

**XE - A**

## **Engineering Mathematics (Compulsory for all XE Candidates)**

### **Section 1: Linear Algebra**

Algebra of real matrices: Determinant, inverse and rank of a matrix; System of linear equations (conditions for unique solution, no solution and infinite number of solutions); Eigen values and eigen vectors of matrices; Properties of eigen values and eigen vectors of symmetric matrices, diagonalization of matrices; Cayley-Hamilton Theorem.

### **Section 2: Calculus**

**Functions of single variable:** Limit, indeterminate forms and L'Hospital's rule; Continuity and differentiability; Mean value theorems; Maxima and minima; Taylor's theorem; Fundamental theorem and mean value theorem of integral calculus; Evaluation of definite and improper integrals; Applications of definite integrals to evaluate areas and volumes (rotation of a curve about an axis).

**Functions of two variables:** Limit, continuity and partial derivatives; Directional derivative; Total derivative; Maxima, minima and saddle points; Method of Lagrange multipliers; Double integrals and their applications.

**Sequences and series:** Convergence of sequences and series; Tests of convergence of series with non-negative terms (ratio, root and integral tests); Power series; Taylor's series; Fourier Series of functions of period  $2\pi$ .

### **Section 3: Vector Calculus**

Gradient, divergence and curl; Line integrals and Green's theorem.

### **Section 4: Complex variables**

Complex numbers, Argand plane and polar representation of complex numbers; De Moivre's theorem; Analytic functions; Cauchy-Riemann equations.

### **Section 5: Ordinary Differential Equations**

First order equations (linear and nonlinear); Second order linear differential equations with constant coefficients; Cauchy-Euler equation; Second order linear differential equations with variable coefficients; Wronskian; Method of variation of parameters; Eigen value problem for second order equations with constant coefficients; Power series solutions for ordinary points.

### **Section 6: Partial Differential Equations**

Classification of second order linear partial differential equations; Method of separation of variables: One dimensional heat equation and two dimensional Laplace equation.

### **Section 7: Probability and Statistics**

Axioms of probability; Conditional probability; Bayes' Theorem; Mean, variance and standard deviation of random variables; Binomial, Poisson and Normal distributions; Correlation and linear regression.

### **Section 8: Numerical Methods**

Solution of systems of linear equations using LU decomposition, Gauss elimination method; Lagrange and Newton's interpolations; Solution of polynomial and transcendental equations by Newton-Raphson method; Numerical integration by trapezoidal rule and Simpson's rule; Numerical solutions of first order differential equations by explicit Euler's method.

## **XE – B FLUID MECHANICS**

### **SECTION 1: Flow and Fluid Properties**

**Fluid Properties:** Density, viscosity, surface tension, relationship between stress and strain-rate for Newtonian fluids.

**Classification of Flows:** Viscous versus inviscid flows, incompressible versus compressible flows, internal versus external flows, steady versus unsteady flows, laminar versus turbulent flows, 1-D, 2-D and 3-D flows, Newtonian versus non-Newtonian fluid flow.

**Hydrostatics:** Buoyancy, manometry, forces on submerged bodies and its stability.

### **SECTION 2: Kinematics of Fluid Motion**

Eulerian and Lagrangian descriptions of fluid motion. Concept of local, convective and material derivatives. Streamline, streakline, pathline and timeline.

### **SECTION 3: Integral Analysis for a Control Volume**

Reynolds Transport Theorem (RTT) for conservation of mass, linear and angular momentum.

### **SECTION 4: Differential Analysis**

Differential equations of mass and momentum for incompressible flows.

Inviscid flows - Euler equations and viscous flows - Navier-Stokes equations.

Concept of fluid rotation, vorticity, stream function and circulation.

Exact solutions of Navier-Stokes equations for Couette flow and Poiseuille flow, thin film flow.

### **SECTION 5: Dimensional Analysis**

Concept of geometric, kinematic and dynamic similarity.

Buckingham Pi theorem and its applications.

Non-dimensional parameters and their physical significance - Reynolds number, Froude number and Mach number.

### **SECTION 6: Internal Flows**

Fully developed pipe flow.

Empirical relations for laminar and turbulent flows: friction factor, Darcy-Weisbach relation and Moody's chart.

Major and minor losses.

## **SECTION 7: Bernoulli's Equation and its Applications, Potential Flows**

**Bernoulli's equation:** Assumptions and applications.

Flow measurements - Venturi meter, Pitot-static tube and orifice meter.

**Elementary potential flows:** Velocity potential function.

Uniform flow, source, sink and vortex, and their superposition for flow past simple geometries.

## **SECTION 8: External Flows**

**Prandtl boundary layer equations:** Concept and assumptions.

**Boundary layer characteristics:** Boundary layer thickness, displacement thickness and momentum thickness.

Qualitative idea of boundary layer separation, streamlined and bluff bodies, and drag and lift forces.

## **XE - C Materials Science**

### **1: Classification and Structure of Materials**

**Classification of materials:** metals, ceramics, polymers and composites.

**Nature of bonding in materials:** metallic, ionic, covalent and mixed bonding; structure of materials: fundamentals of crystallography, symmetry operations, crystal systems, Bravais lattices, unit cells, primitive cells, crystallographic planes and directions; structures of metals, ceramics, polymers, amorphous materials and glasses.

**Defects in crystalline materials:** 0-D, 1-D and 2-D defects; vacancies, interstitials, solid solutions in metals and ceramics, Frenkel and Schottky defects; dislocations; grain boundaries, twins, stacking faults; surfaces and interfaces.

### **2: Thermodynamics, Kinetics and Phase Transformations**

Extensive and intensive thermodynamic properties, laws of thermodynamics, phase equilibria, phase rule, phase diagrams (unary and binary), basic electrochemistry.

Reaction kinetics, fundamentals of diffusion, Fick's laws, their solutions and applications.

Solidification of pure metals and alloys, nucleation and growth, diffusional solid-state phase transformations (precipitation and eutectoid), martensitic transformation.

### **3: Properties and Applications of Materials**

Mechanical properties of metals, ceramics, polymers and composites at room temperature; stress-strain response (elastic, anelastic and plastic deformation).

**Electronic properties:** free electron theory, Fermi energy, density of states, elements of band theory, semiconductors, Hall effect, dielectric behaviour, piezo- and ferro-electric behaviour.

**Magnetic properties:** Origin of magnetism in materials, para-, dia-, ferro- and ferri-magnetism.

**Thermal properties:** Specific heat, heat conduction, thermal diffusivity, thermal expansion, and thermoelectricity.

**Optical properties:** Refractive index, absorption and transmission of electromagnetic radiation.

Examples of materials exhibiting the above properties, and their typical/common applications.

### **4: Characterization and Measurements of Properties**

X-ray diffraction; spectroscopic techniques such as UV-Vis, IR and Raman; optical microscopy, electron microscopy, composition analysis in electron microscopes. Tensile test, hardness measurement. Electrical conductivity, carrier mobility and concentrations.

Thermal analysis techniques: thermogravimetry and calorimetry.

### **5: Processing of Materials**

Heat treatment of ferrous and aluminium alloys; preparation of ceramic powders, sintering; thin film deposition: evaporation and sputtering techniques, and chemical vapour deposition, thin film growth phenomena.

### 6: Degradation of Materials

Corrosion and its prevention; embrittlement of metals; polymer degradation.

## **XE - D Solid Mechanics**

### **Section 1: Mechanics of rigid bodies**

Equivalent force systems; free-body diagrams; equilibrium equations; analysis of determinate trusses and frames; friction; principle of minimum potential energy; particle kinematics and dynamics; dynamics of rigid bodies under planar motion; law of conservation of energy; law of conservation of momentum.

### **Section 2: Mechanics of deformable bodies**

Stresses and strains; transformation of stresses and strains, principal stresses and strains; Mohr's circle for plane stress and plane strain; generalized Hooke's Law; elastic constants; thermal stresses; theories of failure.

Axial force, shear force and bending moment diagrams; axial, shear and bending stresses; combined stresses; deflection (for symmetric bending); torsion in circular shafts; thin walled pressure vessels; energy methods (Castigliano's Theorems); Euler buckling.

### **Section 3: Vibrations**

Free vibration of undamped single degree of freedom systems.

## **XE - E**    **Thermodynamics**

### **Section 1: Basic Concepts**

Continuum and macroscopic approach; thermodynamic systems (closed and open); thermodynamic properties and equilibrium; state of a system, state postulate for simple compressible substances, state diagrams, paths and processes on state diagrams; concepts of heat and work, different modes of work; zeroth law of thermodynamics; concept of temperature.

### **Section 2: First Law of Thermodynamics**

Concept of energy and various forms of energy; internal energy, enthalpy; specific heats; first law applied to elementary processes, closed systems and control volumes, steady and unsteady flow analysis.

### **Section 3: Second Law of Thermodynamics**

Limitations of the first law of thermodynamics, concepts of heat engines and heat pumps/refrigerators, Kelvin-Planck and Clausius statements and their equivalence; reversible and irreversible processes; Carnot cycle and Carnot principles/theorems; thermodynamic temperature scale; Clausius inequality and concept of entropy; microscopic interpretation of entropy, the principle of increase of entropy, T-s diagrams; second law analysis of control volume; availability and irreversibility; third law of thermodynamics.

### **Section 4: Properties of Pure Substances**

Thermodynamic properties of pure substances in solid, liquid and vapor phases; P-v-T behaviour of simple compressible substances, phase rule, thermodynamic property tables and charts, ideal and real gases, ideal gas equation of state and van der Waals equation of state; law of corresponding states, compressibility factor and generalized compressibility chart.

### **Section 5: Thermodynamic Relations**

T-ds relations, Helmholtz and Gibbs functions, Gibbs relations, Maxwell relations, Joule-Thomson coefficient, coefficient of volume expansion, adiabatic and isothermal compressibilities, Clapeyron and Clapeyron-Clausius equations.

### **Section 6: Thermodynamic Cycles**

Carnot vapor cycle, ideal Rankine cycle, Rankine reheat cycle, air-standard Otto cycle, air-standard Diesel cycle, air-standard Brayton cycle, vapor-compression refrigeration cycle.

### **Section 7: Ideal Gas Mixtures**

Dalton's and Amagat's laws, properties of ideal gas mixtures, air-water vapor mixtures and simple thermodynamic processes involving them; specific and relative humidities, dew point and wet bulb temperature, adiabatic saturation temperature, psychrometric chart.



### **Section 1: Chemistry of high polymers**

Monomers, functionality, degree of polymerizations, classification of polymers, glass transition, melting transition, criteria for rubberiness, polymerization methods: addition and condensation; their kinetics, metallocene polymers and other newer methods of polymerization, copolymerization, monomer reactivity ratios and its significance, kinetics, different copolymers, random, alternating, azeotropic copolymerization, block and graft copolymers, techniques for polymerization-bulk, solution, suspension, emulsion. Concept of intermolecular order (morphology) – amorphous, crystalline, orientation states. Factor affecting crystallinity. Crystalline transition. Effect of morphology on polymer properties.

### **Section 2: Polymer Characterization**

Solubility and swelling, Concept of molecular weight distribution and its significance, concept of average molecular weight, determination of number average, weight average, viscosity average and Z-average molecular weights, polymer crystallinity, analysis of polymers using IR, XRD, thermal (DSC, DMTA, TGA), microscopic (optical and electronic) techniques, Molecular wt. distribution: Broad and Narrow, GPC, mooney viscosity.

### **Section 3: Synthesis, manufacturing and properties**

Commodity and general purpose thermoplastics: PE, PP, PS, PVC, Polyesters, Acrylic, PU polymers. Engineering Plastics: Nylon, PC, PBT, PSU, PPO, ABS, Fluoropolymers Thermosetting polymers: Polyurethane, PF, MF, UF, Epoxy, Unsaturated polyester, Alkyds. Natural and synthetic rubbers: Recovery of NR hydrocarbon from latex; SBR, Nitrile, CR, CSM, EPDM, IIR, BR, Silicone, TPE, Speciality plastics: PEK, PEEK, PPS, PSU, PES etc. Biopolymers such as PLA, PHA/PHB.

### **Section 4: Polymer blends and composites**

Difference between blends and composites, their significance, choice of polymers for blending, blend miscibility-miscible and immiscible blends, thermodynamics, phase morphology, polymer alloys, polymer eutectics, plastic-plastic, rubber-plastic and rubber-rubber blends, FRP, particulate, long and short fibre reinforced composites. Polymer reinforcement, reinforcing fibres – natural and synthetic, base polymer for reinforcement (unsaturated polyester), ingredients / recipes for reinforced polymer composite.

### **Section 5: Polymer Technology**

Polymer compounding-need and significance, different compounding ingredients for rubber and plastics (Antioxidants, Light stabilizers, UV stabilizers, Lubricants, Processing aids, Impact modifiers, Flame retardant, antistatic agents. PVC stabilizers and Plasticizers) and their function,

use of carbonblack, polymer mixing equipments, cross-linking and vulcanization, vulcanization kinetics.

### **Section 6: Polymer rheology**

Flow of Newtonian and non-Newtonian fluids, different flow equations, dependence of shear modulus on temperature, molecular/segmental deformations at different zones and transitions. Measurements of rheological parameters by capillary rotating, parallel plate, cone-plate rheometer. Visco-elasticity-creep and stress relaxations, mechanical models, control of rheological characteristics through compounding, rubber curing in parallel plate viscometer, ODR and MDR.

### **Section 7: Polymer processing**

Compression molding, transfer molding, injection molding, blow molding, reaction injection molding, filament winding, SMC, BMC, DMC, extrusion, pultrusion, calendaring, rotational molding, thermoforming, powder coating, rubber processing in two-roll mill, internal mixer, Twin screw extruder.

### **Section 8: Polymer testing**

Mechanical-static and dynamic tensile, flexural, compressive, abrasion, endurance, fatigue, hardness, tear, resilience, impact, toughness. Conductivity-thermal and electrical, dielectric constant, dissipation factor, power factor, electric resistance, surface resistivity, volume resistivity, swelling, ageing resistance, environmental stress cracking resistance, limiting oxygen index. Heat deflection temperature –Vicat softening temperature, Brittleness temperature, Glass transition temperature, Co-efficient of thermal expansion, Shrinkage, Flammability, dielectric constant, dissipation factor, power factor, Optical Properties - Refractive Index, Luminous Transmittance and Haze, Melt flow index

### **Section 9: Polymer Recycling and Waste management**

Polymer waste, and its impact on environment, Sources, Identification and Separation techniques, recycling classification, recycling of thermoplastics, thermosets and rubbers, applications of recycled materials. Life cycle assessment of polymer products (case studies like PET bottles, packaging bags)

## **XE - G Food Technology**

### **Section 1: Food Chemistry and Nutrition**

**Carbohydrates:** structure and functional properties of mono-, oligo-, & poly- saccharides including starch, cellulose, pectic substances and dietary fibre, gelatinization and retrogradation of starch. **Proteins:** classification and structure of proteins in food, biochemical changes in post mortem and tenderization of muscles. **Lipids:** classification and structure of lipids, rancidity, polymerization and polymorphism. **Pigments:** carotenoids, chlorophylls, anthocyanins, tannins and myoglobin. **Food flavours:** terpenes, esters, aldehydes, ketones and quinines. **Enzymes:** specificity, simple and inhibition kinetics, coenzymes, enzymatic and non- enzymatic browning. **Nutrition:** balanced diet, essential amino acids and essential fatty acids, protein efficiency ratio, water soluble and fat soluble vitamins, role of minerals in nutrition, co-factors, anti-nutrients, nutraceuticals, nutrient deficiency diseases. **Chemical and biochemical changes:** changes occur in foods during different processing.

### **Section 2: Food Microbiology**

**Characteristics of microorganisms:** morphology of bacteria, yeast, mold and actinomycetes, spores and vegetative cells, gram-staining. **Microbial growth:** growth and death kinetics, serial dilution technique. **Food spoilage:** spoilage microorganisms in different food products including milk, fish, meat, egg, cereals and their products. **Toxins from microbes:** pathogens and non-pathogens including Staphylococcus, Salmonella, Shigella, Escherichia, Bacillus, Clostridium, and Aspergillus genera. **Fermented foods and beverages:** curd, yoghurt, cheese, pickles, soya-sauce, sauerkraut, idli, dosa, vinegar, alcoholic beverages and sausage.

### **Section 3: Food Products Technology**

**Processing principles:** thermal processing, chilling, freezing, dehydration, addition of preservatives and food additives, irradiation, fermentation, hurdle technology, intermediate moisture foods. **Food packaging and storage:** packaging materials, aseptic packaging, controlled and modified atmosphere storage. **Cereal processing and products:** milling of rice, wheat, and maize, parboiling of paddy, bread, biscuits, extruded products and ready to eat breakfast cereals. **Oil processing:** expelling, solvent extraction, refining and hydrogenation. **Fruits and vegetables processing:** extraction, clarification, concentration and packaging of fruit juice, jam, jelly, marmalade, squash, candies, tomato sauce, ketchup, and puree, potato chips, pickles. **Plantation crops processing and products:** tea, coffee, cocoa, spice, extraction of essential oils and oleoresins from spices. **Milk and milk products processing:** pasteurization and sterilization, cream, butter, ghee, ice-cream, cheese and milk powder. **Processing of animal products:** drying, canning, and freezing of fish and meat; production of egg powder. **Waste utilization:** pectin from fruit wastes, uses of by-products from rice milling. **Food standards and quality maintenance:** FPO, PFA, A-Mark, ISI, HACCP, food plant sanitation and cleaning in place (CIP).

### **Section 4: Food Engineering**

Mass and energy balance; Momentum transfer: Flow rate and pressure drop relationships for Newtonian fluids flowing through pipe, Reynolds number. Heat transfer: heat transfer by conduction, convection, radiation, heat exchangers. Mass transfer: molecular diffusion and Flick's law, conduction and convective mass transfer, permeability through single and multilayer

films. Mechanical operations: size reduction of solids, high pressure homogenization, filtration, centrifugation, settling, sieving, mixing & agitation of liquid. Thermal operations: thermal sterilization, evaporation of liquid foods, hot air drying of solids, spray and freeze-drying, freezing and crystallization. Mass transfer operations: psychometric, humidification and dehumidification operations.

## **XE - H Atmospheric and Ocean Science**

### **Section A: Atmospheric Science**

Vertical Structure and Composition of the Atmosphere; Blackbody Radiation and Radiation Balance; Modes of Heat Transfer in the Atmosphere; Greenhouse Effect; Cloud Types; Laws of Thermodynamics; Gas Laws; Hydrostatic Equation; Clausius Clapeyron Equation; Adiabatic Processes, Humidity in the Atmosphere, Atmospheric Stability; Weather and Climate.

Navier-Stokes and Continuity Equations; Compressible and Incompressible Fluids; Pressure Gradient, Centripetal, Centrifugal and Coriolis Forces; Geostrophic, Gradient and Cyclostrophic Balances; Circulations and Vorticity, General Circulation of the Atmosphere. Broad Features of Indian Monsoons, Monsoon Depressions; Tropical Convergence Zones; Tropical Cyclones.

### **Section B: Ocean Sciences**

Vertical Profiles of Temperature and Salinity; Stability and Double Diffusion; Equation of State, Equations for Conservation of Mass, Momentum, Heat and Salt; Inertial Currents; Geostrophic Motion; Air-Sea Surface Fluxes; Wind-driven Circulation, Ekman and Sverdrup Transports; Storm Surges, Tides, Tsunamis and Wind Waves; Eddies and Gyres; Eastern and Western Boundary Currents, Equatorial Currents, Indian Ocean Current Systems; Thermohaline Circulation.

Chemical Properties of Seawater, Major and Minor Elements, Ocean Acidification, Biochemical Cycling of Nutrients, Trace Metals and Organic Matter. Biological Pump; Primary and Secondary Biological Productivity; Air-sea Exchange of Biogenic Dissolved Gases; Marine Ecology.

**XH – B1**

**Reasoning and Comprehension  
(Compulsory for all XH Candidates)**

This part is to test the candidate's ability to comprehend and interpret written information – skills that are critical to research in the Humanities and Social Sciences. The section will not directly test language competence in terms of grammar, vocabulary etc. The focus is instead on critical reasoning (similar to what is often found in exams like LSAT, GRE, GMAT etc.) and analysis of the text and its stylistic and rhetorical structure.

Questions of this section XH-B1 will test the following skills:

- **Reading Comprehension** – ability to understand complex language material in short paragraphs and answer questions regarding them.
- **Expression** – questions on stylistic and rhetorical aspects of a short passage including corrections or modifications of particular sentences.
- **Analytical reasoning** – ability to understand relationships in statements or short passages and being able to draw reasonable conclusions/inferences from them.
- **Logical reasoning** – Thinking critically to evaluate or to predict an argument, identify the main and supporting arguments, predict outcomes etc.

## **XH - C1 Economics**

**C1.1 Microeconomics:** Theory of Consumer Behaviour: Cardinal Approach and Ordinal Approach; Consumer Preferences; Nature of the utility function; Marshallian and Hicksian demand functions; Duality Theorem. Slutsky equation and Comparative Statics. Homogeneous and Homothetic Utility Functions; Euler's Theorem. The Theory of Revealed Preference: Weak Axiom of Revealed Preference and Strong Axiom of Revealed Preference, Theory of Production and Costs: Short-run and Long-run Analysis, Existence, Uniqueness and Stability of Market Equilibrium: Walrasian and Marshallian Stability Analysis. The Cobweb Model, Decision making under uncertainty and risk. Asymmetric Information: Adverse Selection and Moral Hazard. Theory of Agency costs. The Theory of Search, Non-Cooperative games: Constant sum game, Mixed Strategy & Pure Strategy, Bayesian Nash Equilibrium, SPNE, Perfect Bayesian Equilibria., Theory of Firm: Market Structures — Competitive and Non-competitive equilibria and their efficiency properties. Structure-Conduct-Performance Paradigm, Factor Pricing: Marginal productivity Theory of Distribution in Perfectly Competitive markets; Theory of Employment in Imperfectly Competitive Markets — Monopolistic Exploitation, General Equilibrium Analysis. Welfare Economics: Fundamental Theorems, Social Welfare Function. Efficiency Criteria: Pareto-Optimality.

**C1.2 Macroeconomics:** National Income Accounting: Closed Economy Concepts and Measurement and Open Economy Issues, Determination of output and employment: Classical & Keynesian Framework, Theories of Consumption: Absolute Income Hypothesis, Relative Income Hypothesis, Life Cycle Hypothesis, Permanent Income Hypothesis and Robert Hall's Random Walk Model; Investment Function Specifications - Dale Jorgenson's Neoclassical Theory of Capital Accumulation and Tobin's, Keynesian Stabilization Policies, (Autonomous) Multipliers and Investment Accelerator, Demand and Supply of Money, Components of Money Supply, Liquidity Preference and Liquidity Trap, Money Multiplier, Interest Rate determination, Central Banking, Objectives, Instruments (Direct and Indirect) of Monetary Policy, Prudential Regulation, Quantitative Easing (Unconventional Monetary Policy), Commercial Banking, Non-Banking Financial Institutions, Capital Market and its Regulation, Theories of Inflation and Expectations Augmented Phillips Curve, Real Business Cycles, Adaptive Expectations Hypothesis, Rational Expectation Hypothesis and its critique. Closed Economy IS – LM Model and Mundell Fleming Model: Monetary and Fiscal Policy Efficacy. The Impossible Trinity.

**C1.3 Statistics, Econometrics and Mathematical Economics:** Probability Theory: Concepts of probability, Probability Distributions [Discrete and Continuous], Central Limit Theorem, Index Numbers and Construction of Price Indices, Sampling Methods & Sampling Distribution, Statistical Inferences, Hypothesis Testing, Linear Regression Models and the Gauss Markov Theorem, Heteroscedasticity, Multicollinearity and Autocorrelation, Spurious regressions and Unit roots, Simultaneous Equation Models – recursive and non-recursive. Identification Problem, Differential Calculus and its Applications, Linear Algebra – Matrices, Applications of Cramer's Rule, Static Optimization Problems and Applications, Input-Output Model, Linear Programming, Difference equations and Differential equations with applications

**C1.4 International Economics:** Theories of International Trade, International Trade under Imperfect Competition, Gains from Trade, Terms of Trade, Trade Multiplier, Tariff and Non-Tariff barriers to trade; Dumping and Anti-Dumping Policies, GATT, WTO and Regional Trade Blocks; Trade Policy Issues, Balance of Payments: Composition, Equilibrium and Disequilibrium and Adjustment Mechanisms, Foreign Exchange Market and Arbitrage, Exchange rate determination, IMF & World Bank.

**C1.5 Public Economics:** Market Failure and Remedial Measures: Asymmetric Information, Public Goods, Externality, Regulation of Market – Collusion and Consumers' Welfare, Public Revenue: Tax & Non-Tax Revenue, Direct & Indirect Taxes, Progressive and non-Progressive Taxation, Incidence and Effects of Taxation, Public expenditure, Public Debt and its management, Public Budget and Budget Multiplier, Tax Incidence, Fiscal Policy and its implications, Environment as a Public Good, Market Failure and Coase Theorem, Cost-Benefit Analysis.

**C1.6 Development Economics:** Theories of Economic Development: Adam Smith, David Ricardo, Karl Marx, J. Schumpeter, W. Rostow, Balanced & Unbalanced Growth, Big Push Approach, Indicators of Economic Development: HDI, SDGs, MDGs, Poverty and Inequalities – Concepts and Measurement Issues, Social Sector Development: Health, Education, Gender, Fertility, Morbidity, Mortality, Migration, Child Labor, Age Structure, Demographic Dividend, Models of Economic Growth: Harrod-Domar, Solow, Ramsey, Technical progress – Disembodied & Embodied, Endogenous Growth Models.

**C1.7 Indian Economy:** Economic Growth in India: Pattern and Structure, Agriculture, Industry & Services Sector: Pattern & Structure of Growth, Major Challenges, Policy Responses, Rural & Urban Development – Issues, Challenges & Policy Responses, Flow of Foreign Capital, Trade Policies, Infrastructure Development: Physical and Social; Public-Private Partnerships, Reforms in Land, Labour and Capital Markets, Poverty, Inequality & Unemployment, Functioning of Monetary Policy in India, Fiscal Policy in the Indian context: Structure of Receipts and Expenditure, Tax reforms-Goods and Services Tax, Issues of Growth and Equity, Fiscal Federalism, Centre-State Financial Relations and Finance Commissions of India; Sustainability of Deficits and Debt, The Fiscal Responsibility and Budget Management Act 2003, Demonetization and aftermath. India's balance of payments, Composition of India's Trade, Competitiveness of India's exports, India's exchange rate policy.



**XH – C2**

**English**

**C2.1** Multi-genre literatures in English—poetry, the novel and other forms of fiction including the short story, drama, creative non-fiction, and non-fiction prose—with emphasis on the long 19th and 20th centuries

**C2.2** Especially in a comparative context, anglophone and in English translation, literatures from India and, extending to some degree, the larger Indian subcontinent

**C2.3** Literary criticism and theory; critical and cultural intellectual-traditions and approaches widely referred to and used in the discipline of English

**C2.4** History of English literature and English literary studies

**C2.5** Research approaches and methodologies, including interpretive techniques responsive to literary forms, devices, concepts, and genres

Note:

- (i) The five units above list aspects the question paper will include rather than signal separate modules or sections; these five units listed are not necessarily exclusive to each other either. The question paper will also not be divided into sections corresponding to the above aspects; and,
- (ii) While the paper will test candidates for a reasonable breadth of disciplinary knowledge, it would prioritize conceptual depth and methodological sensitivity demonstrative of disciplinary training over information wherever possible.

## **XH – C3 Linguistics**

**C3.1 Language and Linguistics:** Language spoken, written and signed; description and prescription; language and cultural heritage; language and social identity; language as an object of inquiry – its structure, units and components; design features; writing systems; biological foundations and language faculty; linguistic competence and performance; levels of grammar; contrast and complementation; rules - context dependent and context free; levels of adequacy for analysis; interdisciplinary approaches; schools of linguistic thought (European, American) and the Indian Grammatical Tradition.

### **C3.2 Levels of Grammar and Grammatical Analysis:**

**A. Phonetics and Phonology:** vocal tract anatomy; phonation; articulatory parameters; classification of sounds; gestural theory of speech production; cardinal vowels; secondary and co-articulation; suprasegmentals - length, stress, tone, intonation and juncture; IPA; basic physics of sound and of phonation and articulation; acoustic cues for speech sounds; organisation of phones into phonemes; phoneme inventories and cross-linguistic properties; syllable structure and phonological properties; principles of phonological analysis - phonetic similarity, contrastive and complementary distribution, free variation, allophones; linear and non-linear approaches; levels of representation; phonological rules; distinctive features (major class, manner, place, etc.); feature geometry; rule ordering, markedness and unspecified featural values; core principles of lexical phonology, optimality theory, autosegmental phonology and prosodic morphology.

**B. Morphology:** Concepts of morpheme, morph, allomorph, zero allomorph, conditions on allomorphs; lexeme and word; types of morphemes – structural and functional; affixes vs clitics; grammatical categories; morphological theories - generative, lexicalist, process and distributed morphology; identification of morphemes and parts of speech; alternation; morphophonology; inflection vs. derivation; conjugation and declension; word creation and word formation rules and processes; creativity and productivity, blocking, bracketing paradoxes, constraints on affix ordering; mental lexicon; lexical categories; valency changing operations.

**C. Syntax:** Basic syntactic units and their types: word, phrase, clause, sentence and their description and generation; grammatical and case relations; key ideas from syntactic theories, Generative Grammars including Minimalist Program, HPSG, Relational Grammar and Lexical Functional Grammar; phrase structure rules (including X-bar theory); universal grammar and cross-linguistic properties; idea of grammaticality judgements; solving the language acquisition problem; diagnostics of structure; syntactic phenomena such as movement, binding, ellipses, case-checking, islands, argument structure etc.; unergatives and unaccusatives.

**D. Semantics and Pragmatics:** Types of meaning, lexical and compositional; syntax-semantics interface (semantic roles, binding, scope, LF etc.); sense and reference, connotation and denotation, lexical semantic relations (homonymy, hypo/hypernymy, antonymy, synonymy, ambiguity); prototype theory and componential analysis; sentence meaning and truth conditions, contradictions, entailment; basic set theory; propositions, truth values, sentential connectives; arguments, predicates, quantifiers, variables; in/definiteness, mood and modality; language use in context; sentence meaning and utterance meaning; speech acts; deixis; presupposition and implicature: Gricean maxims; information structure; politeness, power and solidarity; discourse analysis.

**C3.3 Historical Linguistics:** Neogrammarian laws of phonetic change such as Grimm's, Verner's, Grassmann's Laws; genesis and spread of sound change; split and merger; conditioned vs. unconditioned change; lexical diffusion of sound change; analogical changes and paradigm levelling; relative chronology of different changes; study of sound change in progress; morphosyntactic (syncretism, grammaticalisation and lexicalisation) and semantic change (extension, narrowing, figurative speech); linguistic reconstruction - external vs. internal: the comparative method; lexicostatistics; language contact and dialect geography – borrowing and impact of borrowing; pidgins and creoles; bi- and multilingualism as the source for borrowing; dialect geography - dialect atlas; isogloss, focal, transition and relic areas.

**C3.4 Sociolinguistics:** Micro-and macro approaches to language in society; linguistic repertoire language, dialect, sociolect, idiolect; diglossia; taboo, slang and euphemism; elaborated and restricted codes; speech community and communicative competence; ethnography of speaking; lingua franca; diasporic language; linguistic variables and their co-variation along linguistic/social dimensions; language policies and development (especially in India); language contact and outcomes (language loss, pidginization and creolization); code-mixing and code-switching; language movements – state and societal interventions; script development and modifications; linguistic minorities; language ecology and endangerment linguistic vitality, language endangerment (EGIDS scale), parameters of endangerment, documentation and revitalisation.

**C3.5 Areal Typology, Universals, Cross-linguistic Features:** morphological types of languages agglutinative, analytical (isolating), synthetic fusional (inflecting), polysynthetic (incorporating) languages; formal and substantive universals, absolute and statistical universals; implicational and non-implicational universals (Greenberg); linguistic relatedness—genetic, typological and areal classification of languages; universals and parametric variation; word order typology; salient features of South Asian languages - Indo-Aryan, Dravidian, Austro-Asiatic, and Tibeto-Burman language families; Linguistic Survey of India; contact induced typological change.

### **C3.6 Methods of analysis:**

Experimental and non-experimental methods; sampling and tools; identification of variables and their variants; data processing and interpretation; quantitative analysis of data; ethnomethodology; participant observation; field methods and elicitation; document creation; ethics.

### **C3.7 Applied Linguistics**

(Can be expanded to include Interdisciplinary areas that focus on language and Language Teaching depending on interest and requirement.)

Example: Psycholinguistics: the study of how humans learn, represent, comprehend, and produce language. Topics include word recognition and storage, sentence production and comprehension, reading, speech perception, language acquisition, neural representation of language, bilingualism, and language disorders.

## XH – C4 Philosophy

### C4.1 Classical Indian Philosophy

**C4.1.1 Orthodox Systems: Sāṅkhya-** Puruṣa, Prakṛti, Guṇas, Satkāryavāda, Mokṣa (Kaivalya), Pramāṇas and Theory of Error, **Yoga** – Pramāṇas, Theory of Error, Ísvara, Citta, Kleśa, Aṣṭāṅga-yoga, Kaivalya (Mokṣa), **Nyāya** – Pramāṇas, Hetvābhāsa, Ísvara, Asatkāryavāda, Theory of Error, Navya-Nyāya, **Vaiśeṣika** – Parataḥprāmāṇya, Padārthas (categories), Theory of Atomism (paramāṇuvāda), **Mīmāṃsā**– Dharma, Apūrva, Mokṣa, Pramāṇas (both in Kumārila and Prabhākara), Anyathākhyāti, and, **Vedānta**– Advaita (Adhyāsa, Brahman, Ísvara, Ātman, Jīva, Mokṣa, Viśiṣṭādvaita (Tattva-traya, Mokṣa, and Refutation of Māyāvāda), Dvaita, Dvaitādvaita, Śuddhādvaita, Pramāṇa in Advaita and Viśiṣṭādvaita.

**C4.1.2 Heterodox Systems: Cārvāka** – Pramāṇa, Indian materialism and Hedonism, **Jainism**- Pramāṇas, Syādvāda, Anekāntavāda, Padārtha (categories), Jīva and Ajīva, Mokṣa, Mahāvratā, Aṇuvratā, and, **Buddhism** – Ti-piṭaka, Sarvāstivāda, Sautrāntika, Mādhyamika, Yogācāra-Vijñānavāda, Pañca-skandha, Anityavāda, Anātmavāda, Doctrine of Momentariness, Doctrine of Dependent Origination, Pramāṇas, Doctrine of Two Truths, Doctrine of Tri-kāya, Ṣaḍ-pāramitās, Brahmavihāras, Pāñcaśīla, and Bodhisattva Ideal, and Upāyakauśalya.

**C4.1.3 Upaniṣads, Bhagavadgītā, and Dharmaśāstras:** Philosophy of the Upaniṣads – Pure Monism, Brahman and Ātman, Pañca-kośa, Parā-vidyā and Aparā-vidyā, Meaning of Dharma, Ṛta, Puruṣārtha, Śreyas and Preyas, Varṇāśrama-dharma, Dharma- Svadharma and Sādhāraṇa Dharma, Ṛna, Yajña, Karma-yoga, Sthitaprajña, Lokasaṃgraha, and Law of Karma.

**C4.1.4 KāṣmīraŚaivism, Śaivasiddhānta, VīraŚaivism, Śāktism and Vaiṣṇavism:** KāṣmīraŚaivism – Pratyābhijña school, Śiva and Śakti, and Conception of Kriyā, Śaivasiddhānta – God (pati) and Divine Power (śakti), Proofs for God's Existence, Bondage and Liberation, VīraŚaivism – Philosophical basis of VīraŚaivism, Śāktism - Philosophical basis of Śāktism, and Vaiṣṇavism – Philosophical basis of Vaiṣṇavism.

### C4.2 Contemporary Indian Philosophy

**C4.2.1 Vivekananda:** Notion of God, Freedom and Karma, Nature of Soul/self, Practical Vedānta, and Universal Religion. **Aurobindo:** World Process – Involution and Evolution, Four Theories of Existence, The Supermind, Integral Yoga, and Gnostic Being. **Iqbal:** Nature of Intuition, Nature of Self, and Notion of God. **Tagore:** Humanism and Nature of Man, Notion of Religion, and Nationalism. **K. C. Bhattacharyya:** Concept of Absolute and Its Alternative Forms, and Notion Subjectivity and Freedom. **Radhakrishnan:** Nature of Ultimate Reality, Religious Experience, Intellect and Intuition, Hindu View of Life. **J. Krishnamurti:** Notion of Freedom, Choiceless Awareness, Truth is a Pathless Land, and Notion of Education. **Gandhi:** Notion of Truth, Non-violence, Satyagraha, Swaraj, and Trusteeship. **Ambedkar:** Annihilation of Caste, Neo-Buddhism, Democracy, and Natural Rights and Law. **M. N. Roy:** Radical Humanism and Materialism.

### **C4.3 Classical and Modern Western Philosophy**

**C4.3.1 Metaphysics:** Pre-Socratic Philosophy of Thales, Anaxagoras, Anaximenes, Ionians, Pythagoras, Parmenides, Heraclitus and Democritus. Metaphysics of Plato and Aristotle: The question of Being (to on/ousia): Being as Idea in Plato's *Phaedo*, *Republic* and the *Sophist*, Being as synthesis of hyle [matter] and morphe [form] in Aristotle's *Metaphysics* and *Physics*. Problem of evil and existence of God in St. Augustine, St. Anselm, and St. Thomas Aquinas. Metaphysics in Modern Philosophy: Substance, Mind-Body Dualism, Attribute, Parallelism, Pre-established harmony, the existence of God, Problem of Solipsism, Self and Personal Identity, Rejection of Metaphysics, Phenomena and Noumena, Transcendental Deduction of Categories, Being and Becoming, Absolute Idealism

**C4.3.2 Epistemology:** Plato and Aristotle's Theory of Knowledge, *Doxa*, *Episteme*, and *Sophia*, Method of Dialectics, Theoretical and Practical Reason, Theory of Causation, Descartes's Method of Doubt, *cogito ergo sum*, Innate Ideas and its refutation, Principle of Non-contradiction, Sufficient Reason, and Identity of Indiscernible, Locke's Three Grades of Knowledge, Berkeley's Critique of Abstract Ideas, Hume's Impressions and Ideas, Induction and Causality, Kant's Copernican Revolution, Forms of Sensibility, Possibility of Synthetic a priori Judgments. Hegel's Dialectics, Spirit, and Absolute Idealism.

**C4.3.3 Ethics:** Concepts of Good, Right, Justice, Duty, Obligation, Cardinal Virtues, *Eudaemonism*; Intuition as explained in Teleological and Deontological Theories; Egoism, Altruism, Universalism, Subjectivism, Cultural Relativism, Super-naturalism, Ethical realism and Intuitionism, Kant's moral theory, Postulates of Morality, Good-will, Categorical Imperative, Duty, Means and ends, Maxims; Utilitarianism: Principle of Utility, Problem of Sanction and Justification of Morality, Moral theories of Bentham, J. S. Mill, Sidgwick; Theories of Punishment; Ethical Cognitivism and Non-cognitivism, Emotivism, Prescriptivism, Descriptivism.

**C4.3.4 Social and Political Philosophy:** Plato's theory of Justice and State, Aristotle's definition of State and Political Naturalism; Classical Liberalism and Social Contract Theory (Hobbes, Rousseau, Locke); Marx's Dialectical Materialism, Alienation, and critique of Capitalism.

**C4.3.5 Logic:** Truth and Validity, Nature of Propositions, Categorical Syllogism, Laws of Thought Classification of Propositions Square of Opposition, Truth-Functions and Propositional Logic, Quantification and Rules of Quantification; Symbolic Logic: Use of symbols; Truth Table for testing the validity of arguments; Differences between Deductive and Inductive Logic, Causality and Mill's Method.

### **C4.4 Contemporary Western Philosophy**

**C4.4.1** Frege's Sense and Reference; Logical Positivism's Verification theory of meaning, Elimination of Metaphysics; Moore's Distinction between Sense and Reference, Defense of common-sense, Proof of an External World; Russell's Logical Atomism, Definite Descriptions, Refutation of Idealism; Wittgenstein on Language and Reality, the Picture Theory, critique of private language, Meaning and Use, Forms of life; Gilbert Ryle on Systematically Misleading Expressions, critique of Cartesian dualism; W.V.O. Quine's Two Dogmas of Empiricism; P.F.

Strawson's concept of Person; Husserl's Phenomenological Method, Philosophy as a rigorous science, Intentionality, Phenomenological Reduction, Inter-subjectivity; Heidegger's concept of Being (*Dasein*), Being in the world; Sartre's Concept of Freedom, Bad-faith, Humanism; Merleau-Ponty on Perception, Embodied Consciousness; William James's Pragmatic Theories of Meaning and Truth, Varieties of Religious experience; John Dewey on Pragmatist Epistemology with focus on Inquiry, fallibilism and Experience, Education; Nietzsche on the Critique of Enlightenment, Will to Power, Genealogy of Moral; Richard Rorty's Critique of Representationalism, Against Epistemological method, Edifying Philosophy, Levinas: Ethics as a first philosophy, Philosophy of 'other'; Rawls' Veil of Ignorance, Principle of Justice; Nozick's critique of Rawls, Libertarianism; Charles Taylor's Communitarianism, critique of the Liberal Self, Politics of recognition; Martha Nussbaum's Liberal Feminism and Capability Approach; Simone de Beauvoir on Situated Freedom and Ethics of Ambiguity; Code and Harding on Situated Knowledge and Strong and Weak Objectivity; Gilligan and Noddings on Ethics of Care, Debate between Care and Justice.

## **XH – C5 Psychology**

### **C5.1 Research Methods and Statistics**

**C5.1.1 Approaches to research:** Philosophical worldviews & criteria involved in approach. Research design: quantitative & qualitative, mixed methods.

**C5.1.2 Designing research:** Research problems, purpose statement, Variables and Operational Definitions, Hypothesis, Sampling.

**C5.1.3 Nature of quantitative & qualitative research:** Structured, semi-structured interviewing, self-completion questionnaires (Survey), observation, Experimental, Quasi-experimental, Field studies, Focus groups discussions, Narratives, Case studies, Ethnography.

**C5.1.4 Ethics in conducting and reporting research**

**C5.1.5 Statistics in Psychology:** Measures of Central Tendency and Dispersion. Normal Probability Curve. Parametric and Non-parametric tests Effect size and Power analysis.

**C5.1.6 Correlational Analysis:** Correlation [Product Moment, Rank Order], Partial correlation, multiple correlation. Special Correlation Methods: Biserial, Point biserial, tetrachoric, phi coefficient. Regression: Simple linear regression, Multiple regression. Factor analysis: Assumptions, Methods, Rotation and Interpretation.

**C5.1.7 Experimental Designs:** ANOVA [One-way, Factorial], Randomized Block Designs, Repeated Measures Design, Latin Square, Cohort studies, Time series, MANOVA, ANCOVA. Single-subject designs.

**C5.2 Psychometrics:** Foundations of Psychological measurement; Basic components: scales and items' Construction and analysis of items: Intelligence test items, performance tests, Ability & Aptitude test, Personality questionnaires. Method of test construction, Standardization of measures: Reliability, Validity, Norms, Application of assessment and measurements in Tests— Applications of psychological testing in various settings—educations, counselling and guidance, clinical, organizational and developmental.

**C5.3 Biological and evolutionary basis of behaviour:** Heredity and behaviour Evolution and natural selection, Nervous system, structures of the brain and their functions, Neurons: Structure, functions, types, neural impulse, synaptic transmission. Neurotransmitters. Hemispheric lateralization, The endocrine system types and functions, Biological basis of Motivation: Hunger, Thirst, Sleep and Sex. Biological basis of emotion: The Limbic system, Hormonal regulation of behaviour. Methods of Physiological Psychology: Invasive methods – Anatomical methods, degeneration techniques, lesion techniques, chemical methods, microelectrode studies, Non-invasive methods – EEG, Scanning methods, Muscular and Glandular system: Genetics and behaviour: Chromosomal anomalies; Nature-Nurture controversy [Twin studies and adoption studies]

**C5.4 Perception, Learning, Memory and Forgetting:** What is sensation, sensory thresholds and sensory adaptations, Vision, hearing, touch and pain, smell and taste, kinesthesia and



vestibular sense, Perception: role of attention; organizing principles of perception, gestalt perception, depth perception and illusions, Theories of learning: classical conditioning, operant conditioning, social learning theory, cognitive learning, Memory: encoding, storage, retrieval, Information processing theories of memory, Retrieval in Long term memory, reconstructive nature of long-term memory, Forgetting: encoding failure, interference theory, memory trace decay theory, the physical aspects of memory.

**C5.5 Cognition: Thinking, Intelligence and Language:** Basic elements of thought: Concepts, Propositions, Imagery. Current paradigms of cognitive psychology – Information processing approach, ecological approach, Problem solving: Methods of problem solving, Strategies and obstacles, Role of Metacognitive processing, decision-making: choosing among alternatives, Intelligence: Theories of intelligence (Spearman; Thurstone; Jensen; Cattell; Gardner; Stenberg) and Emotional Intelligence; Measuring intelligence, Individual differences in Intelligence; Role of heredity and environment, Difference between Intelligence, Aptitude and Creativity.

**C5.6 Personality: Theories of personality:** Psychoanalytic, behaviourist, social cognitive view, humanism and trait and type theories, Biology of personality and Assessment of personality.

**C5.7 Motivation, Emotion and Stress and Coping:** Approaches to understanding motivation: instinct, drive-reduction, arousal, incentive, humanistic, Achievement motivation, Intrinsic motivation, aggression, curiosity and exploration, Emotions: nature of emotions; biological basis of emotions, Theories of emotions: James-Lange, Canon-Bard, Schachter and Singer, Lazarus, Definition of stress; what are stressors; cognitive factors in stress, Factors in stress reaction: General adaptation syndrome; effect of stress, Coping with stress: problem-focused coping; emotion-focused coping, REBT and meditation

**C5.8 Social psychology:** Social perception: Attribution; impression formation; social categorization, implicit personality theory, Social influence: conformity, compliance and obedience, Attitudes, beliefs and values: Evaluating the social world, attitude formation, attitude change and persuasion, cognitive dissonance, Prejudice, discrimination, Aggression, power and prosocial behaviour, Belief systems and value patterns. Group dynamics, leadership style and effectiveness, Theories of intergroup relations and conflicts.

**C5.9 Development across the life span:** Nature versus nurture in human development, Prenatal development: Chromosomes, Genes and DNA. Physical, cognitive and psychosocial development in infancy, childhood, adolescence and adulthood, Theories of aging, Moral development.

**C5.10 Applications of Psychology:** Psychological disorders: Conceptions of mental disorders; Assessment and diagnosis, DSM and Other tools, PTSD and Trauma; Psychotherapies: Psychodynamic, Phenomenological/Experiential therapy; Behaviour therapy; cognitive therapy; biological therapy, Applications of theories of motivation and learning in School: Factors in educational achievement; counselling & guidance in schools, Application of theories of motivation, learning, emotions, perceptions, group dynamics & leadership to organizational set up, Issues of Personal space, crowding, and territoriality.

## **XH – C6 Sociology**

### **C6.1 Sociological Theory**

**C6.1.1** Classical Sociological Traditions: Emile Durkheim (Social Solidarity, Social Facts, Religion, Functionalism, Suicide, Anomie, Division of Labour, Law; Max Weber (Types of authority, Social action, Protestant ethic and the spirit of capitalism, Bureaucracy, Ideal type, Methodology); Karl Marx: Class and class conflict, dialectical and historical materialism, capitalism, surplus value, alienation)

**C6.1.2** Structural-Functionalism and Structuralism: Bronislaw Malinowski; A.R. Radcliffe-Brown, Talcott Parsons (AGIL, Systems approach), Robert K. Merton (Middle range theory, reference groups, latent and manifest function), Claude Levi Strauss (Myths, Structuralism)

**C6.1.3** Hermeneutic and Interpretative Traditions: G.H. Mead, Alfred Schutz (Phenomenology); Harold Garfinkel (Ethnomethodology); Erving Goffman (Symbolic interaction, dramaturgy); Clifford Geertz (Culture, thick description)

**C6.1.4** Post-Modernism, Post-Structuralism and Post-Colonialism: Pierre Bourdieu, Michel Foucault, Jurgen Habermas, Anthony Giddens, Frankfurt School

**C6.1.5** Conflict theory: Ralf Dahrendorf; C Wright Mills

**C6.1.6** Indian Thinkers, M.K. Gandhi, B.R. Ambedkar, Radha Kamal Mukherjee, G. S. Ghurye, M.N. Srinivas, Irawati Karve,

### **C6.2 Research Methodology and Methods**

**C6.2.1** Conceptualizing Social Reality: Philosophy of Science; Scientific Method and Epistemology in Social Science; Hermeneutic Traditions; Objectivity and Reflexivity in Social Science; Ethics and Politics of research

**C6.2.2** Research Design: Reading Social Science Research, Data and Documents; Induction and Deduction; Fact, Concept and Theory; Hypotheses, Research Questions, Objectives

**C6.2.3** Quantitative and Qualitative Methods: Ethnography; Survey Method; Historical Method; Comparative Method

**C6.2.4** Research Techniques; Sampling; Questionnaire and Schedule; Statistical Analysis; Observation, Interview and Case study; Interpretation, Data Analysis and Report Writing

### **C6.3 Sociological Concepts**

**C6.3.1 Sociological Concepts:** Social Structure; Culture; Network; Status and Role; Identity; Community; Socialization; Diaspora; Values, Norms and Rules; Personhood, Habitus and Agency; Bureaucracy, Power and Authority; Self and society

**C6.3.2 Social Institutions:** Marriage, Family and Kinship; Economy; Polity; Religion; Education; Law and Customs

**C6.3.3 Social Stratification:** Social Difference, Hierarchy, Inequality and Marginalization: Caste and Class; Status and Power; Gender, Sexuality and Disability; Race, Tribe and Ethnicity

**C6.3.4 Social Change:** Evolution and Diffusion; Modernization and Development; Social Transformations and Globalization; Social Mobility –Sanskritization, Educational and Occupational change

**C6.4 Agrarian Sociology and Rural Transformation:** Rural and Peasant Society; Caste-Tribe Distinction and Continuum; Agrarian Social Structure and Emergent Class Relations; Land Ownership and Agrarian Relations; Decline of Agrarian Economy, De-Peasantization and Agrarian Change; Agrarian Unrest and Peasant Movements; Feudalism, Mode of production debate; Land reforms; Panchayati Raj; Rural development programmes and community development; Green revolution and agricultural change; Peasants and farmers movements

**C6.5 Family, Marriage and Kinship; Theoretical Approaches:** Structural-Functionalist, Alliance and Cultural; Gender Relations and Power Dynamics; Inheritance, Succession and Authority; Gender, Sexuality and Reproduction; Children, Youth and Elderly; Emotions and Family; Emergent Forms of Family; Changing Marriage Practices; Changing Care and Support Systems; Family Laws; Domestic Violence and Crime against Women; Honour Killing

**C6.6 Indian Society / Sociology of India:** Colonial, Nationalist, Indological perspectives (G.S.Ghurye); Structural-Functional approach (M. N. Srinivas); Dialectical approach (A. R. Desai); Subaltern studies (R. Guha); Non Brahmin perspectives (Phule, Dr. Babasaheb Ambedkar); Feminist perspectives (LeelaDube, SharmilaRege); Social Institutions – Family, Kinship, Household, Village and Urban Settings; Social Stratification – Caste, Class, Tribe and Gender; Tradition and Modernity (M.N.Srinivas, Yogendra Singh, Dipankar Gupta); Peasants and agrarian sociology (Andre Beteille, AR Desai, D.N.Dhanagare); Village studies; Communalism and Secularism

## **C6.7 Social Movements**

**C6.7.1 Introduction to social movements:** Nature, Definitions, Characteristics; Social Movement and Social Change; Types of social movements (Reform, Rebellion, Revival, Revolution, Insurrection, Counter Movement)

**C6.7.2 Theories of Social Movements:** Structural –functional; Marxist; Resource Mobilization Theory; New Social Movements

**C6.7.3 Social Movement in India with specific reference to social basis, leadership, ideology and actions:** Peasant movement; Labour movement; Dalit movement; Women's movement, Environmental movement

**C6.7.4 Social Movements, civil society and globalization:** Social movement and its relationship with state and civil society; Social movements and impact of globalization: Debates; Issues of citizenship

## **C6.8 Sociology of Development**

**C6.8.1 Perspectives on the Study of Development:** Definitions and Indices; Liberal, Marxist, and Neo-Marxist Perspectives (Dependency theory, World Systems); Epistemological Critiques of Development

**C6.8.2 State and Market:** Institutions and ideologies: Planned Development and Society; Globalisation and Liberalization

**C6.8.3 The Micro-Politics of Development: Transforming Communities:** Maps and Models; Knowledge and Power in Development; Re-inventing Development: Subaltern Movements; Post-colonial development; Decentralization and devolution; Participatory approaches

**C6.8.4 Sustainable development:** Post-sustainable development; Development, violence and inequality; Post-structural perspectives (Escobar); Alternative development paradigms; Feminist critique; Human development.