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CUET 2026

SYLLABUS

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Mathematics/ Applied Mathematics – 319

Syllabus for CUET (UG) - 2026

Section A1

I. Algebra
(i) Matrices and types of Matrices
(ii) Equality of Matrices, transpose of a Matrix, Symmetric and Skew Symmetric Matrix
(iii) Algebra of Matrices
(iv) Determinants
(v) Inverse of a Matrix
(vi) Solving of simultaneous equations using Matrix Method

II. Calculus
(i) Higher order derivatives upto (second order)
(ii) Increasing and Decreasing Functions
(iii) Maxima and Minima

III. Integration and its Applications
(i) Indefinite integrals of simple functions
(ii) Evaluation of indefinite integrals
(iii) Definite Integrals
(iv) Application of Integration as area under the curve (simple curve)

IV. Differential Equations
(i) Order and degree of differential equations
(ii) Solving of differential equations with variable separable

V. Probability Distributions
Simple Probability

VI. Linear Programming
(i) Graphical method of solution for problems in two variables
(ii) Feasible and infeasible regions
(iii) Optimal feasible solution

Section B1: Mathematics

UNIT I: RELATIONSAND FUNCTIONS

Relations and Functions: Types of relations: Reflexive, symmetric, transitive and equivalence relations. One to one and onto functions.

Inverse Trigonometric Functions: Definition, range, domain, principal value branches. Graphs of inverse trigonometric functions.

UNIT II: ALGEBRA

1. **Matrices:** Concept, notation, order, equality, types of matrices, zero matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operations on matrices: Addition, multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication. Non-commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Invertible matrices and proof of the uniqueness of inverse,if it exists;(Here all matrices will have real entries).
2. **Determinants:** Determinant of a square matrix (up to 3 × 3 matrices), minors, cofactors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equations by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

UNIT III: CALCULUS

1. **Continuity and Differentiability:** Continuity and differentiability, chain rule, derivatives of inverse trigonometric functions, like $\sin^{-1} x$, $\cos^{-1} x$ and $\tan^{-1} x$, derivative of implicit functions. Concepts of exponential, logarithmic functions. Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms. Second-order derivatives.
2. **Applications of derivatives: R**ate of change of quantities, increasing/decreasing functions, maxima and minima (first derivative test motivated geometrically and second derivative test given as provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations).
3. **Integrals:** Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, Evaluation of simple integrals of

the following types and problems based on them.

$$\int \frac{dx}{x^2+a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{a^2-x^2}, \int \frac{dx}{\sqrt{a^2-x^2}},$$

$$\int \frac{(px+q)dx}{ax^2+bx+c}, \quad \int \frac{(px+q)dx}{\sqrt{ax^2+bx+c}}, \int \sqrt{}$$

Fundamental Theorem of Calculus (without proof). Basic properties of definite integralsand evaluation of definite integrals.

4. **Applications of the Integrals**
   Applications in finding the area under simple curves, especially lines, circles/parabolas/ellipses (in standard form only)
5. **Differential Equations**
   Definition, order and degree, general and particular solutions of a differential equation. Solution of differential equations by method of separation of variables, solutions of homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type:

   $\frac{dy}{dx} + Py = Q$, where P and Q are functions of x or constants

   $\frac{dx}{dy} + Px = Q$, where P and Q are functions of y or constants

UNIT IV: VECTORSAND THREE-DIMENSIONALGEOMETRY

1. **Vectors :**Vectors and scalars, magnitude and direction of a vector. Direction cosines and direction ratios of a vector. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Definition, Geometrical interpretation, properties and application of scalar (dot) product of vectors, vector (cross) product of vectors.
2. **Three-dimensional Geometry:** Direction cosines and direction ratios of a line joining two points. Cartesian equation and vector equation of a line, skew lines, shortest distance between two lines. Angle between two lines.

Unit V: Linear Programming

Introduction, related terminology such as constraints, objective function, optimization, graphical method of solution for problems in two variables, feasible and infeasible regions (bounded or unbounded), feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

UnitVI: Probability

Conditional probability, Multiplications theorem on probability, independent events, total probability, Baye's theorem.

Section B2: Applied Mathematics

Unit I: Numbers, Quantification and Numerical Applications

A. Modulo Arithmetic
- Define modulus of an integer
- Apply arithmetic operations using modular arithmetic rules

B. Congruence Modulo
- Define congruence modulo
- Apply the definition in various problems

C. Allegation and Mixture
- Understand the rule of allegation to produce a mixture at a given price
- Determine the mean price of a mixture
- Apply rule of allegation

D. Numerical Problems
- Solve real life problems mathematically

E. Boats and Streams
- Distinguish between upstream and downstream
- Express the problem in the form of an equation

F. Pipes and Cisterns
- Determine the time taken by two or more pipes to fill or empty the tank **G. Races and Games**
- Compare the performance of two players w.r.t. time, distance

H. Numerical Inequalities
- Describe the basic concepts of numerical inequalities
- Understand and write numerical inequalities

UNIT II: ALGEBRA

A. Matrices and types of matrices
- Define matrix
- Identify different kinds of matrices

B. Equality of matrices, Transpose of a matrix, Symmetric and Skew symmetric matrix • Determine equality of two matrices
- Write transpose of given matrix
- Define symmetric and skew symmetric matrix

C. Algebra of Matrices
- Perform operations like addition & subtraction on matrices of same order
- Perform multiplication of two matrices of appropriate order
- Perform multiplication of a scalar with matrix

D. Determinant of Matrices
- Determinant of a square matrix
- Use elementary properties of determinants
- Singular matrix, Non-singular matrix
- $|AB|=|A||B|$
- Simple problems to find determinant value

E. Inverse of a Matrix
- Define the inverse of a square matrix
- Apply properties of inverse of matrices
- Inverse of a matrix using: a) cofactors
- If A and B are invertible square matrices of same size,

i) $(AB)^{-1}=B^{-1}A^{-1}$ ii) $(A^{-1})^{-1}=A$ iii) $(A^T)^{-1}=(A^{-1})^T$

F. Solving system of simultaneous equations (upto three variables only (non-homogeneous equations))

UNIT III: CALCULUS

A. Higher Order Derivatives
- Determine second and higher order derivatives upto second order derivatives

• Understand differentiation of parametric functions and implicit functions

B. Application of Derivatives

• Determine the rate of change of various quantities

C. Marginal Cost and Marginal Revenue using derivatives

• Define marginal cost and marginal revenue
• Find marginal cost and marginal revenue

D. Increasing/Decreasing Functions

• Determine whether a function is increasing or decreasing
• Determine the conditions for a function to be increasing or decreasing

E. Maxima and Minima

• Determine critical points of the function
• Find the point(s) of local maxima and local minima and corresponding local maximum and local minimum values
• Find the absolute maximum and absolute minimum value of a function
• Solve applied problems

F. Integration

• Understand and determine indefinite integrals of simple functions as anti-derivative

G. Indefinite integrals as family of curves

• Evaluate indefinite integrals of simple algebraic functions by methods of
(i) substitution (ii) partial fraction (iii) by parts

H. Definite Integral as area under the curve

• Define definite integral as area under the curve(non-trigonometric function)
• Understand fundamental theorem of integral calculus and apply it to evaluate the definite integral
• Apply properties of definite integrals to solve problems

I. Application of Integration

• Identify the region representing C.S. and P.S. graphically
• Apply the definite integral to find consumer surplus-producer surplus

J. Differential Equations

• Recognize a differential equation
• Find the order and degree of a differential equation

K. Formulating and solving differential equations

• Formulate differential equations
• Verify the solution of differential equation
• Solve simple differential equation

UNIT IV: PROBABILITY DISTRIBUTIONS

A. Probability Distribution

• Understand the concept of Random Variables and its Probability Distributions
• Find probability distribution of discrete random variable

B. Mathematical Expectation

• Apply arithmetic mean of frequency distribution to find the expected value of a random variable

C. Variance

• Calculate the Variance and S.D. of a random variable

D. Binomial Distribution

• Identify the Bernoulli Trials and apply Binomial Distribution
• Evaluate Mean, Variance and S.D. of a Binomial Distribution E. Poisson Distribution
• Understand the conditions of Poisson Distribution
• Evaluate the Mean and Variance of Poisson distribution

F. Normal Distribution

• Understand normal distribution is a continuous distribution
• Evaluate value of Standard normal variate
• Area relationship between Mean and Standard Deviation

UNIT V: TIME BASED DATA

A. Time Series
- Identify time series as chronological data

B. Components of Time Series
- Distinguish between different components of time series

C. Time Series analysis for univariate data
- Solve practical problems based on statistical data and Interpret

D. Secular trend
- Understand the long term tendency

E. Methods of Measuring trend
- Demonstrate the techniques of finding trend by different methods

UNIT VI: INFERENTIAL STATISTICS

A. Population and Sample
- Define Population and Sample
- Differentiate between population and sample
- Define a representative sample from a population
- Differentiate between a representative and a non-representative sample
- Draw a representative sample using simple random sampling
- Draw a representative sample using a systematic random sampling

B. Parameter and Statistics and Statistical Interferences
- Define Parameter with reference to Population
- Define Statistics with reference to Sample
- Explain the relation between Parameter and Statistic
- Explain the limitation of Statistic to generalize the estimation for population
- Interpret the concept of Statistical Significance and Statistical Inferences
- Central Limit Theorem
- Explain the relation between Population-Sampling Distribution-Sample

C. t-Test (one sample t-test for a small group sample)
- Define a hypothesis
- Differentiate between Null and Alternate hypothesis
- Define and calculate degree of freedom
- Test Null hypothesis and make inferences using t-test statistic for one group.

UNIT VII: FINANCIAL MATHEMATICS

A. Perpetuity, Sinking Funds
- Explain the concept of perpetuity and sinking fund
- Calculate perpetuity
- Differentiate between sinking fund and saving account

B. Calculation of EMI
- Explain the concept of EMI
- Calculate EMI using various methods

C. Calculation of Returns, Nominal Rate of Return
- Explain the concept of rate of return and nominal rate of return
- Calculate rate of return and nominal rate of return

D. Compound Annual Growth Rate
- Understand the concept of Compound Annual Growth Rate
- Differentiate between Compound Annual Growth rate and Annual Growth Rate
- Calculate Compound Annual Growth Rate

E. Linear method of Depreciation
- Concept of linear method of Depreciation
- Interpret cost, residual value and useful life of an asset from the given information
- Depreciation

F. Valuation of Bonds:
- Concept of bond and related terms.
- Value of bond using present value approach

UNIT VIII: LINEAR PROGRAMMING

A. Introduction and related terminology
- Familiarize with terms related to Linear Programming Problem

B. Mathematical formulation of Linear Programming Problem
- Formulate Linear Programming Problem

C. Different types of Linear Programming Problems
- Identify and formulate different types of LPP

D. Graphical Method of Solution for problems in two Variables
- Draw the Graph for a system of linear inequalities involving two variables and to find its solution graphically

E. Feasible and Infeasible Regions
- Identify feasible, infeasible and bounded regions

F. Feasible and infeasible solutions, optimal feasible solution
- Understand feasible and infeasible solutions
- Find optimal feasible solution

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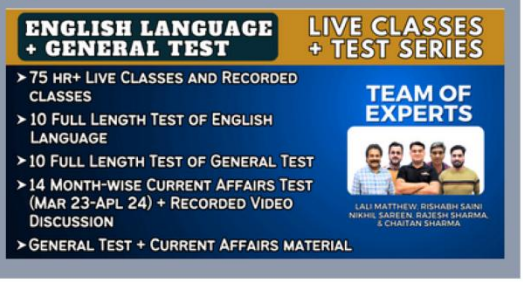

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