DUAT-2025 Syllabus

Test Code: DUAT01

Programme: Master of Business Administration

General Aptitude (20 Marks)

Verbal Aptitude-Basic English grammar: Tenses, articles, adjectives, prepositions, conjunctions, verb-noun agreement, and other parts of speech.

Basic vocabulary: Words, idioms and phrases in context. Narrative sequencing.

Quantitative Aptitude-Data interpretation: Data graphs (bar graphs, pie charts, and other graphs representing data), 2- and 3-dimensional plots, maps, and tables. Numerical computation and estimation: Ratios, percentages, powers, exponents and logarithms, permutations and combinations, summations and series, Mensuration and Geometry

Analytical Aptitude-Logic: Deduction and induction, analogy, numerical relations, and reasoning

Spatial Aptitude-Transformation of shapes: Translation, rotation, scaling, mirroring, assembling, grouping, paper folding, cutting, and patterns in 2 and 3 dimensions.

Mathematics (20 Marks)

Probability, Statistics, Calculus, Discrete Mathematics, basic number theory, algebra

English Reading Comprehension (20 Marks)

Two paragraphs, each having 5-10 questions.

Test Code: DUAT02

Programme: MSc Computer Science with specialisation in Data Analytics/Cybersecurity/Artificial Intelligence; MSc Data Analytics and Computational Science

General Aptitude (20 Marks)

Verbal Aptitude-Basic English grammar: Tenses, articles, adjectives, prepositions, conjunctions, verb-noun agreement, and other parts of speech.

Basic vocabulary: Words, idioms and phrases in context. Narrative sequencing.

Quantitative Aptitude-Data interpretation: Data graphs (bar graphs, pie charts, and other graphs representing data), 2- and 3-dimensional plots, maps, and tables. Numerical computation and estimation: Ratios, percentages, powers, exponents and logarithms, permutations and combinations, summations and series, Mensuration and Geometry

Analytical Aptitude-Logic: Deduction and induction, analogy, numerical relations, and reasoning

Spatial Aptitude-Transformation of shapes: Translation, rotation, scaling, mirroring, assembling, grouping, paper folding, cutting, and patterns in 2 and 3 dimensions.

Mathematics (20 Marks)

Set Theory- Concept of sets–Union, Intersection, Cardinality, Elementary counting; permutations and combinations.

Probability and Statistics- Basic concepts of probability theory, Averages, Dependent and independent events, frequency distributions, measures of central tendencies and dispersions.

Algebra-Fundamental operations in algebra, expansions, factorization, simultaneous linear/quadratic equations, indices, logarithms, arithmetic, geometric and harmonic progressions, determinants and matrices.

Coordinate Geometry- Rectangular Cartesian coordinates, distance formulae, equation of a line, and intersection of lines, pair of straight lines, equations of a circle, parabola, ellipse and hyperbola.

Calculus-Limit of functions, continuous function, differentiation of function, tangents and normal, simple examples of maxima and minima. Integration of functions by parts, by substitution and by partial fraction, definite integrals, and applications of definite integrals to areas.

Vectors-Position vector, addition and subtraction of vectors, scalar and vector products and their applications to simple geometrical problems and mechanics.

Trigonometry-Simple identities, trigonometric equations, properties of triangles, solution of triangles, heights and distances, general solutions of trigonometric equations.

Computer Basics (20 Marks)

Organization of a computer, Central Processing Unit (CPU), structure of instructions in CPU, input/output devices, computer memory, and backup devices.

Data Representation: Representation of characters, integers and fractions, binary and hexadecimal representations, binary arithmetic: addition, subtraction, multiplication, division, simple arithmetic and two’s complement arithmetic, floating-point representation of numbers, Boolean algebra, truth tables, Venn diagrams.

Test Code: DUAT03

Programme: MSc Electronics, MSc Applied Physics

General Aptitude (20 Marks)

Verbal Aptitude-Basic English grammar: Tenses, articles, adjectives, prepositions, conjunctions, verb-noun agreement, and other parts of speech.

Basic vocabulary: Words, idioms and phrases in context. Narrative sequencing.

Quantitative Aptitude-Data interpretation: Data graphs (bar graphs, pie charts, and other graphs representing data), 2- and 3-dimensional plots, maps, and tables. Numerical computation and estimation: Ratios, percentages, powers, exponents and logarithms, permutations and combinations, summations and series, Mensuration and Geometry

Analytical Aptitude-Logic: Deduction and induction, analogy, numerical relations, and reasoning

Spatial Aptitude-Transformation of shapes: Translation, rotation, scaling, mirroring, assembling, grouping, paper folding, cutting, and patterns in 2 and 3 dimensions.

Mathematics (10 Marks)

Linear Algebra: Matrix Algebra, Systems of linear equations, Eigen values, Eigenvectors.

Calculus: Mean value theorems, Theorems of integral calculus, Evaluation of definite and improper integrals, Partial Derivatives, Maxima and minima, Fourier series

Differential equations: First-order equations (linear and nonlinear), Higher-order linear differential equations with constant coefficients, method of variation of parameters, and partial differential equations.

Probability and Statistics: Sampling theorems, Conditional probability, Mean, Median, Mode, Standard Deviation, Random variables, Discrete and Continuous distributions, Poisson distribution, Normal distribution, Binomial distribution, Correlation analysis, Regression analysis

Solid State Physics, Devices, Electronics Circuits (30 Marks)

Crystal structure, Bravais lattices and basis. Miller indices. X-ray diffraction, Bragg's law, Intrinsic and extrinsic semiconductors, and variation of resistivity with temperature. Failure of classical mechanics, origin of quantum theory, particle nature of waves, De Broglie Wave and Uncertainty Principle, Bohr’s Atom model

p-n junction diode, I-V characteristics, diffusion current, drift current, mobility and resistivity, Zener diode and its applications. BJT: characteristics in CB, CE, CC modes. Single stage amplifier, two stages R-C coupled amplifiers. MOS capacitor, MOSFET, LED, photodiode and solar cell

Boolean algebra: Binary number systems; conversion from one system to another system; binary addition and subtraction. Logic Gates: AND, OR, NOT, NAND, NOR exclusive OR; Truth tables; Combination of gates; deMorgan’s theorem

Simple DC and AC circuits with R, L and C components. Kirchhoff's Voltage/current Law, superposition, Thevenin’s theorem, Norton’s theorem, reciprocity, and maximum power transfer. Oscillators: Barkhausen condition, sinusoidal oscillators. OP-AMP Inverting and no inverting amplifier.

Test Code: DUAT04

Programme: MSc Environmental Science

General Aptitude (20 Marks)

Verbal Aptitude-Basic English grammar: Tenses, articles, adjectives, prepositions, conjunctions, verb-noun agreement, and other parts of speech.

Basic vocabulary: Words, idioms and phrases in context. Narrative sequencing.

Quantitative Aptitude-Data interpretation: Data graphs (bar graphs, pie charts, and other graphs representing data), 2- and 3-dimensional plots, maps, and tables. Numerical computation and estimation: Ratios, percentages, powers, exponents and logarithms, permutations and combinations, summations and series, Mensuration and Geometry

Analytical Aptitude-Logic: Deduction and induction, analogy, numerical relations, and reasoning

Spatial Aptitude-Transformation of shapes: Translation, rotation, scaling, mirroring, assembling, grouping, paper folding, cutting, and patterns in 2 and 3 dimensions.

Elementary mathematics and computer basics (10 Marks)

Number System, Sets, Functions, Algebra, Geometry, Trigonometry, Matrices and Determinants, Differentiation and Integration, Basic Statistics and Probability.

Fundamentals of computers, operating systems, algorithm, data types, operators, basics of internet, programming languages, software applications

Subject Questions (Undergraduate Level, 30 Marks)

Properties of matter, fundamentals of thermodynamics, equilibrium in physical and chemical processes, law of mass action, fundamentals of environmental physics, Earth's energy budget, atmospheric and terrestrial interaction of electromagnetic radiation, radiation laws, fundamentals of surface chemistry, atmospheric chemistry, water chemistry, geochemistry, and green chemistry; water - physical characteristics, buffering capacity, Essential and trace elements in living systems, Bio-molecules - chemical components of cells, toxicity of heavy metals.

Origin of life, Eukaryotic and prokaryotic cells- structure and function, taxonomy and systematic, anatomy and physiology of plants and animals, reproduction, developmental biology, molecular biology, microbes and their environmental significance, ethology, geological time scale, theories of evolution, speciation, inheritance of variation, mutation, natural selection, and adaptation, biogeography-global pattern of biodiversity, biodiversity of Indian sub-continent, major biomes of the world.

Components of the atmosphere, lithosphere, hydrosphere, and biosphere; organizational levels of the biosphere, Ecosystem: structure and types, population and community, interactions, food chain and energy flow, terrestrial and aquatics ecosystems; Earth processes; climate and weather systems, environmental geology:

Types of rocks, minerals, hydrological and biogeochemical cycles, natural resources - forest, water, minerals, marine; Energy resources-renewable and non-renewable.

Planetary crisis: climate change and global warming; ozone depletion; acid rain; habitat fragmentation; biodiversity loss; extinction; land and aquatic system degradation; urbanization; environmental pollution and control; air, water, soil, noise, and radioactive pollution; solid waste - disposal, management. Disaster and mitigation: Earthquakes, floods, landslides, and cyclones; Environmental sustainability; sustainable development goals; biodiversity conservation; natural resource management; national and international initiatives; environmental legislations and policies; international relations and current affairs.

Test Code: DUAT05

Programme: MSc Data Science and Bio-AI

General Aptitude (20 Marks)

Verbal Aptitude-Basic English grammar: Tenses, articles, adjectives, prepositions, conjunctions, verb-noun agreement, and other parts of speech.

Basic vocabulary: Words, idioms and phrases in context. Narrative sequencing.

Quantitative Aptitude-Data interpretation: Data graphs (bar graphs, pie charts, and other graphs representing data), 2- and 3-dimensional plots, maps, and tables. Numerical computation and estimation: Ratios, percentages, powers, exponents and logarithms, permutations and combinations, summations and series, Mensuration and Geometry

Analytical Aptitude-Logic: Deduction and induction, analogy, numerical relations, and reasoning

Spatial Aptitude-Transformation of shapes: Translation, rotation, scaling, mirroring, assembling, grouping, paper folding, cutting, and patterns in 2 and 3 dimensions.

Mathematics (10 Marks)

Set Theory: Concept offsets–Union, Intersection, Cardinality, Elementary counting, permutations and combinations.

Probability and Statistics: Basic concepts of probability theory, Averages, Dependent and independent events, frequency distributions, measures of central tendencies and dispersions.

Biochemistry/Biotechnology (Undergraduate level questions, 20 Marks)

Nucleic Acids: Structure and functions of DNA and RNA; DNA replication, transcription, and translation. Proteins: Structure, folding, stability, and interactions. Enzymes: Mechanisms of enzyme action, enzyme kinetics (Michaelis-Menten equation), enzyme inhibition, and regulation. Human Genome Project: Key achievements and significance. Genome Sequencing: Fundamentals and applications

of sequencing technologies. Genomic Integrity: Mutations and DNA repair mechanisms. Production of therapeutic proteins and vaccines. CRISPR Technology: Principles and Applications

Atomic Structure: Overview of atomic models, concepts of atom, orbit, orbital, and electronic configuration. Periodic Properties: Trends in atomic size, electronegativity, and electron affinity. Chemical Bonding and Molecular Structure: Hybridization, VSEPR theory, valence bond theory, molecular orbital theory, and intermolecular forces. Chemical Kinetics: Basics of reaction rates, mechanisms, and activation energy. Stereochemistry: Configuration and conformational isomerism, with emphasis on chirality. Organic Chemistry: Fundamentals, including reaction mechanisms. Medicinal Chemistry: Drug classification, properties, an overview of drug-receptor interactions, ADMET properties, and pharmacokinetics. Computational Chemistry: Basics of molecular mechanics and quantum mechanics.

Computer Basics (10 Marks)

Organization of a computer, Central Processing Unit (CPU), structure of instructions in CPU, input/output devices, computer memory, and backup devices.

Data Representation: Representation of characters, integers and fractions, binary and hexadecimal representations, binary arithmetic: addition, subtraction, multiplication, division, simple arithmetic and two's complement arithmetic, floating-point representation of numbers, Boolean algebra, truth tables, Venn diagrams.

Test Code: DUAT06

Programme: MSc Data Science and Geoinformatics

General Aptitude (20 Marks)

Verbal Aptitude-Basic English grammar: Tenses, articles, adjectives, prepositions, conjunctions, verb-noun agreement, and other parts of speech.

Basic vocabulary: Words, idioms and phrases in context. Narrative sequencing.

Quantitative Aptitude-Data interpretation: Data graphs (bar graphs, pie charts, and other graphs representing data), 2- and 3-dimensional plots, maps, and tables. Numerical computation and estimation: Ratios, percentages, powers, exponents and logarithms, permutations and combinations, summations and series, Mensuration and Geometry

Analytical Aptitude-Logic: Deduction and induction, analogy, numerical relations, and reasoning

Spatial Aptitude-Transformation of shapes: Translation, rotation, scaling, mirroring, assembling, grouping, paper folding, cutting, and patterns in 2 and 3 dimensions.

Mathematics (10 Marks)

Statistics and Probability: Measure of central tendency, measure of dispersion, skewness and Kurtosis, and elementary analysis of data. Probability and properties, conditional probability, multiplication rule. Total Probability. Bayes' theorem and independence of events.

Earth and Environmental Sciences (20 Marks)

Earth Sciences: Structure and composition of Environment-Atmosphere, Hydrosphere and Lithosphere, Earth Processes, Mineral and Power Resources in India, Bio-geochemical Cycles, Meteorology, Climate Change, Origin and evolution of earth, Mineral and Power Resources in India.

Agriculture Land Use/Land Utilization Systems.

Ecology and Environment: Biosphere, Organizational levels of biosphere, Ecosystem: Structure and Types, Food Chain and Energy Flow, Population and Community Ecology, Biodiversity and its Conservation.

Natural resources and Management: Natural Resources, Land and Water Resources, Minerals, Marine, Energy (Renewable and Non-renewable) - Sources, Threats, Conservation, and Management.

Remote sensing and GIS: Electro Magnetic Spectrum, Components and types of remote sensing, Resolutions (Spectral, Spatial, Temporal & Radiometric), Platforms. GIS: components of GIS, Spatial data, Vector and Raster Data, GIS Data Model and Data Structure - Projection and coordinate Systems.

Computer Basics (10 Marks)

Organization of a computer, Central Processing Unit (CPU), structure of instructions in CPU, input/output devices, computer memory, and backup devices.

Data Representation: Representation of characters, integers and fractions, binary and hexadecimal representations, binary arithmetic: addition,

subtraction, multiplication, division, simple arithmetic and two's complement arithmetic, floating-point representation of numbers, Boolean algebra, truth tables, Venn diagram

Test Code: DUAT07-MTECHCS

Programme: MTech Computer Science and Engineering

General Aptitude (20 Marks)

Verbal Aptitude-Basic English grammar: Tenses, articles, adjectives, prepositions, conjunctions, verb-noun agreement, and other parts of speech. Basic vocabulary: Words, idioms and phrases in context. Narrative sequencing.

Quantitative Aptitude-Data interpretation: Data graphs (bar graphs, pie charts, and other graphs representing data), 2- and 3-dimensional plots, maps, and tables. Numerical computation and estimation: Ratios, percentages, powers, exponents and logarithms, permutations and combinations, summations and series, Mensuration and Geometry Analytical Aptitude-Logic: Deduction and induction, analogy, numerical relations, and reasoning. Spatial Aptitude-Transformation of shapes: Translation, rotation, scaling, mirroring, assembling, grouping, paper folding, cutting, and patterns in 2 and 3 dimensions.

Mathematics (20 Marks)

Set Theory- Concept of sets–Union, Intersection, Cardinality, Elementary counting; permutations and combinations.

Probability and Statistics- Basic concepts of probability theory, Averages, Dependent and independent events, frequency distributions, measures of central tendencies and dispersions.

Algebra-Fundamental operations in algebra, expansions, factorization, simultaneous linear/quadratic equations, indices, logarithms, arithmetic, geometric and harmonic progressions, determinants and matrices.

Coordinate Geometry- Rectangular Cartesian coordinates, distance formulae, equation of a line, and intersection of lines, pair of straight lines, equations of a circle, parabola, ellipse and hyperbola.

Calculus-Limit of functions, continuous function, differentiation of function, tangents and normal, simple examples of maxima and minima. Integration of functions by parts, by substitution and by partial fraction, definite integrals, and applications of definite integrals to areas.

Vectors-Position vector, addition and subtraction of vectors, scalar and vector products and their applications to simple geometrical problems and mechanics.

Trigonometry-Simple identities, trigonometric equations, properties of triangles, solution of triangles, heights and distances, general solutions of trigonometric equations.

Computer Science (20 Marks)

Programming and Data Structures-Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.

Algorithms-Searching, sorting, hashing. Asymptotic worst-case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide-and-conquer. Graph traversals, minimum spanning trees, shortest paths

Operating System-System calls, processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU and I/O scheduling. Memory management and virtual memory. File systems.

Databases-ER-model. Relational model: relational algebra, tuple calculus, SQL. Integrity constraints, normal forms. File organization, indexing (e.g., B and B+ trees). Transactions and concurrency control.

Computer Networks-Concept of layering: OSI and TCP/IP Protocol Stacks; Basics of packet, circuit and virtual circuit-switching; Data link layer: framing, error detection, Medium Access Control, Ethernet bridging; Routing protocols: shortest path, flooding, distance vector and link state routing; Fragmentation and IP addressing, IPv4, CIDR notation, Basics of IP support protocols (ARP, DHCP, ICMP), Network Address Translation (NAT); Transport layer: flow control and congestion control, UDP, TCP, sockets; Application layer protocols: DNS, SMTP, HTTP, FTP, Email.

Machine Learning-(i) Supervised Learning: regression and classification problems, simple linear regression, multiple linear regression, ridge regression, logistic regression, k-nearest neighbour, naïve Bayes classifier, linear discriminant analysis, support vector machine, decision trees, bias-variance trade-off, cross-validation methods such as leave-one-out (LOO) cross-validation, k-folds cross validation, multi-layer perceptron, feed-forward neural network; (ii) Unsupervised Learning:

clustering algorithms, k-means/k-medoid, hierarchical clustering, top-down, bottom-up: single-linkage, multiple-linkage, dimensionality reduction, principal component analysis.

Artificial Intelligence-Search: informed, uninformed, adversarial; logic, propositional, predicate; reasoning under uncertainty topics - conditional independence representation, exact inference through variable elimination, and approximate inference through sampling.