



Maharaja Surajmal Brij University
Bharatpur (Raj)

SYLLABUS
MATHEMATICS

B. A./B. Sc. Part I
(Annual Scheme)
(New)

Session 2019-20

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अकादमिक प्रभारी
महाराजा सुरजमल बृज विश्वविद्यालय
भरतपुर (राज.)

(Total number of pages-7)

B. A./B. Sc. Part I Examination - 2020

MATHEMATICS

Teaching : 3 hours per week per theory paper

2 hours per week per batch for practical

(20 candidates in each batch)

Examination Scheme :

	Min. Pass Marks	Max. Pass Marks		
Science	54	150		
Arts	72	200		
			Duration	Max Marks
Paper – I	Discrete Mathematics	3 hrs	40 (Science)	53 (Arts)
Paper – II	Advanced Calculus	3 hrs	40 (Science)	53 (Arts)
Paper – III	Coordinate Geometry and Vector Calculus	3 hrs	40 (Science)	54 (Arts)
Practical		2 hrs	30 (Science)	40 (Arts)

Note :-

1. Syllabus of each of three papers is divided into FIVE units.
2. Each paper is divided into THREE sections A, B & C.
3. **Section-A** : TEN short answer type questions will be set taking two questions from each unit. Each question will carry 1 mark for Science and 1.5 mark for Arts. All questions will be compulsory .
4. **Section-B** : TEN questions will be set taking two questions from each unit. Each question will carry 3 marks for Science and 4 marks for Arts. Student has to attempt ONE question from each unit
5. **Section-C** : FIVE questions will be set taking one questions from each unit. Each question will carry 5 marks for Science in all three papers and 6 marks for Arts in paper I & II and 6.33marks in paper III. Student has to attempt ANY THREE Questions.
6. Common paper will set for Faculty of Science and Faculty of Social Science .



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7. Each candidate is required to appear in the practical examination to be conducted by internal and external examiners. External examiner will be appointed by the University and internal examiner will be appointed by the principal in consultation with the head, department of Mathematics in the college.
8. An internal/external examiner can conduct practical examination of not more than 100 (one hundred) candidates (20 candidates in each batch).
9. Each candidate has to pass in theory and practical examinations separately.

Paper – I Discrete Mathematics

Teaching : 3 hrs per week

Duration of Examination : 3 hrs

Max. Marks 40 (Science)


53 (Arts)

Note: This paper is divided into THREE Sections A, B, & C. **Section-A** consists TEN short answer type questions. Each question is of 1 mark for Science and 1.5 mark for Arts. All questions are compulsory. **Section-B** consists TEN questions taking two questions from each unit. Each question will carry 3 marks for Science and 4 marks for Arts. Student has to attempt FIVE questions selecting ONE question from each unit. **Section-C** consists FIVE questions taking one questions from each unit. Each question will carry 5 marks for Science and 6 marks for Arts. Student has to attempt any THREE questions.

Unit – I : Algebraic Structures – Binary operations, Definition and examples of groups, Elementary properties of groups, Order of an element, Cyclic groups, properties of cyclic groups, Permutation: product of two permutations, even and odd permutations, inverse of permutations, cyclic permutations, Permutation groups.

Unit – II: Graph theory – Introduction, definition of graph, degree of vertex, Directed graphs, finite and infinite graphs, hand shaking property, Regular graphs, Bipartite graphs, Operations on graphs, Isomorphism, Sub graphs, Connected and Disconnected graphs, Euler circuit and Euler graphs, Hamiltonian cycles and Hamiltonian graphs, Weighted graphs, Shortest path problem, Dijkstra algorithm.

Unit – III : Planner and non planner graphs, Euler's formula, Detection of planarity, Dual of planner graphs, Graph colouring, Chromatic number, Map colouring, Five colour theorem, Matrix representation of graphs: Trees, properties of trees, rooted tree, binary tree, Spanning tree, Spanning tree in weighted graphs, Kruskal's algorithm and Prim's algorithm to find minimal spanning tree in a weighted graph.



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Unit – IV : Boolean Algebra- Definition, duality, properties of Boolean algebra, Ordered relation in Boolean algebra, Lattices, Homomorphism, Boolean functions and expressions, Conjunctive and Disjunctive normal forms. Fundamental theorem of arithmetic, divisibility in Z , Congruences, Chinese Remainder Theorem.

Unit – V : Generating functions – Discrete numeric function, ordinary generating function, Convolution of sequences, Summation using convolution, counting techniques, Partition of integers, Exponential generating function. Recurrence Relation - First order relation, second order linear homogeneous relation, Third and higher order linear homogeneous relations, Linear non homogeneous relations of second and higher order, Solution of recurrence relations using generating functions. Logic and propositional calculus- propositions, basic logical operations, truth tables, tautologies and contradictions, quantifiers.

Paper – II Advanced Calculus

Teaching : 3 hrs per week

Duration of Examination : 3 hrs

Max. Marks 40 (Science)

53 (Arts)

Note: This paper is divided into THREE Sections A, B, & C. **Section-A** consists TEN short answer type questions. Each question is of 1 mark for Science and 1.5 mark for Arts. All questions are compulsory. **Section-B** consists TEN questions taking two questions from each unit. Each question will carry 3 marks for Science and 4 marks for Arts. Student has to attempt FIVE questions selecting ONE question from each unit. **Section-C** consists FIVE questions taking one questions from each unit. Each question will carry 5 marks for Science and 6 marks for Arts. Student has to attempt ANY THREE questions.

Unit – I : Convergence and Divergence of Infinite Series- Introduction, Tests for convergence, Comparison test, D' Alembert ratio test, Cauchy's n^{th} root test, Raabe's test, De Morgan and Bertrand test, Cauchy's condensation test.

Successive Differentiation- n^{th} derivative of single variable functions, Leibnitz's theorem, Expansion of functions Using Maclaurin's theorem.

Unit – II : Polar Coordinates – Angle between radius vector and tangent, length of perpendicular from pole to the tangent, polar sub tangent and subnormal, Pedal equation of Cartesian and polar curves. Derivatives of arcs- – Cartesian and polar forms. Curvature – Definition, radius of curvature for Cartesian, polar and parametric curves, curvature at the origin, centre of curvature, circle of curvature, chord of curvature. . Partial differentiation, Euler's theorem on homogeneous functions, Total differentiation.

Unit – III : Envelopes – Family of curves, Definition of envelope, Envelopes of Cartesian, polar and parametric curves. **Asymptotes** – Definition, methods to find asymptotes of Cartesian and polar curves, Intersection of curve and its asymptotes. **Maxima and Minima of functions of two or three variables** – Lagrange's condition for two independent variables, Lagrange's method of undetermined multipliers. Singular points, double point, Tracing of Cartesian and polar curves.

Unit – IV : Gamma and Beta functions – Definition, Transformations of Gamma functions, Relation between Beta and Gamma functions, Euler's functional equation, Double multiple formula. **Double Integral**- Evaluation of double integrals, Change of order of integration, **Triple integrals** – Evaluation of triple integrals, Dirichlet's formula for triple integrals.

Unit – V : Rectification- Meaning, lengths of Cartesian and polar plane curves. **Quadrature** – Areas bounded by plane curves (Cartesian and polar), Use of double integrals to find areas. **Volume and Surfaces of solids of revolution**, Pappus theorem, Use of triple integrals to find volumes.

Paper – III Coordinate Geometry and Vector Calculus

Teaching : 3 hrs per week

Duration of Examination : 3 hrs

Max. Marks 40 (Science)

54 (Arts)

Note: This paper is divided into THREE Sections A, B, & C. **Section-A** consists TEN short answer type questions. Each question is of 1 mark for Science and 1.5 mark for Arts. All questions are compulsory. **Section-B** consists TEN questions taking two questions from each unit. Each question will carry 3 marks for Science and 4 marks for Arts. Student has to attempt FIVE questions selecting ONE question from each unit. **Section-C** consists FIVE questions taking one questions from each unit. Each question will carry 5 marks for Science and 6.33 marks for Arts. Student has to attempt ANY THREE questions .

Unit – I : Two Dimensional Coordinate Geometry – Conic sections, Parabola , Ellipse and Hyperbola, Intersection with straight lines, Condition of tangency, Tangent and Normals, Pair of tangents, Chord of contact, Pole and Polar lines, diameter, Parametric coordinates.



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Unit-II : Three Dimensional Coordinate Geometry– Sphere, Plane sections of sphere, Intersection of a sphere with a line, Tangent plane, Plane of contact, Pole and Polar planes, Orthogonality of two spheres, Radical plane, Radical line and Radical centre of sphere. Cone – Definition and equation, Enveloping cone , Representation of cone by a general equation second degree, Tangent plane, Reciprocal cone, Right circular cone.

Unit-III: Cylinder – Definition and Equation of cylinder, Enveloping cylinder, Right circular cylinder. Central Conicoid – Definition and standard equation, Tangent lines and tangent planes , Director sphere, Pole and Polar planes, Enveloping cone and enveloping cylinder, Normals to conicoids, Diameter and diametral planes.

Unit – IV: Generating lines of conicoids- condition for a straight line to be a generator, system of generating lines, properties of generating lines of hyperboloid. Reduction of general equation of second degree- principal planes and principal directions, centre of a conicoid , canonical forms, transfer of origin and rotation of coordinate axes for canonical form.

Unit –V: Vector Calculus – Differentiation and Integration of vector point function, Gradient of scalar point function, Divergence and Curl of vector point functions, Identities on gradient, curl, divergence. Gauss and Stock's theorems(no proofs are required) and their applications.

Practical

Teaching : 2 hours per week

Examination Scheme:

Duration - 2 hours

	Science	Arts
Maximum Marks	30	40
Minimum Pass Marks	11	14
Distribution of Marks:		
Two Exercises one from each group		
10 marks each	= 20 marks	13 marks each = 26 marks
Practical record	= 05 marks	07 marks
Viva-voce	= 05 marks	07 marks
Total Marks	= 30 marks	40 marks

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Group – A : Graphs of some standard functions- x^n (for different value of n), e^x , $\log_e x$,

$\log_a x$ ($a < 1$ and $a > 1$), $\sin x$, $\cos x$, $\tan x$, $\cot x$, $\operatorname{cosec} x$, $\operatorname{sec} x$.

Tracing of Cartesian and polar two dimensional curves.

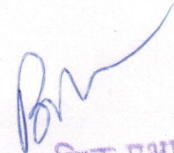
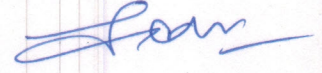
Group – B : Classification and Tracing of conics representing by general equation of second

degree $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$.

Classification of conicoid representing by general equation of second degree

$ax^2 + by^2 + cz^2 + 2fyz + 2gzx + 2hxy + 2ux + 2vy + 2wz + d = 0$

Note :- Each candidate (Regular/Non-collegiate) has to prepare his/her record.



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