U. P. EDUCATION SERVICE SELECTION COMMISSION, PRAYAGRAJ

Syllabus

Mathematics–PGT (Secondary Education)

(Subject Code- 08)

Mathematics

1. Algebra:

Relation and function: Type of relations- reflexive, symmetric transitive and equivalence relations. Equivalence class one-one and onto functions, composite of function. inverse of function . Binary operations.

Matrices: Type of matrices, transpose of a matrix, symmetric and skew-symmetric matrices, addition and multiplication of matrices. Singular and non-singular matrices, Invertible matrices.

Determinants: Properties of determinants. Adjoint and inverse of a square matrix. Consistency and number of solutions of system of linear equations, solving system of linear equations in two or three variables.

Theory of equations of degree greater than or equal to two. Arithmetic, Geometric and Harmonic progressions. Permutations and combinations, Binomial theorem. Exponential and logarithmic series.

Probability: Multiplication theorem of probability, conditional probability, independent events, total probability.

2. Calculus:

Function of one variable: Limit of a function, continuity and differentiability of a function, derivative of composite function. Rolle's theorem, Lagrange and Cauchy mean value theorems. Maclaurin's and Taylor's series. L. Hospital's rule. Successive differentiations. Leibnitz theorem, equation of tangent and normal to a given curve, Maxima and minima, increasing and decreasing functions.

Integration: Methods of integration, definite integration as a limit of sum, basic properties of definite integrals and evaluation of definite integrals. Applications in finding the area under simple curves. Riemann integration.

3.Ordinary Differential equations: Order and degree of differential equations. Formation of differential equations, solution of differential equations of first order and first degree, singular solutions, Linear differential equations with constant coefficients, Homogeneous differential equations.

4. Co-ordinate geometry of two dimensions:

General equation of second degree in two variables (x,y) and its classifications to pair of straight lines, circle, parabola, ellipse and hyperbola. Equation of tangents and normals. Common tangents to two conics, Pair of tangents and Chord of contacts.

5. Vectors and three dimensional geometry:

Vector: Vector and scalars, unit vectors, direction cosines and ratios of a vector, multiplication of a vector by scalar, dot product, cross product of vectors and their simple applications

Three dimensional geometry: Direction cosines and ratios of a line joining two points, Cartesian and vector equation of a straight line, Coplanar and skew lines. shortest distance between two lines, Cartesian and vector equation of a plane, Angle

between (a) two lines (b) two planes (c) a line and a plane. Distance of a point from a plane, Intersection of two lines, intersection of a line and plane and intersection of two planes. Equations of sphere, cone and cylinder.

6.Abstract algebra: Group and its examples, subgroups, homomorphism and isomorphism, properties of homomorphism. Order of an element in a group. Cyclic group. Symmetric group- S_n, Lagrange theorem, Fermat's theorem and its application Normal subgroups, Fundamental theorem of homomorphism. Ring and Field with examples.

7.Linear algebra: Vector space with examples, subspace, linear dependence and independence, Basis and dimension of a vector space, Quotient space, linear sum and direct sum of subspaces. Linear transformation, Kernel and image. of a linear transformation, Rank and nullity of a linear transformation. Rank-nullity theorem, Composite of linear transformations. Singular and non-singular linear transformations, Transpose of a linear transformation, Matrix of a linear transformation.

8. Vector calculus

Vector differentiation: Scalar and vector fields, Gradient, divergence and curl, vector identities. Directional derivatives.

Vector integration: Line integral, surface integral, volume integral, Green's theorem, Gauss-divergence theorem, Stokes' theorem and their simple applications.

9. Mechanics

Statics: Equilibrium of a body under the action of three forces, coplanar forces, Equilibrium of a body under the action of a system of coplanar forces, Centre of gravity, common catenary and properties, Moment of inertia.

Dynamics: Motion of a projectile in vertical plane under gravity. work, power and energy. Radial and transverse velocity and acceleration, tangential and normal velocity and acceleration. Central orbits.

10.Trigonometry: Trigonometric equations, Properties of triangles, Inverse circular functions, Height and distance, Complex numbers. De Moivre's theorem and its application.