

INDIRA GANDHI UNIVERSITY, MEERPUR

NEW SCHEME

Scheme of Examination of B.A. 1st Semester Mathematics (w.e.f. 2017-2018)

Paper Code	Title of the Paper	Allocation of Periods	Maximum Marks		
			Theory	Internal Assessment	Total
12BAI 111	Algebra	6 periods/ 4 hours per week	27	6	100
12BAI 112	Calculus	6 periods/ 4 hours per week	27	7	
12BAI 113	Solid Geometry	6 periods/ 4 hours per week	26	7	

Note:- The other conditions will remain the same as per relevant ordinance and rules and regulations of the University.

Algebra

Paper: 12BAI 111

Max. Marks:

4.5 x 4 = 18
1.5 x 6 = 9
Total = 27

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections(**I-IV**) will contain two questions(each carrying 4.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 1.5 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Section – I

Symmetric, Skew symmetric, Hermitian and skew Hermitian matrices. Elementary Operations on matrices. Rank of a matrices. Inverse of a matrix. Linear dependence and independence of rows and columns of matrices. Row rank and column rank of a matrix. Eigenvalues, eigenvectors and the characteristic equation of a matrix. Minimal polynomial of a matrix. Cayley Hamilton theorem and its use in finding the inverse of a matrix.

Section – II

Applications of matrices to a system of linear (both homogeneous and non-homogeneous) equations. Theorems on consistency of a system of linear equations. Unitary and Orthogonal Matrices, Bilinear and Quadratic forms.

Section – III

Relations between the roots and coefficients of general polynomial equation in one variable. Solutions of polynomial equations having conditions on roots. Common roots and multiple roots. Transformation of equations.

Section – IV :

Nature of the roots of an equation Descarte's rule of signs. Solutions of cubic equations (Cardon's method). Biquadratic equations and their solutions.

Books Recommended :

1. H.S. Hall and S.R. Knight : Higher Algebra, H.M. Publications 1994.
2. Shanti Narayan : A Text Books of Matrices.
3. Chandrika Prasad : Text Book on Algebra and Theory of Equations. Pothishala Private Ltd., Allahabad.

Calculus

Paper: 12BAI 112

Max. Marks:

4.5 x 4 = 18
1.5 x 6 = 9
Total = 27

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (**I-IV**) will contain two questions (each carrying 4.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 1.5 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Section – I

Definition of the limit of a function. Basic properties of limits, Continuous functions and classification of discontinuities. Differentiability. Successive differentiation. Leibnitz theorem. Maclaurin and Taylor series expansions.

Section – II

Asymptotes in Cartesian coordinates, intersection of curve and its asymptotes, asymptotes in polar coordinates. Curvature, radius of curvature for Cartesian curves, parametric curves, polar curves. Newton's method. Radius of curvature for pedal curves. Tangential polar equations. Centre of curvature. Circle of curvature. Chord of curvature, evolutes. Tests for concavity and convexity. Points of inflexion. Multiple points. Cusps, nodes & conjugate points. Type of cusps.

Section – III :

Tracing of curves in Cartesian, parametric and polar co-ordinates. Reduction formulae. Rectification, intrinsic equations of curve.

Section – IV :

Quadrature (area) Sectorial area. Area bounded by closed curves. Volumes and surfaces of solids of revolution. Theorems of Pappu's and Guilden.

Books Recommended :

1. Differential and Integral Calculus : Shanti Narayan.
2. Murray R. Spiegel : Theory and Problems of Advanced Calculus. Schaun's Outline series. Schaum Publishing Co., New York.
3. N. Piskunov : Differential and integral Calculus. Peace Publishers, Moscow.
4. Gorakh Prasad : Differential Calculus. Pothishasla Pvt. Ltd., Allahabad.
5. Gorakh Prasad : Integral Calculus. Pothishala Pvt. Ltd., Allahabad.

Solid Geometry

Paper: 12BAI 113

Max. Marks:

5 x 4 = 20
1 x 6 = 6
Total = 26

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (**I-IV**) will contain two questions (each carrying 5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 1 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Section – I :

General equation of second degree. Tracing of conics. Tangent at any point to the conic, chord of contact, pole of line to the conic, director circle of conic. System of conics. Confocal conics. Polar equation of a conic, tangent and normal to the conic.

Section – II :

Sphere: Plane section of a sphere. Sphere through a given circle. Intersection of two spheres, radical plane of two spheres. Co-axial system of spheres
 Cones. Right circular cone, enveloping cone and reciprocal cone.
 Cylinder: Right circular cylinder and enveloping cylinder.

Section – III :

Central Conicoids: Equation of tangent plane. Director sphere. Normal to the conicoids. Polar plane of a point. Enveloping cone of a conicoid. Enveloping cylinder of a conicoid.

Section – IV :

Paraboloids: Circular section, Plane sections of conicoids.
 Generating lines. Confocal conicoid. Reduction of second degree equations.

Books Recommended

1. R.J.T. Bill, Elementary Treatise on Coördinary Geometry of Three Dimensions, MacMillan India Ltd. 1994.
2. P.K. Jain and Khalil Ahmad : A Textbook of Analytical Geometry of Three Dimensions, Wiley Eastern Ltd. 1999.

INDIRA GANDHI UNIVERSITY, MEERPUR

NEW SCHEME

**Scheme of Examination of B.A. 2nd Semester Mathematics
(w.e.f. 2017-2018)**

Paper Code	Title of the Paper	Allocation of Periods	Maximum Marks		
			Theory	Internal Assessment	Total
12BAI 121	Number Theory and Trigonometry	6 periods/ 4 hours per week	27	6	100
12BAI 122	Ordinary Differential Equations	6 periods/ 4 hours per week	27	7	
12BAI 123	Vector Calculus	6 periods/ 4 hours per week	26	7	

Note:- The other conditions will remain the same as per relevant ordinance and rules and regulations of the University.

Number Theory and Trigonometry

Paper: 12BAI 121

Max. Marks:

4.5 x 4 = 18
1.5 x 6 = 9
Total = 27

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections(**I-IV**) will contain two questions(each carrying 4.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions(each carrying 1.5 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Section – I :

Divisibility, G.C.D.(greatest common divisors), L.C.M.(least common multiple)
Primes, Fundamental Theorem of Arithmetic. Linear Congruences, Fermat's theorem. Wilson's theorem and its converse. Linear Diophantine equations in two variables

Section – II :

Complete residue system and reduced residue system modulo m . Euler's ϕ function Euler's generalization of Fermat's theorem. Chinese Remainder Theorem. Quadratic residues. Legendre symbols. Lemma of Gauss; Gauss reciprocity law. Greatest integer function $[x]$. The number of divisors and the sum of divisors of a natural number n (The functions $d(n)$ and $\sigma(n)$). Moebius function and Moebius inversion formula.

Section - III :

De Moivre's Theorem and its Applications. Expansion of trigonometrical functions. Direct circular and hyperbolic functions and their properties.

Section – IV :

Inverse circular and hyperbolic functions and their properties. Logarithm of a complex quantity. Gregory's series. Summation of Trigonometry series.

Books Recommended :

1. S.L. Loney : Plane Trigonometry Part – II, Macmillan and Company, London.
2. R.S. Verma and K.S. Sukla : Text Book on Trigonometry, Pothishala Pvt. Ltd. Allahabad.
3. Ivan Ninen and H.S. Zuckerman. An Introduction to the Theory of Numbers.

Ordinary Differential Equations

Paper: 12BAI 122

Max. Marks:

$4.5 \times 4 = 18$
$1.5 \times 6 = 9$
Total = 27

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections(**I-IV**) will contain two questions(each carrying 4.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions(each carrying 1.5 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Section – I :

Geometrical meaning of a differential equation. Exact differential equations, integrating factors. First order higher degree equations solvable for x,y,p Lagrange's equations, Clairaut's equations. Equation reducible to Clairaut's form. Singular solutions.

Section – II :

Orthogonal trajectories: in Cartesian coordinates and polar coordinates. Self orthogonal family of curves.. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations. Equations reducible to homogeneous linear ordinary differential equations.

Section – III :

Linear differential equations of second order: Reduction to normal form. Transformation of the equation by changing the dependent variable/ the independent variable. Solution by operators of non-homogeneous linear differential equations. Reduction of order of a differential equation. Method of variations of parameters. Method of undetermined coefficients.

Section – IV :

Ordinary simultaneous differential equations. Solution of simultaneous differential equations involving operators x (d/dx) or t (d/dt) etc. Simultaneous equation of the form $dx/P = dy/Q = dz/R$. Total differential equations. Condition for $Pdx + Qdy + Rdz = 0$ to be exact. General method of solving $Pdx + Qdy + Rdz = 0$ by taking one variable constant. Method of auxiliary equations.

Books Recommended :

1. D.A. Murray : Introductory Course in Differential Equations. Orient Longaman (India) . 1967
2. A.R.Forsyth : A Treatise on Differential Equations, Machmillan and Co. Ltd. London
3. E.A. Codington : Introduction to Differential Equations.
4. S.L.Ross: Differential Equations, John Wiley & Sons
5. B.Rai & D.P. Chaudhary : Ordinary Differential Equations; Narosa, Publishing House Pvt. Ltd.

Vector Calculus

Paper: 12BAI 123

Max. Marks:

5 x 4 = 20
1 x 6 = 6
Total = 26

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (**I-IV**) will contain two questions (each carrying 5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 1 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Section – I

Scalar and vector product of three vectors, product of four vectors. Reciprocal vectors. Vector differentiation. Scalar Valued point functions, vector valued point functions, derivative along a curve, directional derivatives

Section – II

Gradient of a scalar point function, geometrical interpretation of $\text{grad } \Phi$, character of gradient as a point function. Divergence and curl of vector point function, characters of $\text{Div } f$ and $\text{Curl } f$ as point function, examples. Gradient, divergence and curl of sums and product and their related vector identities. Laplacian operator.

Section – III

Orthogonal curvilinear coordinates Conditions for orthogonality fundamental triad of mutually orthogonal unit vectors. Gradient, Divergence, Curl and Laplacian operators in terms of orthogonal curvilinear coordinates, Cylindrical co-ordinates and Spherical co-ordinates.

Section – IV

Vector integration; Line integral, Surface integral, Volume integral.
Theorems of Gauss, Green & Stokes and problems based on these theorems.

Books Recommended:

1. Murraray R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing Company, New York.
2. Murraray R. Spiegel : Vector Analysis, Schaum Publisghing Company, New York.
3. N. Saran and S.N. Nigam. Introduction to Vector Analysis, Pothishala Pvt. Ltd., Allahabad.
4. Shanti Narayna : A Text Book of Vector Calculus. S. Chand & Co., New Delhi.