excel beyond expectancy

CARE Academy

(An ISO 9001: 2015 Certified Institution)
No.5B, North Andal Street, Trichy – 2.
Cell: 98424 23229, 97501 23229
www.carechemistry.com

CARE Competitive Exams Academy

PG TRB - Maths Syllabus

Unit I ALGEBRA

Groups – Examples – Cyclic Groups – Permutation Groups – Lagrange's theorem – Normal subgroups – Homomorphism – Cayley's theorem – Cauchy's theorem – Sylow's theorems – Finite Abelian Groups.
Rings – Integral Domain – Field – Ring Homomorphism – Ideals and Quotient Rings – Field of Quotients of Integral domains – Euclidean Rings – Polynomial Rings – Unique factorization domain.
Fields – Extension fields – Elements of Galois theory – Finite fields.
Vector Spaces – Linear independence of Bases – Dual spaces – Inner product spaces – Linear transformations – Rank – Characteristic roots – Matrices – Canonical forms – Diagonal forms – Triangular forms – Nilpotent transformations – Jordan form – Quadratic forms and Classification – Hermitian, Unitary and Normal transformations.

Unit II REAL ANALYSIS

Elementary set theory – Finite, countable and uncountable sets – Real number system as a complete ordered field – Archimedean Property – Supremum, infimum, Sequences and Series – Convergence – limit supremum – limit infimum – The Bolzano – Weierstrass theorem – The Heine – Borel Covering theorem – Continuity, Uniform Continuity, Differentiability – The Mean Value theorem for derivatives – Sequences and Series of functions – Uniform convergence.
Riemann – Stieltjes integral: Definition and existence of the integral – properties of the integral – Integral and Differentaition – Integration of vector valued functions – Sequences and Series of functions: Uniform convergence – Continuity, Integration and Differentiation.
Power series – Fourier series.
Functions of several variables – Directional derivative – Partial derivative – derivative as a linear transformation – The Inverse function theorem and The Implicit function theorem.

Unit III TOPOLOGY

Topological spaces – Basis – The order Topology – The product Topology – The subspace Topology – Closed sets and limit points.
Continuous functions – The box and product Topologies – The matrix Topology.
Connected spaces – Connected subspaces of the real line – Components and local connectedness – compact spaces – Compact subspaces of the real line – Limit point compactness – Local compactness.
Countability and separation Axioms – Normal spaces – The Urysohn Lemma – The Urysohn metrization theorem – The Tietze extension theorem.

Unit IV COMPLEX ANALYSIS

Introduction to the concept of analytic function: Limits and continuity – Analytic functions – Polynomials and rational functions – Elementary theory of power series – Maclaurin's series – Uniform convergence – Power series and Abel's limit theorem – Analytic functions as mapping – Conformality arcs and Closed curves – Analytical functions in regions – Conformal mapping – Linear transformations – the linear group, the cross ratio and symmetry.
Complex integration – Fundamental theorems – line integrals – rectifiable arcs – line integrals as functions of arcs – Cauchy's theorem for a rectangle – Cauchy's theorem in a Circular disc – Cauchy's integral formula: The index of a point with respect to a closed curve – The integral formula – Higher derivatives – Local properties of Analytic functions and removable singularities – Taylor's theorem – Zeros and Poles – The local mapping – The maximum modulus Principle.

Unit V FUNCTIONAL ANALYSIS

Banach Spaces – Definition and examples – Holder's inequality and Minkowski's inequality – Continuous linear transformations – The Hahn-Banach theorem – Natural imbedding of X in X** – The Open mapping and The Closed graph theorem – Properties of conjugate of an operator.

Hilbert spaces – Orthonormal bases – Conjugate space H* – Adjoint of an operator – Projections – Matrices – Basic operations of matrices – Determinant of a matrix – Determinant and Spectrum of an operator – Spectral theorem for operators on a finite dimensional Hilbert space – Regular and Singular elements in a Banach Algebra – Topological divisor of zero – Spectrum of an element in a Banach algebra – The formula for the spectral radius – Radical and semi-simplicity.

Unit VI DIFFERENTIAL GEOMETRY

Curves in spaces – Serret – Frenet formulae – Locus of centers of curvature – Spherical curvature – Intrinsic equations – Helices – Spherical Indicatrix Surfaces – Curves on a surface – Surface of revolution – Helicoids – Gaussian curvature – First and Second fundamental forms – Isometry – Meusnier's theorem – Euler's theorem- lines of curvature – Dupin's Indicatrix – Asymptotic lines – Edge of regression – Developable surfaces associated to a curve – Geodesics – Conjugate points on Geodesics.

Unit VII DIFFERENTIAL EQUATIONS

Ordinary Differential Equations Linear differential equation with constant and variable co-efficients – Linear dependence and independence – Wronskian – Non homogeneous equations of order two and n – Initial value problems for nth order equations – Second order equations with ordinary point and regular singular points – Legendre Equations – Bessel's equation – Hermite's equation and their properties – Existence and Uniqueness of solutions to first order equations – Exact equation – Lipschitz condition – Non local existence of Solution – Approximation to Uniqueness of solutions.

Partial Differential Equations Lagrange and Charpit methods for solving first order Partial Differential equations – Classification of Second order partial differential equations – General solution of higher order partial differential equation with constant co-efficients – Method of separation of variables for Laplace, Heat and Wave equations (upto two dimensions only).

Unit VIII CLASSICAL MECHANICS AND NUMERICAL ANALYSIS

Classical Mechanics Generalised Co-ordinates – Lagrange's equations – Hamilton's Canonical equations – Hamilton's principle – Principle of least action – Canonical transformations – Differential forms and Generating functions – Lagrange and Poisson brackets.

Numerical Analysis Numerical solutions of algebraic and transcendental equations – Method of iteration – Newton Raphson method – Rate of convergence – Solution of Linear algebraic equations using Gauss elimination and Gauss – Seidel methods. Finite differences – Lagrange, Hermite and Spline Interpolation, Numerical differentiation and integration – Numerical solutions of Ordinary differential equations using Picard, Euler, Modified Euler and Runge- Kutta methods.

Unit IX OPERATIONS RESEARCH

Linear programming problem – Simplex Methods – Duality – Dual Simplex Method – Revised Simplex Method – Integer Programming Problem – Dynamic Programming – Non linear programming – Network Analysis – Directed Network – Max Flow Min Cut theorem – Queuing theory – Steady State solutions of M/M/1, M/M/1 with limited waiting space, M/M/C, M/M/C with limited waiting space, M/G/1 models – Inventory models – Deterministic models with and without shortages – Single Price break models.

Unit X PROBABILITY THEORY

Sample space – Discrete Probability – Independent events – Baye's theorem – Random variables and Distribution functions (Univariate and Multivariate) – Expectation and Moments – Moment Generating function – Characteristic functions and Cumulants – Independent Random variables – Marginal and conditional distributions – Probability inequalities (Tchebyshev, Markov, Jensen) – Modes of convergence, Weak and Strong laws of large numbers – Central limit theorem (i.i.d case).

Probability distributions – Binomial, Poisson, Uniform, Normal, Exponential, Gamma, Beta, Cauchy distributions – Standard Errors – Sampling distributions of t, F and Chi square and their uses in tests of significance – ANOVA – Large sample tests for mean and proportions.

Unit I Perspectives of Education

Pre-primary Education – Universalisation of Elementary Education (UEE) – Primary Education – Equalization of Education opportunities – Secondary and Higher Education – SSA, RMSA, Samagra Shiksha, RUSA – Uniform Pattern of Education – RTE Act, 2009 – Formal, Non-formal and In-formal – Enrolement, Stagnation, Dropouts - Functional Literacy Programme – Open Schooling – Delinking degrees from employment — Brain drain Vocationalisation of Education – Skill Development.

Education of the Socially Disadvantaged Groups: Tribal, Scheduled and Marginalized groups – Special and Diverse needs of learners – Inclusive education – Universal Design of Learning - Barriers in Education – Challenges in affordability and accessibility of Education – Commissions and Committees in Education (Pre-Independence, Post-Independence) - Constitutional Provisions - Socialism, Secularism, Democracy, Sovereign and Egalitarian State - Central and State Government Policies related to Education.

Unit II Philosophical and Sociological Foundations of Education

Philosophical bases of Education – Metaphysics, Ontology, Epistemology, Axiology – Schools of thought: Idealism, Naturalism, Realism, Pragmatism – Propounding Indian Philosophers (Gandhiji, Tagore, Vivekananda, J.Krishnamurti, Aurobindo) and Western Philosophers (Plato, Russell, Pestalozzi, Rousseau, Froebel, Montessori, Dewey) in Education – Innovations emerged from experiments in education.

Sociological bases of Education – Socialization, Social Stratification, Mobility, Social Justice & Social Change – Sociologists (Auguste Comte, Max Weber, Marx, Durkheim, Spencer, Paulo Freire) – Education for International and National understanding – Peace, Value and Environmental Education – Liberalization, Privatization and Globalization in Education - UN-Sustainable Development Goals (SDGs) – Physical and Health Education – Gender perspectives in Education.

Unit III History and Culture of Tamil Nadu

Historical development, Role of Social and Political movements in Education – Initiatives for development: Establishment of State Universities and Educational Infrastructure – Developmental aspects: Professional Education (Medical, Engineering, Law, Teaching, Physical and Sports), Liberal Arts, Social Sciences and Humanities — Tamil Literature, Tradition & Culture: Art & Architecture – Historical sites – Ethnic groups of Tamil Nadu – Freedom fighters & Women leaders of social transformation of Tamil Nadu.

Unit IV Childhood & Adolescence

Psychology of Childhood & Adolescence – Stages of development (Early & Later childhood & Adolescence) – Adolescent characteristics - Dimensions of development (Cognitive, Physical, Psycho-Social, Emotional, Language, Moral) – Theories: Piaget, Bruner, Erik Erickson, Daniel Goleman, Kohlberg) – Developmental tasks and mental abilities – Individual differences – Understanding Learners (Slow and Late-bloomers, Children with Special Needs (CWSN) – Programmes for Diverse learners (Differentiated, Mediated, Remedial & Enrichment)

Unit V Learning and Teaching

Learner, Learning Process and Learning characteristics – Factors contributing to learning: Biological, Psychological, Socio-economic & Cultural - Memory, Remembering and Forgetting – Learning Curve – Paradigms: Behaviourism, Cognitivism, Constructivism, Humanism, Connectivism - Theories of Learning: Trial & Error (Thorndike), Classical Conditioning (Pavlov), Operant Conditioning (Skinner), Insight (Wolfgang Kohler), Gestalt theory – Transfer of learning.

Significance of Language in understanding curriculum and subjects – Psycholinguistic - Types of Learning – Micro-Teaching: Skills & Components – Lesson Planning – Learning Styles: Visual, Auditory, Kinesthetic and Reading - Teaching styles: Autocratic and Permissive – Teaching approaches: Teacher and Student centered, Hybrid approaches – Outcome Based Education – Methods of Teaching (Inductive, Deductive, Analytic, Heuristic, Project) – Models of Teaching: Concept Attainment, Advanced-Organizers, Inquiry-Training) – Teacher Attributes – Teacher autonomy and accountability.

Unit VI Intelligence & Personality

Psychological attributes: Cognitive abilities, Attention, Interest, Motivation, Aptitude & Attitude, Value systems, Maslow's hierarchical theory of Human Needs – Achievement Motivation - Intelligence Basics & Theories (Single, Two-factor, Triarchic, Group-Factor, Multi-Factor, Guilford's Structure of Intellect, Gardner's Multiple Intelligence and Emotional Intelligence) – Creativity and Intelligence – IQ & EQ – Assessment of Intelligence – Understanding Learning difficulties and Learning disabilities (Dyslexia, Dyscalculia, Dysgraphia, Dyspraxia)

Personality – Trait theories: Allport , R.B.Cattell, Eysenck, Type: Hippocrates, Krestchmer, Sheldon, Carl Jung, Spranger – Assessment of Personality – Mental Health & Mental Hygiene : Conflict & Frustration, Unrest – Adjustment: Defense mechanisms – Guidance and Counselling .

Unit VII Educational Evaluation

Test, Measurement, Assessment & Evaluation – Principles of Evaluation - Characteristics of Test: Objectivity, Reliability, and Validity – Types: Formative, Summative, Norm and Criterion Referenced Test —

Scholastic & Non- Scholastic - Achievement Test – Diagnostic and Prognostic Tests – Continuous and Comprehensive Evaluation - Standardization of an achievement test - Table of weightages, Blue Print, Preparation of Question Paper, Scoring key, Item analysis (Index of Difficulty & Discrimination), Reliability – Tools for assessment: Observation, Interview, Portfolio, Rubrics, Peer-Reviews, Check-lists, Rating Scales.

Unit VIII Management & Administration

Principles of Management – Structure of Educational management (Central, State & Local levels) – Personnel, Material and Financial management: Functions (POSDCORB) - SWOC Analyses in Educational Administration – Total Quality Management (TQM) – Assessment and Accreditation of Educational Institutions – Leadership theories and styles – Role of Administrators, School Heads, Teachers and Stakeholders in Planning and Administration.

Unit IX Curriculum Design and Development

Principles of Curriculum, Curriculum patterns (Teacher, Learner, Problem, Subject, Activity/ Experience, Broad-field) – Types (Core, Competency-Based, Null, Hidden, Rhetoric) – Approaches to Curriculum Organisation (Topical, Spiral, Logical, Psychological, Unitary & Integrated) – Curriculum Development process - Models of Curriculum (Ralph Tyler, Wheeler, Hilda Taba, Stufflebeam) – Curriculum Evaluation.

Unit X Instructional and Educational Technology

Bloom's and Revised Taxonomy of Educational Objectives - Levels of Teaching (Memory, Understanding & Reflective) – Instructional designing – Programmed learning (Principles, Types: Linear, Branched) – Systems approach – ADDIE Model - Cybernetics – TPACK - FOSS- OER – MOOCs - Learning Management Systems (LMS) - Smart Classroom, Blended Learning, Flipped Learning – Augmented Reality - Virtual Modes (O-labs, Classrooms, Library) – Virtual Reality – AI in Education.

PG TRB General Knowledge Syllabus

Unit I History of India

Indus Valley Civilisation – Vedic Period- Buddhism and Jainism- Mauryan Empire-Guptas; Delhi Sultanate-Age of Vijayanagaram-Mughals and Marathas; Arrival of Europeans- Early uprising against British rule-English Education and Its impact- Westernisation and Modernisation-Birth of Indian National Congress– Freedom Struggle.

Unit II History of Tamil Nadu

Archaeological discoveries - Sangam literature; Pallavas – Imperial Cholas and Later Pandyas- Nayaks-their contribution to art and Architecture; Palayakar revolt against British Rule-Role of Tamil Nadu in freedom struggle-Justice Party-Self-Respect Movement- Dravidian Movement.

Unit III Indian Polity

Preamble to the Constitution - Fundamental Rights, Directive Principles of State Policy-Centre-State Relations-Judiciary in India-Empowerment of Women– Rights of Transgender.

Unit IV Geography

Salient features of Physical geography of India; Distribution of key natural resources; Geographical phenomena such as earthquakes, tsunami, cyclones.

Unit V General Science

Scientific knowledge and scientific temper-Main concepts of life science; evolution, nutrition, health and hygiene, human diseases; Environment and Ecology.

Unit VI Current Affairs and Sports

Recent achievements in national and international sports-contributions of eminent authors.

Unit VII Indian Economy

Planning, Mobilisation of resources, growth, development and employment; Major crops-cropping patterns in various parts of the country; e-technology in the aid of farmers.

Unit VIII Science and Technology Unit VIII Science and Technology

Latest inventions in science and technology. Indigenisation of technology and developing new technology; achievements of Indians in science and technology; application of Science and Technology in the area of IT, Space, Computers and Robotics..

Unit IX Aptitude and Mental Ability

Simplification- Percentage – Highest Common Factor (HCF)- Lowest Common Multiple (LCM)- Ratio and Proportion- Simple Interest- Compound Interest—Area-Volume- Time and Work.

Unit X Abbreviations

Commonly used acronyms and abbreviations of national and international organisations and institutes, as well as major government schemes.