Raj Rishi Bhartrihari Matsya University Alwar

SYLLABUS

SCHEME OF EXAMINATION AND COURSE OF STUDY

FACULTY OF SCIENCE

B.Sc. MATHEMATICS (HONOURS) (ANNUAL SCHEME)

EXAMINATION 2017-2018 AND ONWARDS

MATHEMATICS

Appendix-I

B.Sc. Honours Part – I – 2017-2018 and ownwards

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 Science – 180		Max. Marks 450	
			Duration	**Max.Marks**
Paper – I	Discrete Mathematics		3 hrs.	100
Paper – II	Calculus		3 hrs.	100
Paper – III	Three Dimensional Geometry and Optimization Theory		3 hrs.	100
Practical	Optimization Techniques		2 hrs.	50
Paper - IV	Number Theory		3 hrs.	100

Note:

1. Common paper will be set for both the Faculties of Social Science and Science. However, the marks obtained by the candidate in the case of Faculty of Social Science will be converted according to the ratio of the maximum marks of the papers in the two Faculties.

2. 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 Local Head/Head, Department of Mathematics in the college.

3. An Internal/external examiner can conduct Practical Examination of not more than 100 (Hundred) Candidates (20 Candidates in one batch).

4. Each candidate has to pass in Theory and Practical examinations separately.

Paper – I: Discrete Mathematics
Teaching : 3 Hours per Week
Duration of Examination : 3 Hours   Max. Marks: 100

Note: Syllabus of this paper is divided into five units. This paper contains 11 questions. Candidates are required to attempt only 9 questions. Question no. 1 to 6 are compulsory and any three questions from question no. 7 to 11. First question contain ten parts of very short answer type, two parts from each unit. Each part carries two marks. Questions no. 2 to 6 (five short answer type question) one from each unit. Each carries seven marks. Questions no. 7 to 11 are five big questions, one from each unit. Each carries fifteen marks.

Unit 1: Boolean Algebras- Lattices and Algebraic structure, Duality, Distributive and Complemented Lattices. Boolean Lattices, Boolean functions and expressions. Fundamental theorem of arithmetic, divisibility in Z, Congruences, Chinese Remainder Theorem, Euler's phi-function, primitive roots.

Unit 2: Logic and Propositional Calculus, Propositions, Simple and compound, Basic Logial operations, Truth tables, Tautologies and contradictions, Propositional Functions, quantifiers. Discrete numeric functions and Generating functions. Recurrence relations and Recursive Algorithms – Linear Recurrence relations with constant coefficients. Homogeneous solutions. Particular solution. Total solution. Solution by the method of generating functions.

Unit 3: Graphs – Basic terminology, Multigraphs, Weighted graphs, Paths and circuits, Shortest paths, Eulerian paths and Circuits. Travelling Salesman problem. Union, Join, Product and composition of graphs. Planar graphs and Geometric dual graphs.

Unit 4: Trees – Properties, Spanning tree, Binary and Rooted tree.
Digraphs – Simple digraph, Asymmetric digraphs, Symmetric digraphs and complete digraphs. Digraph and Binary relations. Matrix representation of graphs and digraphs.

Unit 5: Numerical ability: Numbers and simplifications, Divisibility, H. C. F and LCM of Number, Average, Percentage, Calender, Clocks, Binary System, Profit and Loss, Ratio and Proportion, Races and Games, Alligation Or Mixture, Time, Time and Work, Speed and Distance, Pipes and Cisterns, Trains, Streams and Boats, Surds and Indices, Fractions, Logarithms.

Paper- II: Calculus
Teaching : 3 Hours per Week
Duration of Examination : 3 Hours   Max. Marks: 100

Note: Syllabus of this paper is divided into five units. This paper contains 11 questions. Candidates are required to attempt only 9 questions. Question no. 1 to 6 are compulsory and any three questions from question no. 7 to 11. First question contain ten parts of very short answer type, two parts from each unit. Each part carries two marks. Questions no. 2 to 6 (five short answer type question) one from

each unit. Each carries seven marks. Questions no. 7 to 11 are five big questions, one from each unit. Each carries fifteen marks.

Unit 1: Series – Infinite series and Convergent series. Tests for convergence of a series – Comparison test, D'Alembert's ratio test, Cauchy's n-th root test, Raabe's test, De-Morgan-Bertrand's test, Cauchy's condensation test, Gauss's test, (Derivation of tests is not required). Alternating series. Absolute convergence. Taylor's theorem. Maclaurin's theorem. Power series expansion of a function. Power series expansion of $\sin x$, $\cos x$, e^x, $\log_e(1+x)$, $(1+x)^n$.

Unit 2: Derivative of the length of an arc. Pedal equations. Curvature – Various formulae, Centre of curvature and Chord of curvature. Partial differentiation. Euler's theorem for homogeneous functions. Chain rule of partial differentiation. Total differentiation, Differentiation of implicit functions.

Unit 3: Envelopes, Maxima and Minima of functions of two variables. Lagrange's method of undetermined multipliers. Asymptotes. Multiple points. Curve tracing of standard curves (Cartesian and Polar curves).

Unit 4: Beta and Gamma functions, Reduction formulae (simply standard formulae), Double integrals in Cartesian and Polar Coordinates, Change of order of integration. Triple integrals. Dirichlet's integral.

Unit 5: Areas, Rectification, Volumes and Surfaces of solids of revolution.

Paper-III: Three-Dimensional Geometry and Optimization Theory
Teaching : 3 Hours per Week
Duration of Examination : 3 Hours   **Max. Marks:**   **100**

Note: Syllabus of this paper is divided into five units. This paper contains 11 questions. Candidates are required to attempt only 9 questions. Question no. 1 to 6 are compulsory and any three questions from question no. 7 to 11. First question contain ten parts of very short answer type, two parts from each unit. Each part carries two marks. Questions no. 2 to 6 (five short answer type question) one from each unit. Each carries seven marks. Questions no. 7 to 11 are five big questions, one from each unit. Each carries fifteen marks.

Unit 1: polar equation of conics, polar equation of tangent, normal and asymptotes, chord of contact, auxiliary circle, dircector circle of conics.

Unit 2: Sphere, Cone.

Unit 3: Cylinder, Central Conicoids – Ellipsoid, Hyperboloid of one and two sheets, tangent lines and tangent planes, Direct sphere, Normals.

Unit 4: Generating lines of hyperboloid of one sheet system of generating lines and its properties. Reduction of a general equation of second degree in three-dimensions to standard forms.

Unit 5: The linear programming problem. Basic solution. Some basic properties and theorems on convex sets.. Fundamental theorem of L.P.P. Theory of simplex method only Duality. Fundamental theorem of duality, properties and elementary theorems on duality only.

Paper-IV: Number Theory
Teaching : 3 Hours per Week
Duration of Examination : 3 Hours   **Max. Marks:**   **100**

Note: Syllabus of this paper is divided into five units. This paper contains 11 questions. Candidates are required to attempt only 9 questions. Question no. 1 to 6 are compulsory and any three questions from question no. 7 to 11. First question contain ten parts of very short answer type, two parts from each unit. Each part carries two marks. Questions no. 2 to 6 (five short answer type question) one from each unit. Each carries seven marks. Questions no. 7 to 11 are five big questions, one from each unit. Each carries fifteen marks.

Unit 1: Divisibility – Division Algorithm, g.c.d. the Euclidean algorithm. l.c.m., Prime, Infinitude of primes, Fundamental theorem of Arithmetic. Fibonacci sequence.

Unit 2: Congruence – Linear congruence, Fermat, Little and Wilson's theorems. Fermat's last theorem, Euler's factorization, Mersenne's factorization.

Unit 3: Number theoretic functions, τ and σ-functions, the Mobius function, Greatest integer function, Euler phi function and the properties of Phi function. Application to Cryptography.

Unit 4: Diophantine equations – $ax + by = c$, $ax + by + cz = d$, $x^2 + y^2 = z^2$, $x^4 + y^4 = z^4$. General Integers solution of the equation $x^2 + y^2 + z^2 = w^2$ $(x,y,z,w = 1)$.

Unit 5: Quadratic residues, Quadratic reciprocity. Quadratic congruence. Primitive roots for primes. Composite numbers having primitive roots. Theory of indices.

Reference Books:

1. S.Telang and M. Nadkarni, Number Theory, Tata McGraw-Hill, 2001.
2. David M. Burton, Elementary Number Theory (6th Edition). Tata McGraw-Hill Edition, Indian reprint. 2007.
3. I. Niven and H. Zukerman. An Introduction to the theory of Numbers, Wiley Eastern University Edition, New Delhi, 1985.
4. Neville Robinns. Beginning Number Theory (2nd Edition). Narosa Publishing House Pvt. Limited. Delhi. 2007.

Practical: Optimization Techniques
Teaching: 2 Hours per Week per Batch
(20 Candidates in each Batch)

Examination: **Duration: 2 Hours**
Scheme: Max.Marks   50
Min.Pass Marks   18
Distribution of Marks:
Two Practicals one from each group

15 Marks each	=	30 Marks
Practical Record	=	10 Marks
Viva-voce	=	10 Marks
Total Marks	=	50 Marks

Group A: Modelling of industrial and engineering problems in to mathematical LPP and its dual and their solution by Simplex Method.

Group B: Modelling of industrial and engineering problems into
(i)Assignment Problems and (ii) Balanced and unbalanced Transportation Problems.
and their solution

Note:

1. Problems will be solved by using Scientific Calculators (non-Programmable)
2. Candidates must know about all functions and operations of Scientific Calculator.
3. Each Candidate (Regular/non-Collegiate) has to prepare his/her practical record.
4. Each Candidate has to pass in Practical and Theory examinations separately.
5. Non Collegiate candidates are required to take practice certificate of 21 days (2 hours per day.)