2018-19

Raj Rishi Bhartrihari Matsya University Alwar

MATHEMATICS

Appendix-II

B.Sc. Honours Part – II – 2018-2019 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	Duration	Max. Marks 450 Max.Marks
Paper – I	Real Analysis and Metric Space	3 hrs.	100
Paper – II	Differential Equations	3 hrs.	100
Paper – III	Numerical Analysis Vector Calculus	3 hrs.	100
Practical	Numericl Techniques	2 hrs.	50
Paper - IV	Operations Research	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.

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Paper – I: Real Analysis and Metric Space
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: Real numbers as complete ordered field, Limit point, Bolzano-Weierstrass theorem, Closed and Open sets, Union and Intersection of such sets. Concept of compactness. Heine-Borel theorem. Connected sets.
Real sequences- Limit and Convergence of a sequence, Monotonic sequences.

Unit 2: Cauchy's sequences, Subsequences, Cauchy's general principle of convergence. Properties of continuous functions on closed intervals. Properties of derivable functions, Darboux's and Rolle's theorem.

Unit 3: Notion of limit and continuity for functions of two variables.
Riemann integration – Lower and Upper Riemann integrals, Riemann integrability, Mean value theorem of integral calculus, Fundamental theorem of integral calculus,

Unit 4: Sequence and series of functions – Pointwise and Uniform convergence, Cauchy's criterion, Weierstrass M-test, Abel's test, Dirichlet's test for uniform convergence of series of functions, Uniform convergence and Continuity of series of functions, Term by term differentiation and integration.
Metric space – Definition and examples, Open and Closed sets, Interior and Closure of a set, Limit point of a set.

Unit 5: Subspace of a metric space, Product space, Continuous mappings, Sequence in a metric space, Cauchy sequence. Complete metric space, Baire's theorem, Compact sets and Compact spaces, Connected metric spaces.

Paper – II: Differential Equations
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

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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: Degree and order of a differential equation. Equations of first order and first degree. Equations in which the variables are separable. Homogeneous equations and equations reducible to homogeneous form. Linear equations and equations reducible to linear form. Exact differential equations and equations which can be made exact.

Unit 2: First order but higher degree differential equations solvable for x,y and p. Clairaut's form and singular solutions with Extraneous Loci. Linear differential equations with constant coefficients, Complimentary function and Particular integral.

Unit 3: Homogeneous linear differential equations, Simultaneous differential equations. Exact linear differential equations of nth order. Existence and uniqueness theorem.

Unit 4 : Linear differential equations of second order. Linear independence of solutions. Solution by transformation of the equation by changing the dependent variable/the independent variable, Factorization of operators, Method of variation of parameters, Method of undetermined coefficients.

Unit 5: Partial differential equations of the first order. Lagrange's linear equation. Charpit's general method of solution. Homogeneous and non-homogeneous linear partial differential equations with constant coefficients. Equations reducible to equations with constant coefficients.

Paper – III: Numerical Analysis and Vector 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.

Non-Programmable Scientific Calculators are allowed.

Unit 1: Differences. Relation between differences and derivatives. Differences of a polynomial. Newton's formulae for forward and backward interpolation. Divided differences. Newton's divided difference, Lagrange's interpolation formula.

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Unit 2: Central differences.Gauss's, Stirling's and Bessel's interpolation formulae. Numerical integration, Derivations of general quadrature formulas, Trapazoidal rule, Simpson's one-third, Simpson's three-eighth (derivation of formulae only) and Gauss's quadrature formulae.

Unit 3: Quantitative comparison. Reasoning (Including series formation, lettler series, Symbol Series, Coding-Decoding, Ranking and Arrangements, Puzzles). Non Verbal Reasoning (Including Figural Series, Figural Analogy, Figural Calssification, Grouping of Figures, Counting of Figures, Figural Matrix, Figure Completion, Formation of Figures, Embedded Figures).

Unit 4: Scalar and Vector point functions. Differentiation and integration of vector point functions. Directional derivative. Differential operators. Gradient, Divergence and Curl.

Unit 5: Theorems of Gauss, Green, Stokes (without proof) and problems based on these theorems.

Practical: Numerical 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: Numerical integration using Trapezoidal and Simpson's rules.Numerical solution of Algebraic and Transcendental equations using
)i) Bisection method, (ii) Regula-Falsi method. (iii) Iteration method (iv) Newton-Raphson Method.

Group B: Numerical Solution of system of linear equations by Gauss elimination, Jacobi and Guass-Seidel methods. Solution of linear differential equations of first order and first degree with initial and boundary condition using Picard's, Euler, Modified Euler's method. Runge-Kutta Fourth order method.

Note:

1. Problems will be solved by using Scientific Calculators (non-Programmable)

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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.)

Paper – IV: Operations Reserch
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 : Theory of Games- Introduction, Basic definitions, Minimax (Maximin) criterion and Optimal strategy, Saddle point, Minimax-maximin principle for mixed strategy games, Fundamental theorem of Games theory. Two-by – two games without saddle point, Arithmetic method for 2x2 games, Graphical method for 2xn and nx2 games.

Unit 2: Probability theory – Probability distribution of a random variable. Standard deviation, variance, mathematical expectation, Binomial, Poisson and Normal distribution.

Unit : 3 Inventory model-definition, types of inventory models

Unit: 4 Queucing Theory-Introduction, Probability diatributions in queueing systems. Models-Erlang model, general Erlang model, Model III (M/M/I): (N/FCFS).

Unit: 5 Sequening Models: Sequening problems, processing n jobs through two machines. Processing n jobs through three machines, processing two jobs through m machines and processing n jobs through shortest cyclic Route Models. Minimal path problem (shortest Acyclic Route Models).

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