

B. A./B. Sc. Part III Examination - 2020 <sup>21</sup> onwards

**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,

**Unit - II :** Group homomorphism, Isomorphism and Isomorphic groups, properties of homomorphism, Cayley's theorem, Normal subgroups, Simple groups, Properties of normal subgroups,


**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.

**Unit - IV :** Vector Space - Definition and examples of vector/linear space, Elementary properties of vector space, Linear combination of vectors, Linear span, Linear dependence and independence of vectors, Basis dimensions,

**Unit - V :** Linear transformation or homomorphism, Linear operator, Isomorphism, theorems on isomorphism, Quotient space and its dimensions, Rank and Nullity of linear transformation, Sylveste.'s law,

Characteristic polynomials, Eigen values and Eigen vectors, Cayley-Hamilton's theorem.

Only For Session  
2020-21

  
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Simpson's three-eight rule,

**Unit – III : Numerical solution of algebraic and transcendental equations** - Graphical method, Iterative method, Regula-Falsi method, Newton-Raphson method and their convergences. **Solution of system of linear equations** - Gauss's elimination method, Gauss-Jordan's elimination method, method of triangularisation of matrices,

**Unit – IV : Linear programming problem** - feasible solution, optimal solution, Basic solution, Degenerate and non-degenerate basic solution, Convex sets and their properties, Optimality criterion, Simplex algorithm.

**Unit – V : Duality in linear programming problem** - Dual of l. p. p., use of duality to solve l. p. p. **Transportation problem** - Basic feasible solution and methods to find it, North-west corner rule, least-cost method, Vogel's approximation method, Optimality criterion,

### 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
Total Marks	= 30 marks		40 marks

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**Group – A :** Numerical solution of algebraic and transcendental equations using Bisection method, Secant method, Newton-Raphson method.

Jacobi's method and Gauss-Seidal method to solve system of linear equations.

**Group – B :** Modelling of industrial and engineering problem into linear programming problem , its dual and their solution by simplex method,

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

2. Students can use Non-programmable Scientific Calculators.

3. Student must know all functions and operations of scientific calculator.

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**Unit – III: Differentiability-** Darboux theorem, Rolle's theorem, Algebraic and geometric interpretation of Rolle's theorem, Lagrange's and Cauchy's mean value theorems,

Improper Integrals and their convergence, Comparison test,  $\mu$ -test, Abel's test and Dirichlet's test.

**Unit – IV: Riemann Integration** – partition of an interval, Darboux sums, Lower and Upper Riemann Integrals, Definition of Riemann Integration, Integrability of continuous, discontinuous and monotonic functions, Fundamental theorem of integral calculus, Mean value theorems,

**Unit – V : Uniform convergence of sequence and series of functions,** Cauchy's criterion for uniform convergence,  $M_n$ - test, Weierstrass M-test, Abel and Dirichlet's tests,

Fourier Series – Periodic functions, Dirichlet's conditions, Fourier series in the interval  $(\alpha, \alpha+2\pi)$  and particular cases in the interval  $(0, 2\pi)$ ,  $(-\pi, \pi)$ .

## Paper – II Differential Equation

Teaching : 3 Hours per Week

Duration of Examination : 3 Hours

Max. Marks 40 (Science)

53 (Arts)

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**Unit – I :** Order and degree of differential equations, Differential equations of first and first degree, Method of separation of variables, Homogeneous differential equation, and equations reducible to homogeneous forms, Linear differential equation and equations reducible to linear forms. Exact equation and Differential equations of first order but not of first degree- Differential equations solvable for  $x$ ,  $y$  and  $p$ .

**Unit – II :** Linear differential equations with constant coefficients, Complimentary functions and Particular integrals.

**Paper - II Complex Analysis**

**Teaching : 3 Hours per Week**

**Duration of Examination : 3 Hours**

**Max. Marks 40 (Science)**

**53 (Arts)**

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**Unit-I :** Complex plane, curves and regions in complex plane, Jordan curve theorem, Extended complex plane, 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.

**Unit-II :** Conformal Mapping- necessary and sufficient conditions for  $w = f(z)$  to represent a conformal mapping,, Bilinear transformation, 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, Analytic ty of derivative of an analytic function,

**Unit-IV :** Singularity of an analytic function, Branch point, Reimann Theorem, Cassorati Weierstrass theorem, Entire and meromorphic functions, methods of detecting singularities, Zeros and poles of meromorphic functions

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

Only For Session  
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**Paper - III Mechanics**

**Teaching : 3 Hours per Week**

**Duration of Examination : 3 Hours**

**Max. Marks 40 (Science)**

**54 (Arts)**

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**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,

**Unit-II : Motion in Resisting Medium-** Resistance varies as velocity and square of velocity.


Constrained Motion: Motion on a smooth curve in a vertical plane, motion on inside and outside of a smooth circle.

**Unit-III :** 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, Equipmental Bodies.

**Unit-IV :** Friction: Force of Friction, Angle of Friction, Coefficient of Friction, Cone of Friction, Limiting Equilibrium on an Inclined Plane,

**Unit-V :** Catenary: Equation of Common Catenary, Properties of Catenary, Virtual Work: Principle of Virtual Work, Tension in a String, Thrust in a Rod, Problems involving Elastic String and Curves,

Only 7<sup>th</sup> Session  
2020-21

  
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## Practicals

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Duration - 2 Hours

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Total Marks	=	30 marks			40 marks


Group - A : C-Language Preliminaries, Operators, Input-Output statements, Conditional statements, Implementing loops in C-programs, Array variables, Matrix addition, subtraction,

Group - B : Numerical Integration, Gauss elimination method to solve system of linear equations, Bisection method, Newton-Raphson method,

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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