

## B.Sc./B.A. Part III Examination 2022

### TEACHING AND EXAMINATION SCHEME

Subject/Paper	Period/Week		Exam. Hours	Max Marks	Min.Pass Marks
	L	P			
<b>MATHEMATICS</b>					
Paper I	3	-	3	75	} 81
Paper II	3	-	3	75	
Paper III	3	-	3	75	

**B.Sc./B.A. Part III Examination 2022**  
**MATHEMATICS**

**Paper I** : **Abstract Algebra**  
**Paper II** : **Analysis and Laplace Transforms**  
**Paper III** : **Mechanics II (Dynamics of Rigid Bodies and Hydrostatics)**

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**Total Marks: 75**

**Time: 03:00 Hrs.**

**Paper I**  
**Abstract Algebra**

**Note:** Each theory paper is divided in three parts i.e. Section – A, Section – B and Section – C

**Section A:** Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry 2 marks.

**Section B:** Will consist of 10 questions. Each unit will be having two question; students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question will carry 5 marks.

**Section C:** Will consist of total 05 questions one from each unit. Students will answer any 03 questions and answer of each question shall be limited up to 500 words. Each question will carry 10 marks.

**Unit 1:** Definition and example of groups. General properties of groups, Order of an element of a group. Permutations : Even and Odd permutations. Groups of permutations. Cyclic group, Isomorphism, Isomorphism of cyclic groups, Cayley's theorem.

**Unit 2:** Subgroups, Cosets, Lagrange's theorem, Product Theorem of subgroups, Conjugate elements, conjugate complexes, Centre of a group, Normaliser of an element and of a complex. Normal subgroups, quotient Groups, Commutator subgroup of a group. Homomorphism, Fundamental theorem of homomorphism.

**Unit 3:** Definition and kinds of rings, Integral domain, Division ring, Field, Subring of a ring, Subfield of a field. Characteristic of a ring and field.

**Unit 4:** Ideals of a ring, Quotient rings, Prime fields, Prime ideals, Field of quotients of an integral domain, Definition and examples of a vector space, subspace of a vector space, Linear combination and linear space, Linear dependence and independence of vectors. Direct product of vector spaces and internal direct sums of subspaces.

**Unit 5:** Bases and dimension of a finitely generated spaces, Quotient space, Isomorphism, Linear transformation (Homomorphism), Rank and nullity of linear transformation.

**SUGGESTED BOOKS**

G.C. Sharma: Modern Algebra; Ram Prasad & Sons, Agra.  
J.L. Bansal & S.L. Bhargava : Abstract Algebra (Hindi Ed. ); Jaipur Publishing House, Jaipur.  
R.S. Agarwal. : Text Book on Modern Algebra; S. Chand & Co., New Delhi.  
D.C. Gokhroo & S.R.Saini : Abstract Algebra (Hindi Ed. ); Jaipur Publishing House, Jaipur.

**Total Marks: 75**

**Time: 03:00 Hrs.**

**Paper – II**  
**Analysis and Laplace Transforms**

**Note:** Each theory paper is divided in three parts i.e. Section – A, Section – B and Section – C

**Section A:** Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry 2 marks.

**Section B:** Will consist of 10 questions. Each unit will be having two question; students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question will carry 5 marks.

**Section C:** Will consist of total 05 questions one from each unit. Students will answer any 03 questions and answer of each question shall be limited up to 500 words. Each question will carry 10 marks.

**Unit 1 :** Dedekinds theory of real numbers. Linear sets. Upper and Lower bounds, Limiting points, Weierstrass's theorem. Derived sets, Enumerable Sets, Open and Closed sets.

**Unit 2 :** Theory of Riemann integration, Darboux theorem. Fundamental theorem of integral calculus, Mean value theorem of integral calculus.

**Unit 3 :** Functions, Limits, and continuity. Differentiability, Concept of an analytic function, Cartesian and Polar form of Cauchy-Riemann equations. Harmonic function, Conjugate function, Laplace's differential equations, Orthogonal system, Construction of analytic functions. Power Series: Absolute convergence of power series, circle and radius of convergence of power series, sum function of a power series.

**Unit 4:** Basic definition and Properties of complex integration Complex integration as the sum of two line integrals, Inequality for complex integrals. Curves in complex plane, Cauchy-Goursat theorem, Connected regions, Indefinite integral (or Anti Derivative). Derivative of Single-valued functions  $F(z)$ . Cauchy's integral formula, Extension of Cauchy's integral formula to multiconnected, regions, Cauchy's integral formula for the derivative of an analytic function, Successive derivative of an analytic function, Morera's Theorem. Liouville's Theorem, Poisson's integral formula.

**Unit 5:** Laplace Transforms and Inverse Laplace Transforms. Laplace transforms of derivatives and integrals. Shifting theorems. Convolution theorem. Applications of Laplace Transform to the solution of differential equations.

**SUGGESTED BOOKS**

Shanti Narayan: Real Analysis; S.Chand & Co., New Delhi.

G.N.Purohit: Real Analysis; Jaipur Publishing House, Jaipur.

S.L. Bhargava, S.P. Goyal: Real Analysis (Hindi Ed.); Jaipur Publishing House, Jaipur.

D.C. Gokhroo, S.R. Saini, J.P.N. Ojha: Real Analysis (Hindi Ed.); Jaipur Publishing House, Jaipur.

Shanti Narayan: Theory of Functions of a Complex Variable; S.Chand & Co., New Delhi.

K.P.Gupta : Complex Analysis; Pragati Prakashan; Meerut

D.C. Gokhroo, S.R. Saini & G.R. Yadav: Complex Analysis (Hindi Ed.); Navkar Publication, Ajmer

G.N. Purohit: Complex Analysis; Jaipur Publishing House, Jaipur.

S. Ponnusamy: Foundations of Complex Analysis, Narosa Publishing House, Bombay, New Delhi.

V. Karunakaran: Complex Analysis, Narosa Publishing House. Bombay, New

Delhi (2002).

N. Levinson and R.M. Redheffer: Complex Variables, Tata McGraw-Hill Publ. Co. Ltd., New Delhi (1980).

**Total Marks: 75**

**Time: 03:00 Hrs.**

### ***Paper III***

#### **Mechanics – II**

#### **(Dynamics of Rigid Bodies and Hydrostatics)**

**Note:** Each theory paper is divided in three parts i.e. Section – A, Section – B and Section – C

**Section A:** Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry 2 marks.

**Section B:** Will consist of 10 questions. Each unit will be having two question; students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question will carry 5 marks.

**Section C:** Will consist of total 05 questions one from each unit. Students will answer any 03 questions and answer of each question shall be limited up to 500 words. Each question will carry 10 marks.

**Unit 1:** Moments and Products of inertia. D'Alembert's principle, the general equations of motion of a rigid body, Motion of the center of inertia and motion relative to the center of inertia. Motion about a fixed axis under finite forces.

**Unit 2:** The compound Pendulum. Reaction of the Axis of rotation. Motion of a rigid body in two dimension under finite forces.

**Unit 3:** Fluids and Fluid Pressure, homogeneous and heterogeneous fluids, Surface of equal pressure, fluid at rest under action of gravity, Fluid pressure on Plane surfaces.

**Unit 4:** Centre of pressure, resultant pressure on curved surfaces.

**Unit 5:** Equilibrium of floating bodies, Centre of buoyancy, Surface of buoyancy. Stability of equilibrium of floating bodies, Meta Centre.

#### **SUGGESTED BOOKS**

S.L. Loney : Rigid Body Dynamics; Cambridge Univ. Press.

P.P.Gupta : Rigid Body Dynamics, Vol.I; Krishna Prakashan, Mandir; Meerut

J.L.Bansal: Rigid Body Dynamics; Jaipur Publishing House, Jaipur.

B.N.Prasad: Hydrostatics; Krishna Prakashan, Mandir; Meerut

S.M. Mathur : A Text Book of Hydrostatics; Ramesh Book Depot, Jaipur.

Sharma, D.C. Gokhroo, S.R. Saini, S.M.Agarwal.: Elements of Hydrostatics; Jaipur Publishing House, Jaipur.