प्राविधिक शिक्षा तथा व्यावसायिक तालीम परिषद्

पदपूर्ति समिति

सानोठिमी, भक्तपुरको

गणित प्रशिक्षक

गणित उप समूह (अधिकृत स्तर तृतीय श्रेणी प्राविधिक) पदको खुला र आन्तरिक प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

द्वितीय पत्र : सेवा सम्बन्धी प्राविधिक विषय

पूर्णाङ्क - १००

1. Set and Real Number System

1.1 Set and notations, Relation between sets, Operation of sets, denumerable set and its cardinality.

1.2 Algebra of set, Cartesian product and DE Morgan's law.

1.3 Types of Functions

1.3.1 Algebraic, trigonometric, transcendental, logarithmic and exponential functions.

1.3.2 Identity, constant, quadratic and composite functions.

1.3.3 Graph of above functions.

1.4. Real number system.

1.4.1. Real number and its subset.

1.4.2 Absolute value of real numbers.

1.4.3 Open and closed intervals, inequality.

1.5 Complex Number System.

1.5.1 Imaginary unit, Complex number and its geometrical interpretations.

1.5.2 Square root of complex number, Conjugate of complex number, Absolute value of complex number and Polar form of Complex Number.

2. Trigonometry

2.1 Review of trigonometric ratios.

2.1.1 Basic trigonometric formulae and its derivation.

2.1.2 Identities and conditional identities.

2.2 Trigonometric equations.

2.2.1 Periodicity of trigonometric functions.

2.2.2 General solutions of Sinx =K, Cosx=K, Tanx= K using trigonometric equations.

2.3 Inverse Circular functions.

2.3.1 Formulae involving inverse circular functions.

2.3.2 Simple identities and equation involving inverse circular functions.

2.4 Properties of Triangle.

2.4.1 The sine law, the cosine law, the tangent law, the projection law, half angle law.

2.5 The area of a triangle.

2.6 The solution of a triangle.

2.7 The Fourier series.

2.7.1 Periodic function, Even and odd function.

2.7.2 Trigonometric series, Fourier series of the function of period 2π.

2.7.3 Euler's formulae.

3. Algebra

3.1 Elementary group theory.

3.1.1 Binary operation on sets and their properties.

3.1.2 Definition and example of group

3.1.3 Elementary properties of group

3.1.4 Finite group, Infinite group and Abelian group.

3.2 Progression

3.2.1 A.P., G.P. and H.P.

3.3 Sequence and Series

3.3.1 Exponential and logarithmic series.

3.3.2 Finite and infinite series (McLaurin's series, Taylor's series).

3.3.3 Power Series

3.4 Binomial Theorem.

3.4.1 Finding general term, middle term/s, and Binomial coefficients.

3.4.2 Properties of Binomial theorem.

3.4.3 Expansion of e^x, a^x and log(1+x).

3.5 Permutation and Combinations.

3.5.1 Basic counting principles.

3.5.2 Arrangement of objects in cases (all different, not all different, circular).

3.5.3 Selection of objects (combinations) and its properties.

3.6 Equations and Inequalities.

3.6.1 Polynomial functions and polynomial equations.

3.6.2 Quadratic equation, nature of roots of quadratic equation, relations between roots and coefficients.

3.6.3 Linear inequalities and its graph.

3.7 Matrix and Determinant.

3.7.1 Transpose, adjoint and inverse of a matrix and related problems.

3.7.2 Properties of Determinants.

3.7.3 Application of matrix and determinant to solve linear system of equations (Matrix inverse and crammer's rule).

4. Geometry

4.1 Vectors and its Simple Applications.

4.1.1 Addition, subtraction, composition and decomposition of Vectors.

4.1.2 Scalar product of two vectors.

4.1.3 Properties of scalar product and its geometrical interpretations.

4.1.5 Application of Vector products in plane geometry.

4.1.6 Unit vectors i, j, k.

4.2 Co-ordinate Geometry

4.2.1 Review of various forms of equation of straight lines.

4.2.2 Conditions of parallelism and perpendicularity of two lines.

4.2.3 General equations of second degree in x and y ($ax^2 + 2hxy+by^2+2gx+2fy+c=0$)

4.2.4 Angle between two straight lines represented by the homogeneous equation of second degree.

4.3 Co- ordinate in Space.

4.3.1 Co-ordinate axes, Co-ordinate planes, direction cosine and ratios.

4.3.2 Equation of plane in intercept and normal form.

4.3.3 Plane through the intersection of two planes, parallel and perpendicular planes.

4.4 Conic Sections (circle, ellipse, parabola and hyperbola).

4.4.1 Equation of circle in various forms, tangent and normal to a circle.

4.4.2 Standard equations of Parabola, Ellipse and Hyperbola.

4.4.3 Equation of tangent and normal to a parabola at a given point.

5. Calculus

5.1 Limit and Continuity.

5.1.1 Limiting values of simple algebraic and trigonometric functions.

5.1.2 Limit of function of indeterminate form($\frac{0}{0}$, $\frac{\infty}{\infty}$, $\infty - \infty$, $0\times \infty$, 1^∞)

5.1.3 Continuity and discontinuity.

5.1.4 Geometrical meaning of continuity and discontinuity.

5.2 Derivative and its Applications

5.2.1 Relationship between continuity and differentiability of a function.
5.2.2 Derivative of functions and its geometrical meaning.
5.2.3 Basic techniques of differentiation (sum rule, product rule, power rule, quotient rule and chain rule).
5.2.4 Differentiating algebraic, trigonometric, logarithmic and exponential functions.
5.2.5 Equation of tangent and normal.
5.2.6 Maximum and minimum value of a function in an interval.
5.2.7 Derivative as rate of change.

5.3 Antiderivative and its Applications

5.3.1 Concept of antiderivative.
5.3.2 Techniques of integration.
5.3.3 Integration of basic algebraic and trigonometric functions.
5.3.4 Areas as a definite integral.

5.4 Differential Equations

5.4.1 Meaning, Concept and Definitions
5.4.2Ordinary differential equation of first degree.
5.4.3General and particular solution
5.4.4Change of variable
5.4.5Homogeneous equations
5.4.6Equations reducible to homogeneous equations
5.4.7Linear differential equation
5.4.8Equations reducible to linear form.

5.5 Curve Sketching

5.5.1 Tracing curves of some functions (even function and odd function, symmetricity of the function, increasing and decreasing functions, periodicity of a function)
5.5.2 Rule of tracing Cartesian and polar curves.

6. Statistics

6.1 Central Tendency
6.1.1 Concepts, and appropriate use of measure of central tendencies (Mean, Median and Mode).
6.1.2 Quartile and semi-quartile values.
6.2 Dispersions
6.2.1 Concepts, and appropriate use of measure of dispersions (Range,QD,MD,SD)
6.2.2 Coefficient of variations.
6.3 Correlation and Regressions
6.3.1 Method of studying correlations by scatter diagram.
6.3.2 Calculation of Karl Pearson's coefficient of correlations and Spearman's rank correlations.
6.3.3 Regression equation y on x and x on y.
6.4 Probability
6.4.1 Classical and empirical definitions of probability.
6.4.2 Application and use of addition and multiplication law of probability.
6.4.3 Explanation and use of binomial probability distribution formulae.
6.5 Concept of Moment, Skewness and Kurtosis.

Specification Chart

Unit	Scope of Curriculum	Obj. Questions			Subj. Questions		
		Q.no	Weightage	Total	Q.no	Weightage	Total
Set and Real Number	Set and Notations,Types of Functions, Real number system, Complex number system.	3	2	6	1		
Trigonometry	Trigonometric ratios, Trigonometric equations, Inverse circular function, Properties of triangle, The fourier series.	4	2	8	1		
Algebra	Group theory, Progression, Sequence and series, Binomial theorem, Permutation and combinations, Equation and inequalities, Matrix and determinant	5	2	10	1		
Geometry	Vectors and its application, Co-ordinate geometry, Co-ordinate in space, Conic section.	4	2	8	1		
Calculus	Limit and continuity, Derivative, Antiderivative, Differential equations, Curve sketching	5	2	10	1		
Statistics	Central tendency, Dispersions, Correlation and regression, Probability.	4	2	8	1		
Total		25	2	50	5*15 1*25	75 25	100

नोट : विषयगत प्रश्नहरु सोध्दा कुनै पाँच एकाइबाट १५ पूर्णांकको १/१ वटा र बाँकी एक एकाइबाट २५ अंकको एउटा प्रश्न गरी जम्मा छ वटा प्रश्न सोध्नु पर्नेछ । आवश्यकता अनुसार खण्ड क र खण्ड ख गरेर छोटो प्रश्नहरु सोध्न सकिनेछ ।