

### 8. SCHEME OF EXAMINATION: OBJECTIVE TYPE (OMR METHOD) AND ORAL TEST:

Subject	Duration	Maximum marks	Minimum qualifying marks for selection		
			SCs, SC(A)s, MBC/DCs, BC(OBCM)s& BCMs	Others	
<p><b>Paper –I</b> one of the following subjects in which the candidate has acquired his/her Degree qualification (Subject Paper) (200 questions) (Degree Standard)</p> <ul style="list-style-type: none"> <li>i) Agricultural Engineering (Code No. 280)</li> <li>(ii) Automobile Engineering (Code No. 258)</li> <li>(iii) Civil Engineering (Code No.261)</li> <li>iv) Mechanical / Production / Manufacturing Engineering (Code No.256)</li> <li>(v) Electrical Engineering (Code No. 259)</li> <li>(vi) Chemical Engineering (Code No.260)</li> <li>(vii) Textile Technology (Code No.306)</li> </ul>	3 Hours	300	153	204	
<p><b>Paper-II (Objective Type)</b> <b>Part-A</b> <b>Tamil Eligibility Test (SSLC Std) (100 Questions / 150 Marks)</b></p>					<p><b>Note:</b> <i>Minimum qualifying marks – 60 marks (40% of 150). Marks secured in Part-A of Paper-II will not be taken into account for ranking.</i></p>
<p><b>Part-B</b> <b>(General Studies) (100 questions) (150 marks)(Code No:003)</b></p> <p><b>General studies</b> (Degree standard) – 75 questions and <b>Aptitude and mental ability test</b> (SSLC standard) - 25 questions</p>					150*
<b>iii. Interview and Records</b>		60			
<b>Total</b>		<b>510</b>			

**\*Note:**

- a) Answer sheets of Paper-I and Part B of Paper II of the candidates will not be evaluated, if the candidate does not secure minimum qualifying marks in Part-A of Paper-II.
- b) Only marks secured in Paper-I and Part-B of Paper-II will be considered for ranking.
- c) The question paper for Paper –I in the subjects Agricultural Engineering, Electrical Engineering, Automobile Engineering, Chemical Engineering and Textile Technology will be set in English only and the question paper in the subject Civil Engineering and Mechanical Engineering will be set both in English and Tamil. The questions in Part-B of Paper-II will be set both in Tamil and English. Candidates should choose and specify in the application, only the prescribed subject in which they have obtained the educational qualification for appearing to the examination.
- d) Refer to para.17 of "[Instructions to Applicants](#)" with regard to Instructions to be followed while appearing for competitive Examinations conducted by the Commission.
- e) The syllabus for written examination is available in [Annexure-II](#) to this Notification.

**9. SELECTION PROCEDURE:**

Selection will be made in two stages i.e., (i) Written Examination and (ii) Oral Test in the shape of an interview. The final selection will be made on the basis of the total marks obtained by the applicants at the written examination and oral test taken together subject to the rule of reservation of appointments. Applicants' appearance in the written examination and oral test is compulsory. The applicant who has not appeared for any of the subjects in the written examination or Oral Test will not be considered for selection, even if he/she secures the minimum qualifying marks for selection. (For further details refer to para 18(B) of the 'Instructions to Applicants')

**Note :**

1. First, the selection will be made for the carried forward vacancies. [Section 27 of the Tamil Nadu Government Servants (Conditions of Service) Act, 2016]
2. Secondly, the selection will be made for regular vacancies following the rule of reservation of appointments.

**10. CENTRES FOR EXAMINATION:**

The examination will be held at the following centres.

Name of the Centre	Centre Code	Name of the Centre	Centre Code
Chennai	0101	Pudukkottai	1501
Coimbatore	0201	Ramanathapuram	1601
Chidambaram	0303	Salem	1701
Kancheepuram	0701	Karaikudi	1805
Nagarcoil	0801	Thanjavur	1901
Madurai	1001	Tiruchirapalli	2501
Udagamandalam	1301	Tirunelveli	2601
Vellore	2701		

**ANNEXURE-II****Paper –I [ SYLLABUS FOR WRITTEN EXAMINATION ]****AGRICULTURAL ENGINEERING****CODE NO: 280****UNIT-I: SURVEYING AND HYDROLOGY**

Surveying – Instruments - Methods of surveying – Computation of area – Triangulation, intersection, traversing, cross staff survey – Plane table survey – Earth work computation -Simpson’s trapezoidal rule - Levelling - Definition - Types of benchmarks - Different types of levels – Reduction of leveling data by rise and fall method and height of collimation method -Contouring – Profile surveying - Cross section survey - Use of Minor instruments - Hydrology – Measurement of rainfall, evaporation and infiltration – Estimation of runoff – Factors affecting runoff – Computation of volume of runoff and peak flow – Unit hydrograph - Occurrence of ground water, hydraulics of wells, types of wells and their construction - Well drilling – Techniques for different formations - Well logging - Types of well screen - Design of well screens - Well development - Yield testing.

**UNIT-II: SOIL EROSION AND CONSERVATION**

Soil erosion – Types – Factors affecting erosion by water and wind - Stages of water erosion -Biological control measures - Biological control measures and their suitability - Contour farming, strip cropping, mixed cropping, intercropping and mulching - Mechanical control measures and their suitability – Design and construction of contour bunds, graded bunds, terraces, contour stone walls, contour trenches, staggered trenches and diversion drain - Gully control structures and check dams - Wind erosion – Types and control - Dry farming techniques for improving crop production - Estimation of soil erosion - Universal Soil Loss Equation.

**UNIT-III: WATERSHED DEVELOPMENT AND MANAGEMENT**

Watershed – Concept, types and delineation - Land capability classification - Participatory rural appraisal technique – Watershed development plan – Estimation of cost and benefits -Gully and ravine reclamation – In-situ & Ex-situ water harvesting, micro catchments – Ground water recharge - Farm pond and percolation pond – Selection of suitable soil and water conservation practices – Afforestation – Holistic planning - Watershed based rural development – Use of aerial photography and remote sensing in watershed management - Applications of GIS in planning and development of watersheds including forest cover and water resources.

**UNIT-IV: IRRIGATION AND DRAINAGE**

Irrigation - Sources – Soil- water- Plant relationship - Water requirement of crops– Measurement of irrigation water - Weirs and flumes - Methods of irrigation - Surface, sprinkler and drip irrigation - Drip irrigation – Components – Wetting pattern - Filters and Fertigation tanks - Design of laterals - Submain - Main lines -Pump capacity - Operation and

maintenance- Sprinkler irrigation - Components - Sprinkler performance - Hydraulic design of sprinkler systems - Duty and delta relationship - Irrigation scheduling - Irrigation efficiencies and their estimation - Pumps - Types, selection and installation - Drainage - Causes of water logging and salt problem - Methods of drainage - Design of surface, sub-surface and vertical drainage systems - Improvement and utilization of poor quality water - Reclamation of saline and alkali soils.

### **UNIT-V: FARM AND IRRIGATION STRUCTURES**

Design and construction of farm structures - Site selection - Materials of construction - Quality- types of masonry - Foundation, basement and superstructure - Types of roofs - building plan and estimation, requirements of farm house, threshing floor, drying floor, poultry house, dairy farm, rat proof godown and farm roads - Design features earthen dams and gravity dams - Water conveyance structures - Earthen channels and lined channels - Advantages of lining - materials of lining - Design of channel cross section - Crossing control structures - Drop spillway, chute spillway, pipe inlet spill way - Road crossing structures - Culvert, inverted siphon aqueduct - Their uses - Underground pipe line system - Components and their functions - Structures for plant environment- Green houses, polyhouses and shadenets - Construction and utilization - Soil less culture.

### **UNIT-VI: FARM POWER**

Agricultural mechanization - Scope and sources of farm power - Animate and electromechanical - Thermodynamics - Construction and working of internal combustion engines - Fuel, ignition, lubrication, cooling, air intake, exhaust, governing and electrical systems of IC engines - Different types of tractors and power tillers - Power transmission, ground drive, power takeoff, steering, brake, implement control and hydraulic systems - Bulldozer - Features, traction, suspension, steering, operations using bulldozer - Weight transfer, theory of traction - Tractive efficiency - Mechanics and stability - Care and maintenance of tractors.

### **UNIT- VII: FARM MACHINERY**

Farm machinery - Primary tillage implements - Mould board plough, disc plough and chisel plough - Secondary tillage implements - Cultivators, harrows and rotary tillers - Land shaping machinery - Leveller, ridger and bund former - Sowing and transplanting - Seed drills, planters and rice transplanters - Interculture implements - Plant protection equipment - Sprayers and dusters - Harvesting, threshing and combining equipment - Machinery for earth moving and land development - Machinery for horticulture, agro-forestry and forages - Haulage of agricultural and forest produces - Management of farm machinery - Cost estimation for farm operations.

### **UNIT-VIII: UNIT OPERATIONS IN FOOD AND AGRICULTURAL PROCESSING**

Heat transfer principles – Conduction, convection and radiation - Types of heat exchangers - Unit operations – Evaporators - Types - Mechanical separation – Filtration – Sedimentation – Settling – Centrifugal separation – Cyclone separation- Size reduction – Mixing – Blending – emulsification - Food processing operations- Pasteurization – Sterilization – Canning - Retort processing - Extrusion processing of foods - Methods of drying of foods – Preservation of food by irradiation - Microwave and dielectric heating - Fats and oil processing – Extraction methods and equipments - Food packaging – Materials and characteristics – Suitability - Processing of milk and milk products, packaging of milk - Principles of refrigeration and applications in food industries – Cold storage of fruits and vegetables - Design aspects.

### **UNIT- IX: PROCESS ENGINEERING OF AGRICULTURAL AND HORTICULTURAL CROPS**

Engineering properties of food materials – Moisture content – Methods of determination – Psychrometry - Drying – Thin layer and deep bed drying – Types of heat sources and types of dryers - Cleaning and grading – Principles – Separators – Efficiency – Performance index - Shelling and decortication – Seed processing and layout of seed processing units - Rice processing – Parboiling and dehusking of paddy – Machines used - Milling of wheat, corn and pulses – Material handling equipments - Conveyors and elevators - Storage – Conditions for safe storage – Bag and bulk storage – Silo storage - Design aspects - Modified atmosphere storage – Storage structures - Equipments used for processing of horticultural crops – Preservation of fresh fruits and vegetables – Drying and dehydration – Processing of coffee, tea, rubber, cashew nut, coconut, oil palm, aromatic plants, flowers and spices.

### **UNIT-X: RENEWABLE AND BIOENERGY**

Solar energy – Solar collectors – Air heaters – Water heaters – Solar photovoltaic systems and applications - Wind energy - Suitable sites – Types of wind mills – Wind mill components – Applications – Performance of wind mills - Biomass resources – Agro residues – Characteristics - Conversion technologies – Biochemical conversion – Biogas plant – Types and selection, construction, operation and maintenance - Slurry handling - Thermochemical conversion – Stoves – Types - Improved stoves – Pyrolysis – Charcoal production – Gasification – Briquetting – Cogeneration - Energy plantation and environmental impact – Global warming – Clean development mechanism (CDM) and role of afforestation - Biofuels – Biodiesel feedstock, production and by-product utilization – Ethanol – Production and utilization – Emission - Standards and control.

**Paper –I AUTOMOBILE ENGINEERING****(Code No: 258)****UNIT - I: ENGINES**

Petrol engine – principle and construction – diesel engine- principle and construction – four stroke and two stroke. Carburettors – types, working principle, different circuits – compensation circuits. Cooling system – air and water cooling system- forced circulation and pressure cooling system.

Lubrication system –

pressure lubrication – splash lubrication – wet and dry sump lubrication. Properties of lubricants and coolants. Combustion in SI and CI engines – stages of combustion – flame propagation – detonation in SI engine and knocking in CI engines. Combustion chambers – Turbo and superchargers.

**UNIT – II: AUTOMOTIVE CHASSIS**

Types of chassis layout – various types of frames – front axles – types, stub axle, front wheel geometry – Ackermann & Davis steering mechanism – steering gear boxes. Power Assisted steering. Hutch kiss and torque tube drive. Propeller shaft- final drive – types. Differential – principle and construction details- non slip differential – differential lock. Rear axle - types – full floating –  $\frac{3}{4}$  quarter & semi. Wheels and rims – types and construction. Tyres – types and construction details.

**UNIT – III: SUSPENSION AND BRAKING SYSTEM**

Suspension system – requirements – types - construction details of Single leaf and multi leaf coil and torsion bar springs. Rubber, pneumatic and hydroelastic suspension. Independent suspension – shock absorbers. Braking system – need, stopping distance, classification of brakes. Drum brake and disc brake theory. Mechanical, hydraulic, pneumatic, electric and power assisted braking system. Retarders.

**UNIT – IV: AUTOMOTIVE TRANSMISSION**

Clutches – coils spring, diaphragm clutches – centrifugal and semi centrifugal clutches – multiplate clutches. Gear box – sliding mesh, constant mesh and synchromesh – construction and operation. Automatic transmission – fluid coupling, torque converter, epicycle gear box, hydrostatic transmission, electric drive.

**UNIT – V: AUTOMOTIVE ELECTRICAL AND ELECTRONICS**

Battery – types, lead acid battery, battery charging, rating, and testing. Ignition system – coil, magneto and electronic ignition system – principle and operation. Spark plug – Automobile Air conditioning, power windows and central locking system – starting system – types of drives - bendix drive, solenoid drive system – charging system – generator system – types – alternator, principle and operation of cut-out and regulators. Sensors – electronic suspension – electronic steering systems. Navigation system – ABS – AIRBAG restraint system.

### **UNIT – VI: VEHICLE BODY ENGINEERING**

Classification of cars, buses, HCVs and LCVs – visibility – forward and rearward visibility – safety – design – safety equipments. Aerodynamics of vehicles – different types of drags – optimization techniques - wind tunnel testing for drag force and pressure distribution. Construction of cars – panels . Construction of buses –conventional and integral construction. Driver’s seat – compactness of driver’s cab – segmental design – modern painting processes for cars. Body trim items. Body mechanism – window winding – door lock.

### **UNIT – VII: VEHICLE DYNAMICS**

Concept of vibration – free, forced, undamped and damped vibration. Response analysis of single DOF, Two DOF and multi DOF. Vibration absorbers. Tyres – tyre forces and moments – longitudinal and lateral force at various slip angles. Tractive and cornering properties of tyres. Human response to vibration. Design and analysis of passive, semi active and active suspension using quarter car, half car and full car models. Steady state handling characteristics – directional control of vehicle. Stability of vehicle.

### **UNIT – VIII : VEHICLE CONTROL SYSTEMS**

Degree of freedom for vehicle control – calculation of the control - degree of freedom. Selection of control, manipulator and measured disturbances variables. General types of vehicle controllers configuration. Dynamic behaviour of first order and second order vehicle system – dynamic responses characteristics of vehicle systems. Basic control modes – proportional control – integral control. PID controls. Lambda control – knock control – adaptive knock control – drive line modeling – active suspension control.

### **UNIT – IX : AUTOMOTIVE POLLUTION AND CONTROL**

Pollutants – sources, formation and effects on environment and human beings. Emission standards. HC,CO and NO formation in SI engines. Smoke emission and NOx emissions and its types from diesel engine. Particulate emissions. Control techniques – EGR, SCR, Secondary air induction, particulate trap and catalytic converters. Test procedures CVS1, CVS3 – Test cycles. NDIR analyser – flame ionization detectors – chemiluminescent analyser – dilution tunnels – gas chromatograph – smoke meters.

### **UNIT – X : SERVICING & MAINTENANCE, MOTOR VEHICLE ACT**

Automobile law – motor vehicle act – registration, driving licence, insurance, pollution and control, regulation. Trouble shooting and servicing of clutch, gear box, brakes, suspension and steering system. Trouble shooting and servicing of engine, engine cooling system and lubrication system – tools and equipments required for repairs – service station – organization and management of service stations.

**UNIT - I : BUILDING MATERIALS AND CONSTRUCTION PRACTICES**

Properties of engineering materials-brick, stones, aggregates, cement (types and grades), concrete (mix design), Concrete admixtures, Self compacting Concrete, steel and new materials. - Construction of stone masonry, brick masonry and R.C.C. and block masonry – construction equipments - Building bye - laws and Development regulations practiced in Tamil Nadu - Provisions for fire safety, lighting and ventilation- Acoustics.

**UNIT - II : ENGINEERING SURVEY**

Survey - computation of areas - Chain Survey - Compass surveying - Plane table survey - levelling - fly levelling - L.S. and C.S. - Contour volumes - Theodolite survey - Traversing - Heights and Distances - Geodetic Observations- Tachometry and Triangulation - Use of EDM, GPS and Remote sensing techniques.

**UNIT- III : STRENGTH OF MATERIALS**

Stresses and strains -Thermal stresses- elastic constants - Beams and bending - Bending moment and shear force in beams - Theory of simple bending - deflection of beams - torsion - Combined stresses – stresses on inclined planes - Principal stresses and principal planes - Theories of Failure – Analysis of plane trusses.

**UNIT - IV : STRUCTURAL ANALYSIS**

Indeterminate beams - Stiffness and flexibility methods of structural analysis - Slope deflection - Moment Distribution method – Arches and suspension cables - Theory of columns - moving loads and influence lines – Matrix method- Stability of retaining walls – plastic theory.

**UNIT - V : GEOTECHNICAL ENGINEERING**

Formation of soils - types of soils - classification of soils for engineering practice - Field identification of soils - Physical properties of soils - Three phase diagram - permeability characteristics of soils - stress distribution in soils - Theory of consolidation, shear strength parameters of soils - Compaction of soils. Soil exploration - Soil sampling techniques - Borelog profile - shallow foundations - Terzhagi's bearing capacity theory - Pile foundation - Group action of piles - settlement of foundations.



### **UNIT - VI : ENVIRONMENTAL ENGINEERING AND POLLUTION CONTROL**

Sources of water - Ground water Hydraulics - Characteristics of water - Water analysis - water treatment - water borne diseases. Sewerage system - Design of sewerage systems - sewer appurtenances - Pumping of sewage - sewage treatment and disposal - Industrial waste treatment - solid waste management - Air, water and Noise pollution control- e waste management

### **UNIT - VII: DESIGN OF REINFORCED CONCRETE, PRESTRESSED CONCRETE AND STEEL STRUCTURES**

Design of concrete members - limit state and working stress design concepts - design of slabs - one way, two way and flat slabs - Design of singly and doubly reinforced sections and flanged sections -design of columns and footings – pre-stressing - systems and methods- post tensioning slabs - Design of pre-stressed members for flexure. Design of tension and compression members - Design of Bolted and welded connections design of members of Truss - designs of columns and bases - design of beams, plate girders and gantry girder.

### **UNIT - VIII : HYDRAULICS AND WATER RESOURCES ENGINEERING**

Hydrostatics-applications of Bernoulli equation – flow measurement in channels, Applications of Momentum equation, Kinematics of flow. Water resources in Tamil Nadu - Water resource planning - Master plan for water management flood control–Runoff estimation – hydrograph – flood routing - Soil plant water relationship - Water requirement of crops - Irrigation methods –Design of alluvial canal and design of headworks. Waterlogging and land reclamation - Cross drainage works.

### **UNIT - IX : URBAN AND TRANSPORTATION ENGINEERING**

Urbanisation trend and impact - Slum clearance and slum improvement programmes - Different modes of transport and their characteristics. Geometric design of highways. –Design and Construction of bituminous and concrete roads - Maintenance of roads. Railways-Components of permanent way - Signalling, Interlocking and train control. Airport planning-Components of Airport - Site selection – Runways – Planning of terminal buildings. Harbours & Ports- Layout of a harbour - Docks - Breakwaters.

### **UNIT - X : PROJECT MANAGEMENT AND ESTIMATING**

Construction management - Construction planning - Scheduling and monitoring - Cost control, Quality control and inspection - Network analysis - CPM and PERT methods of project management - Resources planning and resource management. Types of estimates - Preparation of technical specifications and tender documents - Building valuation - law relating to contracts and arbitration.

**PAPER –I****MECHANICAL/PRODUCTION/MANUFACTURING ENGINEERING****CODE NO: 256****UNIT – I : MECHANICS, KINETICS AND DYNAMICS**

Statics of Particles, Equilibrium of Rigid bodies, Properties of Surfaces and Solids, Dynamics of Particles, Friction and Elements of Rigid Body Dynamics, Basics of Mechanisms, Kinematics of mechanisms, gyroscope, Gears and Gear Trains, Friction in Machine Elements, Force Analysis, Balancing, Single Degree Free Vibration, Forced Vibration, mechanisms for Control and Vibration.

**UNIT – II : STRENGTH OF MATERIALS AND DESIGN**

Stress, Strain and Deformation of Solids, Transverse Loading on Beams and Stresses in Beams, Torsion, Deflection of Beams, Energy Principles, Thin Cylinders and Thick Cylinders, Spherical Shells, Fundamentals of Design for Strength and Stiffness of Machine Members, Design of Shafts and Couplings, Design of Fasteners and Welded Joints, Design of Springs, Design of Bearings, Design of Flywheels, Design of Transmission Systems for Flexible Elements, Spur Gears and Parallel Axis Helical Gears, Bevel Gears, Worm Gears and Crossed Helical Gears, Design of single and two stage speed reducers, Design of cam, Clutches and Brakes.

**UNIT – III : FLUID MECHANICS AND TURBO MACHINERY**

Fluid properties, fluid statics, manometry, buoyancy, control volume analysis of mass, momentum and energy, fluid acceleration, differential equations of continuity and momentum, Bernoulli's equation, viscous flow of incompressible fluids, boundary layer, elementary turbulent flow, flow through pipes, head losses in pipes, bends etc. Turbomachinery: Pelton wheel, Francis and Kaplan turbines - impulse and reaction principles - velocity diagrams.

**UNIT – IV : THERMODYNAMICS**

Basic concepts, Zeroth, First and Second laws of thermodynamics, thermodynamic system and processes, Carnot cycle. irreversibility and availability, behaviour of ideal and real gases, thermodynamic relations, properties of pure substances, calculation of work and heat in ideal processes, analysis of thermodynamic cycles related to energy conversion, Fuel and combustion.

**UNIT – V : HEAT AND MASS TRANSFER**

Modes of heat transfer one dimensional heat conduction, resistance concept, electrical analogy, unsteady heat conduction, fins dimensionless parameters in free and forced convective heat transfer, various correlations for heat transfer in flow over flat plates and through pipes thermal boundary layer effect of turbulence radiative heat transfer, black and grey surfaces, shape factors, network analysis; heat exchanger performance, LMTD and NTU methods. Basic Concepts of Mass transfer, Diffusion Mass Transfer, Fick's Law of Diffusion Steady state Molecular diffusion, Convective Mass Transfer, Momentum, Heat and Mass Transfer Analogy, Convective Mass Transfer Correlations.

Applications: Power Engineering: Steam Tables, Rankine, Brayton cycles with regeneration and reheat. I.C. Engines: air-standard Otto, Diesel cycles. Refrigeration and air-conditioning: Vapour refrigeration cycle, heat pumps, gas refrigeration, Reverse Brayton cycle; moist air: psychometric chart, basic psychometric processes.

### **UNIT – VI : MATERIALS SCIENCE AND METALLURGY**

Constitution of alloys and phase diagrams, steels, cast iron, TTT diagram, heat treatment of ferrous and non-ferrous metal, surface modification techniques, non-metallic materials, mechanical properties and testing, crystal defects and strengthening mechanisms, conducting and semi conducting materials, magnetic and dielectric materials, Engineering ceramics, Engineering and commodity polymers, composites.

### **UNIT – VII : PRODUCTION TECHNOLOGY**

Foundry Technology- types of pattern, moulding and casting methods, design of castings, defects, Hot and Cold working, metal forming processes- types and defects, metal joining processes, types and design of weldment, welding metallurgy, welding defects, Metal cutting, machine tools - center lathe, drilling, milling, grinding, gear cutting and broaching, unconventional machining processes, CNC machine tools, Part programming.

### **UNIT – VIII : METROLOGY AND QUALITY CONTROL**

Linear and angular measurements, Interferometry, laser interferometers , Types, Computer Aided Inspection, Basic concept of CMM- Types of CMM, Machine vision, Form measurement-Straightness - Flatness, Roundness, Surface finish measurement, contact and non contact method, Measurement of power, flow and temperature. Statistical quality control, control charts, acceptance sampling, reliability, TQM, 5S, ISO standards.

### **UNIT – IX : CAD / CAM / CIM / FEA**

Fundamentals of Computer Graphics, Geometric Modeling, Visual Realism, Assembly of Parts, CAD Standards, Fundamentals of CIM, Production Planning and Control and Computerized Process Planning, Cellular Manufacturing, Flexible Manufacturing System and Automated Guided Vehicle System, Industrial Robotics, Additive manufacturing, Just in Time(JIT), lean manufacturing, One Dimensional Problems in FEA, Two Dimensional Scalar Variable Problems, Two dimensional vector variable Problems, Isometric Parametric Formulation.

### **UNIT – X : INDUSTRIAL ENGINEERING AND MANAGEMENT**

Work study - techniques, Method study - objectives - basic procedure, work measurement - objectives - basic procedure, machine loading and scheduling, product sequencing, inventory control - E O Q - quantity discounts, ABC Analysis material handling systems, operations research, simplex method, Transportation model, Assignment model CPM and PERT. Management theory and practice, planning - nature and purpose of Planning, Decision making, Organising, staffing, Motivation, Leadership, controlling, control techniques.

**Paper –I CHEMICAL ENGINEERING****CODE NO: 260****UNIT-I: CHEMICAL PROCESS CALCULATIONS AND CHEMICAL ENGINEERING THERMODYNAMICS**

Properties of gases liquids and solids, Humidity and saturation, Gas laws, Material and Energy balances- involving recycle, by pass and purge systems, Material and Energy balance with reactions. Thermodynamics functions - Chemical and Phase Equilibrium - Laws of Thermodynamics - Ideal and non-ideal gases and solutions – fugacity, partial molal properties.

**UNIT- II: MECHANICAL OPERATIONS AND ENGINEERING MATERIALS**

Size Reduction, law, particle size Analysis, Mixing and agitation, Filtration, Sedimentation and Settling, Materials of construction for chemical Industries, Metallic, Non-metallic and Polymeric materials, corrosion. Grinding, Law. Smart materials for Chemical Engineering applications.

**UNIT- III: CHEMICAL TECHNOLOGY AND RENEWABLE ENERGY SOURCES**

Acids, Fertilizers, marine Chemicals, Cement, Glass, Ceramic and Refractories. Petroleum Refining Products, Fermentation Products, Oils, Soaps and Detergents, Pulp and paper, Dyes, sugar, leather and rubber. Potential for energy resources, energy conversion, solar, thermal, photoelectric, ocean, geothermal, wind energy, bio-energy sources, battery and fuel Cells.

**UNIT -IV: TRANSFER OPERATIONS**

Momentum: Newtonian and Non-Newtonian fluids, Compressible and incompressible fluids flow through packed bed, Fluidized bed and closed ducts, Fluid Machinery. Heat transfer: conduction, convection and radiation, Heat transfer with phase change, heat exchangers, Evaporation. Mass transfer: Diffusion, Theories of mass transfer, Inter phase mass transfer, Analogy. Distillation, Extraction, Absorption, Adsorption, Drying.

**UNIT - V: CHEMICAL REACTION ENGINEERING**

Chemical Kinetics, Rate equations, Interpretation of rate data, Design of reactors, order of reaction, Catalysis, Thermal characteristics of reactors. Isothermal and adiabatic fixed bed reactors, non-isothermal and non-adiabatic fixed bed reactors. Two-phase fluidized bed model, slurry reactors, trickle bed reactor. Experimental determination and evaluation of reaction kinetics for heterogeneous systems.

## **UNIT - VI: INSTRUMENTATION AND PROCESS CONTROL**

Principles of measurements and classification of process instruments, measurement of temperature, pressure, fluid flow, liquid weight and weight flow rate, viscosity, pH, concentration, electrical and thermal conductivity, humidity of gases. Laplace transformation, application to solve ODEs. Open-loop systems, first order systems, first order systems in series, linearization and its application in process control, second order systems and their dynamics; transportation lag. Closed loop control systems, feed-back control systems, BODE diagram, stability criterion, tuning of controller settings, cascade control, feed forward control, Smith predictor controller, control of distillation towers and heat exchangers.

## **UNIT - VII: NUMERICAL AND COMPUTATIONAL METHODS**

Curve fitting, Equations with real and rational Coefficients, Imaginary roots and irrational roots, Transformation of equations. Numerical solutions of linear and non linear algebraic equations- solution of initial value and boundary value ordinary and non-linear differential equations, solution of partial differential equations. Partial Differential equation – finite element, finite difference method. Matrix, determinants and properties – Elementary Row transformations algebraic equations; ordinary differential equations and non homogeneous first order ordinary differential equations rank of Matrix – Eigen value problems, Orthogonal and orthonormal vectors; Gram-Schmidt orthogonalization; Theorem for Eigenvalues and Eigenfunctions.

## **UNIT - VIII: SEPARATION OPERATIONS**

Crystallization, Membrane separation processes. frame, tubular, spiral wound and hollow fibre membrane reactors, dialysis, reverse osmosis, nano/ultra filtration, microfiltration. Ion Exchange chromatography and electro dialysis, Separations involving pervaporation and permeation techniques for solids, liquids and gases, supercritical fluid extraction.

## **UNIT-IX: ENVIRONMENTAL ENGINEERING AND SAFETY IN CHEMICAL INDUSTRIES**

Air, Water and soil pollution, causes, effects and remedies, Nuclear waste disposal, Noise control, Wastewater treatment by various methods: Chemical, biochemical and advanced oxidation process. Industrial hygiene, occupational safety. Industrial safety principles, site selection and plant layout, chemical hazards classification, Safety in operations and processes, hazardous identification techniques.

## **UNIT - X: DESIGN AND OPTIMIZATION**

Problem formulation, degree of freedom analysis, objective functions, Simplex method, Barrier method, sensitivity analysis, Convex and concave functions, unconstrained NLP, Newton's method, Quasi-Newton's method, Direct substitution, Quadratic programming, Cost estimation, Plant utilities, Heat exchanger networks, Pinch technology.

**Unit - I: Fibre Identification and Blend analysis**

- i) Textile fibre Classification.
- ii) Fine, gross structure and properties of fibres
- iii) Microscopic, physical and chemical test methods for fibre identification; blend analysis
- iv) Morphology characterization – Density, XRD, Electron microscopy v) Thermal characterization methods - DSC, DMA / TMA, TGA

**Unit - II: Physical Properties of Fibres**

- i) Mechanical – Tensile, Elastic recovery, Time Effect, Bending, Twisting & Compression
- ii) Optical - Absorption and dichroism, Reflection and lustre.
- iii) Electrical and Thermal Properties - Dielectric property, Static Electricity, Structural changes in fibres on thermal treatment

**Unit - III: Synthetic Fibre Spinning and Post Spinning Operations**

- i) Requirements of fibre forming polymers
- ii) Spinning of Polymers - Melt Spinning, Wet spinning, Dry spinning
- iii) Post Spinning Operations – Drawing, Crimping, Heat setting, Tow-to-top conversion, Texturing methods

**Unit - IV: Spinning:**

- i) Principles of opening, cleaning and mixing/blending of fibrous materials ii) Draft and Drafting, Irregularity introduced by drafting
- iii) Roller arrangements in drafting systems;
- iv) Combing cycle, combing efficiency, lap preparation;
- v) Mechanism of roving bobbin building, roving twist;
- vi) Ring Cop formation, forces acting on yarn and traveller;
- vii) Single and folded yarn twist, production of core spun / compact spun yarn.
- viii) Alternate Spinning systems - rotor spinning, air jet spinning, friction spinning.
- ix) Principles of long staple spinning – Jute, Wool

**Unit - V: Weaving:**

- i) Warp winding - random and precision winding, winding parameters ii) Yarn clearers**  
and Tensioners; yarn splicing
- iii) Types of warping - beam and sectional warping, pirn winding process;
- iv) Sizing Techniques, sizing of spun and filament yarns
- v) Primary, Secondary and Tertiary motions of loom, Loom timings. vi) Tappet, Dobby and Jacquard shedding;
- vii) Principles of Shuttleless Weft insertion systems.
- viii) Principles of Circular and Multiphase weaving
- ix) Basic woven fabric constructions and its derivatives

**Unit - VI: Testing & Quality Control:**

- i) Sample selection techniques using statistics.
- ii) Measurement of fibre length, strength, fineness, maturity iii) HVI and AFIS techniques
- iv) Determination of yarn count, twist and hairiness v) Tensile testing of fibres, yarns and fabrics
- vi) Evenness testing of slivers, rovings and yarns
- vii) fabric properties - air permeability, drape, crease recovery, tear / bursting strength & abrasion.

- viii) Objective Evaluation of fabric hand - FAST and KESF
- ix) Statistical analysis of experimental results – Mean, SD, CV%

**Unit - VII: Chemical Processing:**

- i) Preparatory processes for natural fibres, synthetics and common blends ii) Dyeing of fibres using various dye classes.
- iii) Batch-wise and continuous dyeing techniques
- iv) Styles of printing. Printing thickeners and auxiliaries. v) Printing of cotton with reactive dyes.
- vi) Printing of polyester with disperse dyes.
- vii) Mechanical and chemical finishing of cotton

**Unit - VIII: Knitting & Garments:**

- i) Knitting - Yarn quality requirements, principles of weft and warp knitting ii) Basic weft and warp knitted structures and its properties
- iii) Garments - Pattern making, Spreading, Cutting, Marker efficiency iv) Stitches and Seams
- v) Types of Sewing machine vi) Sewing thread attributes
- vii) Inspection and Merchandising

**Unit - IX: Nonwovens & Technical Textiles:**

- i) Nonwovens - Web formation
- ii) Bonding methods – mechanical, thermal and chemical. iii) Finishing and Application of nonwovens
- iv) Technical Textiles - Property requirements
- v) Industrial Textiles - Belts, Ropes, Tyre-cords, Coated abrasives vi) Automotive Textiles - Filter fabrics, Airbags, Carpets
- vii) Geotextiles – Applications in civil engineering
- viii) Agriculture Textiles – Crop covers, bird nets, soil mats and sacks ix) Packaging Textiles – Food packing and bags.

**Unit - X: Textile Management & Environment Conservation:**

- i) Industrial Engineering – Work study, method study, ii) Costing – Elements, Balance sheet, P & L Account
- iii) Tools – TQM, 5S, Kaizen, MIS. iv) Marketing Management
- v) Industrial relations and Labour laws
- vi) Energy conservation in textile production process, vii) Characteristics of Effluent
- viii) Effluent treatment.

**PAPER-I ELECTRICAL ENGINEERING****CODE NO: 259****UNIT – I: ELECTRICAL CIRCUITS**

Circuit elements – Kirchoff's Laws – Mesh and Nodal Analysis - Network Theorems and Applications for DC and AC circuits: Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem – Sinusoidal Steady State Analysis of RL-RC-RLC Circuits- Resonant Circuits - Natural and Forced Response – Transient Response of RL-RC-RLC Circuits-Two-port networks – Three Phase Circuits.

**UNIT – II: ELECTRIC AND MAGNETIC FIELDS**

Coulomb's Law-Electric Field Intensity-Electric Flux Density-Gauss's Law- Divergence - Electric Field and Potential due to Point, Line, Plane and Spherical Charge Distributions - Effect of Dielectric Medium - Capacitance of Simple Configurations. Magnetic Circuits- Magnetomotive force - Reluctance-Faraday's laws-Lenz's law--Biot- Savart's law - Ampere's law - Fleming's Left and Right Hand Rule-Lorentz force - Inductance - Self and Mutual Inductance-Dot Convention- Coupled Circuits.

**UNIT – III: MEASUREMENTS AND INSTRUMENTATION**

Units and Standards – Static and Dynamic Characteristics-Types of Errors-Error Analysis – Measurement of Current, Voltage, Power, Power-factor and Energy – Indicating instruments – Measurement of Resistance, Inductance, Capacitance and Frequency – Bridge Measurements – Instrument Transformers-Electronic Measuring Instruments – Multi meters-True RMS meter-Spectrum Analyzer-Power Quality Analyser- Recording Instruments-X-Y Recorder-Magnetic Recorders-Digital Data Recorder-Oscilloscopes-LED and LCD Display-Transducers and their applications to the Measurement of Non-Electrical Quantities like Temperature, Pressure, Flow-rate, Displacement, Acceleration, Noise level — Data Acquisition Systems – A/D and D/A Converters- Data Transmission Systems.

**UNIT – IV: CONTROL SYSTEMS**

Mathematical Modelling of Physical Systems – Transfer Function - Block Diagrams and Signal Flow Graphs and their Reduction using Mason's Rule – Time Domain and Frequency Domain Analysis of Linear Time Invariant (LTI) System – Errors for Different Type of Inputs and Stability Criteria for Feedback Systems – Stability Analysis Using Routh-Hurwitz Array – Nyquist Plot and Bode Plot – Root Locus – Gain and Phase Margin – Basic Concepts of Compensator Design – PI,PD and PID Controllers-State Variable Matrix – System Modeling and Design – Sampled Data System – Stability of Sampled Data System.

**UNIT –V: ELECTRICAL MACHINES**

D.C. Machines – Construction, Excitation methods – Armature Reaction and Commutation – Characteristics and Performance Analysis – Generators and Motors – Starting and Speed Control – Testing – Losses and Efficiency. Transformers- Types-Construction and Operation- Testing – Equivalent Circuits – Losses and Efficiency-All day efficiency – Regulation – Parallel Operation – Three Phase Transformers – Auto-transformer. Induction Machines – Construction, Principle of operation – Rotating Magnetic Field – Performance, Torque-Speed Characteristics, No-load and Blocked Rotor tests, Equivalent Circuit, – Starting and Speed Control – Single-Phase Induction Motors – Linear Induction Motors – Hysteresis Motors – Reluctance Motors. Synchronous Machines – Construction – Operating characteristics and Performance analysis – Efficiency and Voltage regulation – Parallel operation – V and inverted V curves of synchronous motors – Power factor improvement-BLDC Motor.



**UNIT –VI: POWER SYSTEMS**

Single Line Diagram of Power System-Per Unit Quantities-Power Generation Types-- Hydro, Thermal and Nuclear Stations – Pumped storage plants – Co generation– Economic and operating factors – Modelling and performance characteristics of Power transmission lines and Cables-HVDC transmission– Mechanical Design of Transmission Lines-Sag-Insulators - ZBus and YBus formulation - Load flow studies — Shunt and Series Compensation- Symmetrical and Un symmetrical Faults Analysis - Transient and Steady-State Stability of Power Systems – Equal Area Criterion-Voltage and Frequency Control – Power System Transients – Power System Protection – Circuit Breakers – Relays –AC and DC Distribution.

**UNIT –VII: ANALOG AND DIGITAL ELECTRONICS**

Semiconductor Devices – PN junctions – Transistors – FET – Zener, Photo diodes and their applications – Rectifier circuits – Voltage regulators – Multipliers. Biasing circuits – Small signal amplifiers – Frequency response – Multistage amplifiers – Coupling methods – Large signal amplifiers – Push-pull amplifiers – Feedback amplifiers – Oscillators – Operational amplifiers and its applications – Precision rectifiers – Multivibrators - Voltage Controlled Oscillator-Timer. Digital logic gate families (DTL,TTL,ECL,MOS,CMOS) – Logic gates - Simplification of Logic Functions- Design of Combination circuits - Sequential logic circuits-latch–Flip- flops– Counters – Registers – Memories(ROM,PLA and FPGA).

**UNIT – VIII: POWER ELECTRONICS AND DRIVES**

Power Semiconductor devices – Ideal and practical attributes of switch - Power Diode-DIAc - SCRs- TRIAC-GTO - power MOSFET-IGBT- Static Characteristics and Principles of Operation- Single and Three Phase AC to DC Converters – Single and Three Phase AC to AC converters –DC to DC Converters (MOSFET and IGBT based) - Single and Three Phase Inverters (MOSFET and IGBT based) - Pulse Width Modulation – Sinusoidal Modulation with Uniform Sampling – Uninterrupted Power Supplies-Switched Mode Power Supplies – Speed Control of DC and AC Motor Drives– Applications of Variable Speed Drives

**UNIT –IX: DIGITAL PROCESSORS AND COMMUNICATION**

Architecture of 8085, 8086 and 8051 – Instruction Sets – Assembly Language Programming – Interfacing for memory and I/O: 8255 Programmable Peripheral Interface – 8253 Programmable Timer Interface – 8279 Programmable Keyboard and Display Interface – 8257 Direct Memory Access Interface - Embedded processors (ARM and PIC basics only).Classification of Signals – Properties of Discrete Fourier Transforms - FFT Computation – FIR Filters – IIR Filters: Butterworth Filters – Chebyshev Filters. Digital Communication Systems: Pulse Code Modulation and Demodulation – Adaptive Delta Modulation - Frequency Division and Time Division Multiplexing – Data Communication Network Topologies - 7-layer OSI Protocol.

**UNIT –X: RENEWABLE ENERGY SOURCES AND STORAGE DEVICES**

Renewable Energy – Sources and Features - Solar Radiation Spectrum - Radiation Measurement-Solar Photovoltaic Cell -Operating Principle- Microhydel - Operating principle- Wind Energy Source-Wind Patterns and Wind Data- Site Selection- Types of Wind Generators-Fuel Cells-Batteries-Super Capacitors.

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

**கட்டாய தமிழ் மொழி தகுதித் தேர்விற்கான பாடத்திட்டம்**

**(கொள்குறி வினாவிற்கான தலைப்புகள்)**

**பத்தாம் வகுப்பு தரம்**

1. பிரித்தெழுதுதல் / சேர்த்தெழுதுதல்.
2. எதிர்ச்சொல்லை எடுத்தெழுதுதல்.
3. பொருந்தாச் சொல்லைக் கண்டறிதல்.
4. பிழை திருத்தம் (i) சந்திப்பிழையை நீக்குதல் (ii) மரபுப் பிழைகள், 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, தொழிற் பெயரை / உருவாக்கல்.
10. அகர வரிசைப்படி சொற்களை சீர் செய்தல்.
11. சொற்களை ஒழுங்குப்படுத்தி சொற்றொடராக்குதல்.
12. இருவினைகளின் 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 (கலைச் சொல்)
17. விடை வகைகள்.
18. பிறமொழிச் சொற்களுக்கு இணையான தமிழ்ச் சொற்களைக்

கண்டறிதல் (எ.கா.) கோல்டு பிஸ்கட் - தங்கக் கட்டி.

19. ஊர்ப் பெயர்களின் மரூஉவை எழுதுக (எ.கா.) தஞ்சாவூர் - தஞ்சை
20. நிறுத்தற்குறிகளை அறிதல்.
21. பேச்சு வழக்கு, எழுத்து வழக்கு (வாரான் - வருகிறான்).
22. சொற்களை இணைத்து புதிய சொல் உருவாக்கல்.
23. பொருத்தமான காலம் அமைத்தல்  
(இறந்தகாலம், நிகழ்காலம், எதிர்காலம்).
24. சரியான வினாச் சொல்லைத் தேர்ந்தெடு.
25. சரியான இணைப்புச் சொல்  
(எனவே, ஏனெனில், ஆகையால், அதனால், அதுபோல).
26. அடைப்புக்குள் உள்ள சொல்லைத் தகுந்த இடத்தில் சேர்க்க.
27. இருபொருள் தருக.
28. குறில் - நெடில் மாற்றம், பொருள் வேறுபாடு.
29. கூற்று, காரணம் - சரியா? தவறா?
30. கலைச் சொற்களை அறிதல் :-  
எ.கா. - Artificial Intelligence - செயற்கை நுண்ணறிவு  
Super Computer - மீத்திறன் கணினி
31. பொருத்தமான பொருளைத் தெரிவு செய்தல்
32. சொற்களின் கூட்டுப் பெயர்கள் (எ.கா.) புல் - புற்கள்
33. சரியான தொடரைத் தேர்ந்தெடுத்தல்
34. பிழை திருத்துதல் (ஒரு-ஓர்)
35. சொல் - பொருள் - பொருத்துக
36. ஒருமை-பன்மை பிழை
37. பத்தியிலிருந்து வினாவிற்கான சரியான விடையைத் தேர்ந்தெடு.

**PAPER-II Part –B General Studies (Degree Standard)****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 Abul Kalam 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.

**ANNEXURE – III**

Sl. No.	Degree considered as Equivalent to the Qualification prescribed in the Rule	G.O.
1	B.E. (Production Engineering) and B.E. (Industrial Engineering) awarded by the Universities in Tamil Nadu be treated as an equivalent qualification to the B.E. Degree in Mechanical Engineering.	G.O.No.183, Personnel and Administrative Reforms (R) Department, dated 06.06.1995.
2	B.E. (Civil and Transportation Engineering) awarded by Bharathiyar University is equivalent to B.E. (Civil Engineering).	G.O.(Ms).No.110, Public Works (B2) Department, dated 30.04.2008.
3	B.E. (Civil Engineering with Diversification in Construction Engineering and Management) awarded by Anna University, B.E. (Civil Engineering and Computer based construction) awarded by Anna University and Madurai Kamaraj University and B.E. (Civil Engineering with Diversification in Environmental Engineering) awarded by the Anna University are equivalent to B.E. (Civil Engineering).	G.O.(Ms).No.232, Public Works (B2) Department, dated 23.07.2008.
4	B.Sc., (Civil Engineering) awarded by Kurukshetra University is equivalent to B.E. (Civil Engineering).	G.O.Ms.No.260, Public Works (B2) Department, dated 16.11.09.
5	B.E Manufacturing Engineering awarded by Anna University is equivalent to that of B.E Mechanical Engineering.	G.O.(Ms) No.309, Higher Education (J2) Department, dated 17.12.2018.
6	B.E Manufacturing Engineering (Part-time) awarded by Anna University is equivalent to that of B.E Mechanical Engineering of the Anna University.	G.O.Ms.No.9 Energy (B2) Department, dated 28.01.2010.
7	(i) B.E. (Civil and Structural Engineering) is equivalent to B.E. (Civil Engineering) and (ii) B.E. (Mechanical and Production Engineering) is equivalent to B.E. (Mechanical Engineering).	G.O.(Ms) No.102, Agriculture (AA3) Department, dated 11.05.2010.