



**Maharaja Surajmal Brij University**  
**Bharatpur (Raj)**

**SYLLABUS**  
**MATHEMATICS**

**B. A./B. Sc. Part III**  
*(Annual Scheme)*

*(New)*

**Session 2019-20**

**अकादमिक प्रभारी**  
महाराजा सुरजमल बृज विश्वविद्यालय  
भरतपुर (राज.)

(Total number of pages-5)

**B. A./B. Sc. Part III Examination – 2020**

**Paper – I Modern Algebra**

**Teaching : 3 Hours per Week**

**Duration of Examination : 3 Hours**

**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 :** Subgroups – Complex of a group, subgroup, criterion for a complex to be a subgroup, algebra of complexes, union and intersection of subgroups, cosets of a group, algebra of cosets, index of a subgroup, Lagrange's theorem, Fermet's theorem, subgroups of cyclic group.

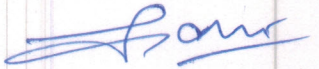
**Unit – II :** Group homomorphism, Isomorphism and Isomorphic groups, properties of homomorphism, Cayley's theorem, Normal subgroups, Simple groups, Properties of normal subgroups, Quotient group or Factor group, Fundamental theorem on homomorphism.

**Unit – III :** Ring, Integral domain and Fields- Definition and their properties, Characteristics of Ring, Integral domain and Field. Subring, Subfield, Prime field and their properties. Ring homomorphism, Embedding of ring and integral domain, Embedding of integral domain in a field, Field of quotients.

**Unit – IV :** Vector Space - Definition and examples of vector/linear space, Elementary properties of vector space, Vector subspaces, Direct sum of subspaces, Linear combination of vectors, Linear span, Linear dependence and independence of vectors, Basis dimensions, properties of finite dimensional vector spaces.

**Unit – V :** Linear transformation or homomorphism, Linear operator, Isomorphism, theorems on isomorphism, Quotient space and its dimensions, Rank and Nullity of linear transformation, Sylvester's law, Matrices of linear maps, Matrices of composition maps, Invertible matrices, Similar matrices, Determinant of matrices and its computations, Characteristic polynomials, Eigen values and Eigen vectors, Cayley-Hamilton's theorem.

  
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**Paper – II Complex Analysis**

**Teaching : 3 Hours per Week**

**Duration of Examination : 3 Hours**

**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 .

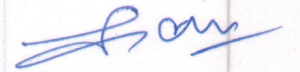
**Unit-I :** Complex plane, curves and regions in complex plane, Jordan curve theorem, Extended complex plane, Steriographic Projection. Complex valued function- limit, continuity, differentiability, Analytic function, necessary and sufficient conditions for a function to be analytic, Harmonic functions, Construction of an analytic function, Milne-Thomson's method. Convergence of power series- absolute convergence, Abel's theorem, Cauchy-Hadamard theorem, circle and radius of convergence of power series.

**Unit-II :** Conformal Mapping- necessary and sufficient conditions for  $w = f(z)$  to represent a conformal mapping,, Bilinear transformation, Elementary mapping:  $w = \frac{1}{2}(z + 1/z)$ ,  $w = z^2$ ,  $w = e^z$ ,  $w = \sin z$ ,  $w = \cos z$ . Analytic continuation, Power series method of analytic continuation.

**Unit-III :** Complex Integration- complex line integral, Cauchy integral theorem, Indefinite integral, Fundamental theorem integral calculus for complex functions, Cauchy integral formula, Analyticity of derivative of an analytic function, Morera's theorem, Poisson integral formula, Liouville's theorem, Maximum Modulus Principal.

**Unit-IV :** Taylor's theorem, Laurent's theorem,, Singularity of an analytic fuction, Branch point, Reimann Theorem, Cassorati Weierstrass theorem, Entire and meromorphic functions, methods of detecting singularities, Zeros and poles of meromorphic functions, Argument principle, Rouche's theorem, Fundamental theorem of algebra.

**Unit-V :** Residue at singularity, Residue at infinity, Calculation of residues, Cauchy Residue theorem, Evaluation of real definite integrals by contour integration.



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**Paper – III Mechanics**

**Teaching : 3 Hours per Week**

**Duration of Examination : 3 Hours**

**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 : Kinematics and Kinetics:** Radial and Transverse Components of Velocity and Acceleration, Angular velocity and acceleration, Tangential and Normal Components of Acceleration, Kinetics: Force and Motion. **Rectilinear Motion:** Simple Harmonic Motion, Hooke's law, Horizontal Elastic String, Vertical Elastic String, Repulsion from a fixed point, Motion under Inverse Square Law.

**Unit-II : Motion in Resisting Medium-** Resistance varies as velocity and square of velocity. **Uniplanar Motion:** Projectile on an Horizontal Plane, Projection to pass through a given point, Projectile on an Inclined Plane. **Constrained Motion:** Motion on a smooth curve in a vertical plane, motion on inside and outside of a smooth circle.

**Unit-III : Central Orbits:** p-r equation, Apses, time in a orbit, Keplar's law of planetary motion. Moment of Inertia- M. I of rod, circular ring, circular disk, rectangular, elliptical and triangular lamina, solid and hollow spheres, solid ellipsoid, Product of Inertia, Theorem of Parallel Axis, Principal Axis, Equipomental Bodies.

**Unit-IV : Equilibrium of a body under Coplanar Forces:** Reduction of System of Coplanar Forces into a Force and a Couple, Equilibrium of body Under Three Forces and more than Three Forces. **Friction:** Force of Friction, Angle of Friction, Coefficient of Friction, Cone of Friction, Limiting Equilibrium on an Inclined Plane, Least Force Required to pull a Body up and down on an inclined rough plane.

**Unit-V : Catenary:** Equation of Common Catenary, Properties of Catenary, Sag of Tightly Stretched Wire. **Virtual Work:** Principle of Virtual Work, Tension in a Strng, Thrust in a Rod, Problems involving Elastic String and Curves, Problems Related to a body or a Frame work resting on a Pags or on Inclined Plane.

  
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## Practicals

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
<b>Total Marks</b>	=	<b>30 marks</b>			<b>40 marks</b>

**Group – A :** C-Language Preliminaries, Operators, Input-Output statements, Conditional statements, Implementing loops in C-programs, Array variables, some elementary programs, Matrix addition, subtraction, multiplication and to find inverse.

**Group – B :** Solution of some Numerical Analysis problems- Numerical Integration, Gauss elimination method to solve system of linear equations, Bisection method, Newton-Raphson method, Euler's method, Runge-Kutta's method using C-programming.

**Note :-**1. Each candidate (Regular/Non-collegiate) has to prepare his/her record.

2. Students have to practice in a computer lab.

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