Syllabus for the Post of Assistant Professor

Mathematics

S.N.	Paper	Question Format	Full Marks	Number of Questions	Exam Time
1.	**Paper I**	Aptitude + Core Course (Objective)	50 + 50	100	100 minutes
2.	**Paper II**	Core Course, Research, and Teaching-Learning (Subjective)	100	10	3hrs
Total Written Exam Full Marks:			**200**		

Paper I: Aptitude Test (Objective) Marks: 1 × 50 = 50

S.N.	Area of Questions Aptitude Test	Number Questions	Details
1.	Teaching and Communication Aptitude	15	Objectives and Perspectives, Essential Qualities for Higher Education, Teaching Rolls: Individual, Social, and Professional, Teaching Methods, Student Evaluation and Assessment
2.	Research Aptitude, Publication Ethics, and Data Interpretation	15	Definition and Importance of Research, Objectives, Types, and Methods of Research, Research and Publication Ethics, Data Sources, Accessibility, Availability, and Presentation. Research-Based Articles, Journal Quality, Dissertation/Thesis Framework
3.	Information and communication Technology	10	Benefits and Risk, Use of ICT in teaching-Learning and research, Virtual Learning Platforms, Digital Education Resources, Tools and Applications
4.	Higher Education System, Tribhuvan University	10	Higher Education Policy 2076, Tribhuvan University Acts, Laws, and Bylaws

Assistant Professor

(Mathematics)

(Detail Syllabus)

Paper I: Core Course (Objective) Marks: 1 × 50 = 50

Unit	Area of Questions	Number Questions
1.	Calculus	6
2.	Algebra	5
3.	Mathematical Transformation	5
4.	Complex Variable	6
5.	Analytic Geometry	6
6.	Mathematical Analysis & Topology	5
7.	Probability & Statistics	6
8.	Vector Calculus	7
9.	Teaching, Research, Problem Identification, and Solutions	4

Paper II: **Core Course** **Marks: $10 \times 10 = 100$**

Subjective Knowledge, Research, and Teaching-Learning Questions

S.N.	Area of Questions	Number of Questions
1.	Unit 1: Calculus	2
2.	Unit 2: Algebra	
3.	Unit 3: Mathematical Transformations	3
4.	Unit 4: Complex Variable	
5.	Unit 5: Analytic Geometry	
6.	Unit 6: Mathematical Analysis and Topology	1
7.	Unit 7: Probability and Statistics	1
8.	Unit 8: Vector Calculus	1
9.	Unit 9: Research Methodology, Applications; Problem - Solving	2
	Teaching Learning and Student Evaluation; Syllabus Structure	

Syllabus

1. Calculus

1.1 Limit, continuity , derivatives and integration with applications, improper integrals

1.2 Higher order derivatives, mean value theorems, Taylor's and Maclaurin's series, asymptotes and curvature

1.3 Double and triple integrals with their applications

1.4 Partial derivatives, physical and geometrical interpretation of partial derivatives, maxima and minima of function of two and three variables, error estimation, Jacobians and applications, Taylor's series for function of two variables

1.5 Ordinary differential equations of first order

1.6 Linear differential equation of second order, Cauchy-Euler equations, method of variation of parameters.

1.7 Applications of differential equations

1.8 Series solution of second order differential equations, Bessel's functions, Legendre's polynomials, Hermite functions, Laguerre's function, Chebyshev polynomials, Gamma and beta functions

1.9 Partial differential equations and their solutions, Lagrange's linear equations, Charpit's method, one dimensional wave equation, one dimensional heat equation, two dimensional heat equation; Laplace equation, Navier-Stoke's equation

2. Algebra

2.1 Algebra of matrices and determinants, rank of matrices and its applications,

2.2 Eigenvalues and eigenvectors, matrix diagonalization, canonical forms

2.3 Metric spaces, normed spaces, vector spaces, Banach spaces, Cauchy sequences, linear transformations

2.4 Elementary concept of group, ring and field

2.5 Infinite series and convergence, Fourier series

3. Mathematical Transformations

3.1 Fourier transform

3.2 Laplace transform

3.3 Hankel transform

3.4 Hilbert transform

3.5 Z- transforms

4. Complex Variable

4.1 Analytic function, Cauchy-Reimann equations, Harmonic functions, orthogonal system

4.2 Application of analytic functions to flow problems, mappings

4.3 Taylor's series and Laurent's series, residue theorem

4.4 Application of residues to evaluation real integrals

5. Analytic Geometry

5.1 Two dimensional geometry, Transformation of coordinates, Conic sections, General equation of conic section, conic section in polar form

5.2 Three dimensional geometry, plane, straight lines

5.3 Sphere, cone and right circular cylinder

6. Mathematical Analysis and Topology

6.1 Euclidean spaces and metric spaces, compactness,

6.2 Function of bounded variation

6.3 Normed and Banach spaces, bounded linear operators

6.4 Functionals, bounded linear functionals

6.5 Topology and topological spaces, countability and Homeomorphism, connectedness

7. Probability and Statistics

7.1 Probability, discrete and continuous probability distributions, binomial, Poisson, negative binomial, hypergeometric, chi-square and normal distributions

7.2 Theory of estimation and hypothesis testing

7.3 Correlation and regression analysis

8. Vector Calculus

8.1 Vector differentiation and integration, geometrical meaning, velocity and acceleration

8.2 Vector differential operators, gradient, divergence and curl

8.3 Line integral, Green's theorem

8.4 Surface integral, Volume integral, Gauss divergence theorem, Stoke's theorem

8.5 Applications in physical sciences and engineering

9. Teaching, Research, Problem Identification, and Solutions

9.1 Emerging trends in the field of Mathematics: their impact and applications

9.2 Teaching methodologies in Mathematics education

9.3 Research approaches and methodologies in Mathematics

9.4 Contemporary challenges in Mathematics and their possible solutions

9.5 Identification and critical analysis of undergraduate and postgraduate curricula in engineering education

9.6 Principles of question paper design, student assessment, and answer script evaluation