diseases on man and domestic animals; Beneficial and harmful insects - insect pests on crops and stored products. Control methods. Pheromones and IPM. Sericulture, apiculture, lac culture, sea weed culture, poultry, pisciculture and induced breeding. Shell fisheries - fin and shells. Aqua culture practices in Tamil Nadu and their impact on the environment and on agriculture.

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**FISHERIES SCIENCE**  
**(DEGREE STANDARD)**

**SUBJECT CODE: 328**

**UNIT- I: FISH BIOLOGY, FISH PHYSIOLOGY & FISH GENETICS**

Systematics – Binomial nomenclature: classification of elasmobranchs, teleost's, crustaceans, and molluscs; external morphology – morphometric – meristic and anatomy of finfish and shellfish, DNA bar coding –Karyo taxonomy, Food and feeding habits –Gastro somatic index length weight relationships – age and growth – reproductive strategies – breeding – maturation and spawning –Gonado- somatic index fecundity and development biology of commercially important finfish and shellfish – physiology – respiration, circulation, digestion, excretion, osmoregulation- reproductive physiology -endocrine glands and sex hormones. Fish genetics : Sex determination, hybridization, fish breeding techniques.- Chinese hatchery, cryopreservation of gametes.

**UNIT- II: MARINE FISHERIES AND POPULATION DYNAMICS**

Commercially important marine fisheries of world; India, shellfish, crustacean and seaweed resources of India; fish population dynamics – Vonbertalanfy's growth equations- growth and mortality parameters – Maximum sustainable yield –Maximum economic yield- CPUE-Yield per recruit- fish stock assessment soft\wares - growth overfishing-recruitment overfishing -Closed season –mesh size regulation.

**UNIT- III: AQUACULTURE, ORNAMENTAL FISH CULTURE AND FISH DISEASES**

Site selection for fish culture – cultivable fishes for fresh water- Pond chemistry – Dissolved Oxygen – Alkalinity, Hardness aquaculture , fish feeds – Pond disinfection with lime -Water quality management, integrated fish farming – sewage – fed fish culture, brackish water aquaculture, - -Shrimp culture -- shrimp feed formulation – shrimp hatchery and nursery rearing- culture techniques of bivalves, Mari culture- candidate species for Mariculture, Open water cages –Ornamental fish culture – Live bearers-Egg layers- culture of Fish food organisms- aquarium keeping –Fish diseases – fish parasites-Bacterial and viral diseases-remedial measures.

**UNIT-IV: LIMNOLOGY, AQUATIC ECOLOGY AND BIODIVERSITY, FISHERY OCEANOGRAPHY, AQUATIC POLLUTION, COASTAL ZONE MANAGEMENT**

Physico – chemical characteristics of fresh water bodies; lentic and lotic systems, flora and fauna, classification of lakes based on origin, productivity & mixing of water; phytoplankton and zooplankton, nekton, benthos, Estimation of primary production; Components of aquatic ecosystems, food chain, energy flow, animal association;

Ecological niches – lagoons, estuaries, mangroves, coral reefs, flood plains, wet lands- exotic species- endangered species, conservation of habitats Marine zones – physical properties of sea water –chemistry of sea water- waves, tides, currents, El -Nino, Ekman spiral, upwelling; Aquatic pollution -BOD,COD, oxygen demanding waste, eutrophication-sewage pollution, red tide- oil pollution, pesticide pollution, thermal pollution, radioactive pollution- biological indicators of pollution; Application of GIS in aquatic resource identification- remote sensing for coastal management-CRZ - Environmental Impact Assessment.

### **UNIT- V: FISHERIES ECONOMICS, STATISTICS, FISHERIES MARKETING & FISHERIES EXTENSION**

Theories of demand and supply, market equilibrium, production function in capture and culture fisheries, Economics of fishing and fish farming, fish marketing; marketing channel, export and import policies; mean, median, mode standard deviation, bar diagram, pie diagram, histogram, frequency polygon, primary and secondary data for statistical analysis, correlation co-efficient, linear regression; extension teaching methods and use of audiovisual aids in extension activities, individual group and mass contact methods.

### **UNIT - VI: FISHING GEAR TECHNOLOGY, FISHING CRAFT TECHNOLOGY & NAVIGATION AND SEAMANSHIP**

Types of fishing gears – fishing gear materials and their properties– yarn numbering system –Fishing gear accessories, floats, sinkers, etc.-design and construction of gill nets longline, trawls and purse seine. Principles of hydrostatics , law of floatation – Archimedes principle – Simpson’s rules Fishing craft materials – wood, steel, FRP- form co-efficients, TPC– ship’s stability– state of equilibrium care and maintenance of vessels; types of propeller and rudder; Principles of navigation and seamanship – chart reading and fixing positions- chart symbols Compass, GPS–EPIRB- Rules of road related to fishing vessels – navigational lights-International code flags-life saving devices- buoyage system, storm signals, distress signals.

### **UNIT – VII: REFRIGERATION AND EQUIPMENT ENGINEERING, MARINE ENGINES**

Laws of thermodynamics-vapour compression refrigeration- vapour absorption refrigeration-Compressor, evaporator, condenser – Freezers – plate, blast, tunnel-refrigerated- coefficient of performance sea water systems; Types and functions – operation and maintenance of various processing equipments-types of diesel engines and their working principles – outboard engines.

**UNIT – VIII: FISH IN NUTRITION, FISH PROCESSING TECHNOLOGY**

Nutritional value of fish- protein, non -protein, nitrogen, lipid, minerals, micro and macro element, trace elements, other functional biomolecules in fishes. Freshness of fish and rigor mortis – mechanisms of fish spoilage – fish drying methods – principles of salting and salt curing methods – smoking of fishes. Canning materials – canning media – methods of canning – quality of canned fishery products. Spoilage of canned foods, types, causes and preventive measures-packaging materials for canned foods. Fish preservation by chilling and icing – preparation of ice-chemicals used in freezing – types of freezing changes during frozen storage– method of thawing. Microbiological and biochemical changes in freezing – packaging and transport of frozen fishery products – freeze drying.

**UNIT- IX: FISH PACKAGING TECHNOLOGY, FISH PRODUCTS AND VALUE ADDITION**

Packaging materials and their properties-packaging for retail sale and storage- retort pouch packing, vacuum packaging, active packaging, MAP. Fishery by products – Fish meal- fish oil- shrimp waste- chitin –chitosan-fish protein concentrate- fish hydrolysate- fish silage – fish maws, fish glue- gelatin-isinglass-utilization of seaweeds –agar agar – algin – carrageenan.

**UNIT- X: MICROBIOLOGY OF FISH AND FISHERY PRODUCTS, QUALITY ASSURANCE OF FISH AND FISHERY PRODUCTS**

Source and types of microorganisms in fish and fishery products-Indicators of microbiological quality of fish and fishery products-nutritive values of processed seafood. Quality dimensions of sea food-assessment of quality changes in fresh and iced fish and during processing- application of HACCP concept in quality assurance- Role of EIA and MPEDA in fish and fishery products- Certification system for fish and fishery products –sea food safety – authenticity – traceability.

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**PAPER -II**  
**SYLLABUS FOR WRITTEN EXAMINATION**  
**Part-A**

**கட்டாய தமிழ்மொழி தகுதித் தேர்விற்கான பாடத் திட்டம்**

**(கொள்குறி வினாவிற்கான தலைப்புகள்)**

**பத்தாம் வகுப்பு தரம்**

1. பிரித்தெழுதுதல் / சேர்த்தெழுதுதல்.
2. எதிர்ச்சொல்லை எடுத்தெழுதுதல்.
3. பொருந்தாச் சொல்லைக் கண்டறிதல்.
4. பிழைதிருத்தம் (i) சந்திப்பிழையை நீக்குதல் (ii) மரபுப்பிழைகள், வழுவச் சொற்களை நீக்குதல் / பிறமொழிச் சொற்களை நீக்குதல்.
5. ஆங்கிலச் சொல்லுக்கு நேரான தமிழ்ச் சொல்லை அறிதல்.
6. ஒலி மற்றும் பொருள் வேறுபாடறிந்து சரியான பொருளையறிதல்.
7. ஒரு பொருள் தரும் பல சொற்கள்.
8. வேர்ச்சொல்லைத் தேர்வு செய்தல்.
9. வேர்ச்சொல்லைக் கொடுத்து / வினைமுற்று, வினையெச்சம், வினையாலணையும் பெயர், தொழிற்பெயரை / உருவாக்கல்.
10. அகரவரிசைப்படி சொற்களை சீர் செய்தல்.
11. சொற்களை ஒழுங்குப்படுத்தி சொற்றொடராக்குதல்.
12. இரு வினைகளின் பொருள் வேறுபாடு அறிதல்.  
(எ.கா.) குவிந்து-குவித்து
13. விடைக்கேற்ற வினாவைத் தேர்ந்தெடுத்தல்.
14. எவ்வகை வாக்கியம் எனக் கண்டெழுதுதல் - தன்வினை, பிறவினை, செய்வினை, செய்ப்பாட்டு வினை வாக்கியங்களைக் கண்டெழுதுதல்.
15. உவமையால் விளக்கப்பெறும் பொருத்தமான பொருளைத் தேர்ந்தெழுதுதல்
16. அலுவல் சார்ந்த சொற்கள் (கலைச்சொல்)
17. விடை வகைகள்.
18. பிறமொழிச் சொற்களுக்கு இணையான தமிழ்ச் சொற்களைக் கண்டறிதல்  
(எ.கா.) கோல்டு பிஸ்கட் - தங்கக்கட்டி.
19. ஊர்ப் பெயர்களின் மரபுவை எழுதுக (எ.கா.) தஞ்சாவூர் - தஞ்சை
20. நிறுத்தற் குறிகளை அறிதல்.
21. பேச்சுவழக்கு, எழுத்துவழக்கு (வாரான் - வருகிறான்).
22. சொற்களை இணைத்து புதிய சொல் உருவாக்கல்.
23. பொருத்தமான காலம் அமைத்தல்  
(இறந்தகாலம், நிகழ்காலம், எதிர்காலம்).
24. சரியான வினாச்சொல்லைத் தேர்ந்தெடு.
25. சரியான இணைப்புச் சொல்  
(எனவே, ஏனெனில், ஆகையால், அதனால், அதுபோல).

26. அடைப்புக்குள் உள்ள சொல்லைத் தருந்த இடத்தில் சேர்க்க .
27. இருபொருள் தருக .
28. குறில் - நெடில் மாற்றம், பொருள் வேறுபாடு.
29. கூற்று, காரணம் - சரியா? தவறா?
30. கலைச் சொற்களை அறிதல் :-  
எ.கா. - Artificial Intelligence - செயற்கைநுண்ணறிவு  
Super Computer - மீத்திறன் கணினி
31. பொருத்தமான பொருளைத் தெரிவு செய்தல்
32. சொற்களின் கூட்டுப் பெயர்கள் (எ.கா.) புல் -புற்கள்
33. சரியான தொடரைத் தேர்ந்தெடுத்தல்
34. பிழைதிருத்துதல் (ஒரு-ஓர்)
35. சொல் - பொருள் - பொருத்துக
36. ஒருமை-பன்மைபிழை
37. பத்தியிலிருந்து வினாவிற்கான சரியான விடையைத் தேர்ந்தெடு.



**Part-B**  
**GENERAL STUDIES (DEGREE STANDARD)**

**CODE NO.003**

**Topics for Objective Type**

**UNIT-I: GENERAL SCIENCE**

- (i) Scientific Knowledge and Scientific Temper - Power of Reasoning - Rote Learning vs Conceptual Learning - Science as a tool to understand the past, present and future.
- (ii) Nature of Universe - General Scientific Laws – Mechanics - Properties of Matter, Force, Motion and Energy - Everyday application of the Basic Principles of Mechanics, Electricity and Magnetism, Light, Sound, Heat, Nuclear Physics, Laser, Electronics and Communications.
- (iii) Elements and Compounds, Acids, Bases, Salts, Petroleum Products, Fertilisers, Pesticides.
- (iv) Main concepts of Life Science, Classification of Living Organisms, Evolution, Genetics, Physiology, Nutrition, Health and Hygiene, Human Diseases.
- (v) Environment and Ecology.

**UNIT-II: CURRENT EVENTS**

- (i) History-Latest diary of events-National symbols-Profile of States-Eminent personalities and places in news–Sports-Books and authors.
- (ii) Polity – Political parties and political system in India-Public awareness and General administration- Welfare oriented Government schemes and their utility, Problems in Public Delivery Systems.
- (iii) Geography-Geographical landmarks.
- (iv) Economics-Current socio-economic issues.
- (v) Science-Latest inventions in Science and Technology.
- (vi) Prominent Personalities in various spheres – Arts, Science, Literature and Philosophy.

**UNIT-III: GEOGRAPHY OF INDIA**

- (i) Location – Physical features - Monsoon, Rainfall, Weather and Climate-Water Resources - Rivers in India-Soil, Minerals and Natural Resources-Forest and Wildlife - Agricultural pattern.
- (ii) Transport -Communication.
- (iii) Social Geography – Population density and distribution- Racial, Linguistic Groups and Major Tribes.
- (iv) Natural calamity – Disaster Management – Environmental pollution: Reasons and preventive measures – Climate change – Green energy.

**UNIT-IV: HISTORY AND CULTURE OF INDIA**

- (i) Indus Valley Civilization - Guptas, Delhi Sultans, Mughals and Marathas-Age of Vijayanagaram and Bahmani Kingdoms-South Indian History.
- (ii) Change and Continuity in the Socio-Cultural History of India.
- (iii) Characteristics of Indian Culture, Unity in Diversity –Race, Language, Custom.
- (iv) India as a Secular State, Social Harmony.

**UNIT-V: INDIAN POLITY**

- (i) Constitution of India-Preamble to the Constitution- Salient features of the Constitution- Union, State and Union Territory.
- (ii) Citizenship, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy.
- (iii) Union Executive, Union Legislature – State Executive, State Legislature – Local Governments, Panchayat Raj.
- (iv) Spirit of Federalism: Centre-State Relationships.
- (v) Election - Judiciary in India – Rule of Law.
- (vi) Corruption in Public Life– Anti-corruption measures – Lokpal and Lok Ayukta - Right to Information- Empowerment of Women-Consumer Protection Forums, Human Rights Charter.

### **UNIT-VI: INDIAN ECONOMY**

- (i) Nature of Indian Economy –Five year plan models-an assessment – Planning Commission and Niti Ayog.
- (ii) Sources of revenue – Reserve Bank of India – Fiscal Policy and Monetary Policy - Finance Commission–Resource sharing between Union and State Governments - Goods and Services Tax.
- (iii) Structure of Indian Economy and Employment Generation, Land Reforms and Agriculture-Application of Science and Technology in Agriculture-Industrial growth-Rural Welfare Oriented Programmes – Social Problems – Population, Education, Health, Employment, Poverty.

### **UNIT-VII: INDIAN NATIONAL MOVEMENT**

- (i) National Renaissance –Early uprising against British rule - Indian National Congress - Emergence of leaders –B.R.Ambedkar, Bhagat Singh, Bharathiar, V.O.Chidambaranar, Jawaharlal Nehru, Kamarajar, Mahatma Gandhi, Maulana AbulKalam Azad, Thanthai Periyar, Rajaji, Subash Chandra Bose, Rabindranath Tagore and others.
- (ii) Different modes of Agitation: Growth of Satyagraha and Militant Movements.
- (iii) Communalism and Partition.

### **UNIT-VIII: History, Culture, Heritage and Socio-Political Movements in Tamil Nadu**

- (i) History of Tamil Society, related Archaeological discoveries, Tamil Literature from Sangam Age till contemporary times.
- (ii) Thirukkural : (a) Significance as a Secular Literature  
(b) Relevance to Everyday Life  
(c) Impact of Thirukkural on Humanity  
(d) Thirukkural and Universal Values - Equality, Humanism, etc  
(e) Relevance to Socio-Politico-Economic affairs  
(f) Philosophical content in Thirukkural
- (iii) Role of Tamil Nadu in freedom struggle - Early agitations against British Rule - Role of women in freedom struggle.
- (iv) Evolution of 19<sup>th</sup> and 20<sup>th</sup> Century Socio-Political Movements in Tamil Nadu - Justice Party, Growth of Rationalism - Self Respect Movement, Dravidian Movement and Principles underlying both these Movements, Contributions of Thanthai Periyar and Perarignar Anna.

**UNIT-IX: Development Administration in Tamil Nadu**

- (i) Human Development Indicators in Tamil Nadu and a comparative assessment across the Country – Impact of Social Reform Movements in the Socio-Economic Development of Tamil Nadu.
- (ii) Political parties and Welfare schemes for various sections of people – Rationale behind Reservation Policy and access to Social Resources - Economic trends in Tamil Nadu – Role and impact of social welfare schemes in the Socio-Economic Development of Tamil Nadu.
- (iii) Social Justice and Social Harmony as the Cornerstones of Socio-Economic Development.
- (iv) Education and Health Systems in Tamil Nadu.
- (v) Geography of Tamil Nadu and its impact on Economic growth.
- (vi) Achievements of Tamil Nadu in various fields.
- (vii) e-Governance in Tamil Nadu.

**UNIT-X: APTITUDE AND MENTAL ABILITY**

- (i) Simplification – Percentage - Highest Common Factor (HCF) - Lowest Common Multiple (LCM).
- (ii) Ratio and Proportion.
- (iii) Simple interest - Compound interest - Area - Volume - Time and Work.
- (iv) Logical Reasoning - Puzzles-Dice - Visual Reasoning - Alpha numeric Reasoning – Number Series.

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