Revised ~~SYA~~ SYLLABUS
From Honours and Subsidiary
Session 2015 — 2018.

RANCHI WOMEN'S COLLEGE,

RANCHI

(Autonomous College)

· Constituent Unit

of

Ranchi University, Ranchi

MATHEMATICS-- Honours

Undergraduate Syllabus

Session 2015 — 2018

RANCHI WOMEN'S COLLEGE, RANCHI

(AN AUTONOMOUS UNIT OF RANCHI UNIVERSITY FROM 2012)

DEPARTMENT OF MATHEMATICS

COURSES OF STUDY FOR MATHEMATICS HONOURS

Number of Papers - 16

Full Marks - 1600

Number of Semester - 6

B.Sc. Honours Part – I : 400 Marks.

B.Sc. Honours Part – II : 400 Marks.

B.Sc. Honours Part –III : 800 Marks.

Ranchi Women, College , Ranchi

Department Of Mathematics

Meeting for Revision of Syllabus of B.Sc (Mathematics Hons)B.A/ B.Sc Course for the session 2015-2018

A meeting of the Board of Studies was held on 24/07/15 in the department of Mathematics Ranchi Women's College to revise the course structure of B.A/B.Sc (Mathematics Hons) Three Years Degree course (six semesters) to be interfused to the session 2015 -2018. The following members were present in the meeting

1. Dr. K. C. Prasad, Ex Prof. and Head P.G. Deptt. of Mathematics — Expert K. C. Prasad
2. Dr. N.K Agrawal Univ. Prof. P.G. Deptt. of Mathematics — Expert 24.07.2015
3. Dr. A.K Mahto Prof. and Head P.G. Deptt. of Mathematics — Expert
4. Dr. Tej Kaur Head Deptt. of Mathematics R.W. C — Member T. Kaur
5. Dr, Rita Mazumadar Associate Prof. Deptt. of Mathematics R.W.C — Member Rita Mazumdar 24.7.15
6. Dr. Asha Lata Keshri Assistant Prof. Deptt. of Mathematics R.W.C — Member 24.7.15
7. Mrs. Nanda Banerjee Assistant Prof. Deptt. of Mathematics R.W.C — Member 24/7/15

The board reviewed the syllabus and some minor changes were made and if was decided to Impliment the syllabus from the session 2015-2018

K. C. Prasad

24.07.2015

T. Kaur

Rita Mazumdar 24.7.15

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Summary of syllabus of B.Sc (Honours) in Mathematics

Year	Semester	Paper	Contents	Full Marks	Mid Sem	End Sem	Pass Marks	Lectures
1st	I	I	Differential Calculus,Discrete Mathematics, Trigonometry	100	20	80	45	60
		II	Coordinate Geometry of two dimension,integral Calculus I,Vector Calculus	100	20	80	45	60
	II	III	Matrices ,Theory of Equation ,Integral Calculus II	100	20	80	45	60
		IV	Analitical Geometry of 3 dimentions,Topology of the Real line Higher Arithmetic	100	20	80	45	60
2nd	III	V	Group Theory, Real Analysis I, Statics	100	20	80	45	60
		VI	Set theory, Complex Analysis	100	20	80	45	60
	IV	VII	Linear Algebra , Game Theory, Fourier Series& Integral Transforms	100	20	80	45	60
		VIII	Dynamics, Differential Equation I, Analysis	100	20	80	45	60
3rd	V	IX	Real Analysis II (advanced Integral Calculus), Abstract Algebra.	100	20	80	45	60
		X	Metric Space , Special Functions	100	20	80	45	60
		XI	Numeri cal Analysis , Basics of Computer Science & Programming.	100	20	80	45	60
		XII	Statics , Dynamics	100	20	80	45	60
	VI	XIII	Statistics and Probability , Linear Algebra	100	20	80	45	60
		XIV	Fluid Mechanics , Graph theory	100	20	80	45	60
		XV	Partial Differential Equation , Mathematical Modelling	100	20	80	45	60
		XVI	Operation Research, Computer based Numerical and Statistical Techniques	100	20	80	45	60

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Syllabus for Three years
Bachelor of Science/ Arts Course
Mathematics Honours

B.Sc.(Hons.)Part I

Answer ~~eight~~ EIGHT Questions from Group A and ~~eight~~ EIGHT Questions from Group B
Each question in Group A contains 2 marks and each question in group B contains 8 marks.

Semester I

Paper-I
TIME:3 HRS **FULL MARKS:80** **PASS MARKS:36**

Module A
DIFFERENTIAL CALCULUS [Q—6/ L—30]

A1: Successive Differentiation, Leibnitz theorem, Expansions, Partial Differentiation, Taylor's Theorem for functions of two variables, Jacobians [Q- 2]
A2: Tangents and normals, Curvature [Q- 2]
A3 : Asymptotes, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.[Q- 2]

Module –B
DISCRETE MATHEMATICS [Q --3 /L-15]

B:1 Logic : Logical connectives, Negation, Quatifiers, Compound statements, Thruth tables(Q-1)
B:2 Lattice :Definition and properties, sub-lattice, types of lattice, Distributive and Complemented lattice, Complete lattice (Q-1)
B:3 Boolean algebra: Definition, Duality, Sub-algebra ,Boolean Algebra as lattice, Boolean functions and expressions. Switching circuits (Q-1)

Module C
TRIGONOMETRY [Q-3/ L-15]

C 1: De-Moivre's theorem, Trigonometric and exponential Functions of complex arguments and Hyperbolic functions [Q- 2]
C 2: Summation of trigonometric series [Q- 1]

Books Recommended:

1. Differential calculus by J.Edward /Das and Mukherjee /Lalji Prasad.
2. Discrete Mathematics – Kenneth and Rosen
3. Schaum,s outlines Discrete Mathematics Semour, R.Lipschitz and Lipson TMH
4. Trigonometry by Das and Mukherjee//Laljee Prasad .

Paper II
Time: 3 hrs **Full marks:80** **Pass marks:36**

Module A
CO-ORDINATE GEOMETRY OF 2 DIMENSIONS [Q- 5 / L- 25]

A1:Change of rectangular Axes, Conditions for the general equation of second degree to represent Parabola, Ellipse and Hyperbola and reduction to standard forms. [2 – Q]
A2: Equations of tangents and normals (using Calculus) chord of contact, pole, polar and pair of tangents. [1-Q]
A3: Axes, center, Director circle in reference to general equation of conics (1 question)
A4: Polar Equation of conics. [1- Q]

Module B
INTEGRAL CALCULUS [Q- 4 /L-20]

B1: Integration of rational and irrational function, Evaluation of definite integrals, Reduction formulae, Differentiation and integration under the sign of integration [2-Q]
B2: Point of inflexion, Double point, curve tracing, length and area. [2- Q]
Module C
VECTOR CALCULUS (Q 3 / L-- 15]

C:1 :Product of three and four vectors. [1- Q]
C2:Point functions, Differentiation of a vector function of a scalar variable, Gradient, Divergence and Curl and second order operations in cartesian co-ordinate system [2Q]
Books Recommended:

1. Coordinate Geometry: Askwrith/J.Jha
2. Integral Calculus: Das and Mukherjee/ Lalji Prasad.
3. Vectors: Vector Calculus by Shanti Narayan/Jha and Das/
4. Lalji Prasad/Das Gupta and Prasad.
5. Mathematical Analysis-- Mallik and Arora for Double and Triple integral.

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Semester II

Paper –III
Time: 3 hrs **Full marks:80** **Pass marks:36**

Module -A
MATRICES [Q – 4/ L- 20]

A:1Preliminaries,Transpose, Conjugate, Special types (Singular,non-singular)Symmetric,Non-symmetrc,Hermitian,Skew-Hermitian,Orthogonal and unitary.Algebra of matrices:Scalar multiplication,addition,multiplication,Laws of operation [Q—1]
A:2 Adjoint, Inverse, Partitioning, characteristic equation, Caley Hamilton theorem
[Q-1]
A:3 Rank,Elementary transformation, normal form. Elementary matrice, rank of sum and product, Equivalent of matrces, criteria for equivalence [Q-1]

Module -B
THOERY OF EQUATION [Q- 4 / L-20]

B:1 Relation of root and their symmetric function with co-efficient [Q—I]
B:2 Transformation of equation, Descarte's rule of signs [Q-1]
B:3 Cordon's solution of a cubic equation [Q-1]
B:4 Descarte's solution of a biquadratic equation [Q-1]

Module C
INTEGRAL CALCULUS[Q- 4 / L-20]

C:1 Volumes and surface area of solids of revolution. [Q -2]
C: 2 Double and triple Integrals [Q-2]

Books recommended:

1. Real Analysis- K.K.Jha
2. Theory of equation-Burside and Penton / M.L.Khanna
3. Higher Algebra-Hall & knight
4. Mathematical Analysis-- Mallik and Arora for double and Triple integral .

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Paper –IV
Time:3 hrs **Full marks:80** **Pass marks-36**

Module -A
ANALYTICAL GEOMETRY OF THREE DIMENSION,[Q--4/ L-20]

A:1 Rectangular,spherical, Polar,Cylindrical co- ordinates.Direction cosines, Angle between two str. Lines, [Q—1]
A:2 Equation of planes and str. Lines , Shortest distance between lines. [Q-1]
A:3 Sphere ,Cone Cylinder [Q-2]

Module B
TOPOLOGY OF THE REAL LINE [Q—3/L- 15]

B1:Fundamental and Algebraic properties of the set of real numbers: Completeness properties, Archemedean property,Identity theorem,density theorem. [Q—1]
B2:Concept of lower bounds and upper bounds,propertie of open sets,closed sets,neighbourhood,interior and limiting points and Balzano Weirstrass theorem [Q-1]
B3:Compact sets and their properties,Heine borel theorem.[Q—1]

Module -C
HIGHER ARITHMETIC [Q-5/ L - 25]

C:1 Divisbility.H.C.F. Primes & Unique factorization [Q—1]
C:2 Residue class, complete and reduced residue system, congruence and their properties, Format's theorem and Wilson's theorem[Q—2]
C3Arithmetical Function p(n) and u(n),Mobius inversion formula.[Q—1]
C4 Algebraic congruence. Solution by Inspection, solution of ax=b(modus). Chinese Remainder theorem [Q-1]

Books recommended:

1. Analytical Geometry of two dimension.J.Jha/Shanti Narayan
2. Introduction to Number theory:Niven Even & Zuckermann .
3. Higher Real analysis by Dr. K. K. Jha.

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B.Sc (Hons)Part-II

Answer **eight** Questions from Group A and **eight** Questions from Group B
Each question in Group A contains 2 marks and each question in group B contains 8 marks.

Semester –III

Paper---V
Time:3 hrs **Full marks:80** **Pass marks-36**

Module -A
GROUP THEORY [Q—4 / L—20]

A:1 Groups,Preliminary results,Equivalent Definitions,subgroups [Q—1]
A:2 Cyclic subgroups , Lagrange's theorem,Permutations,Symmetric and Alternating Groups[Q—1],
A:3 Normal subgroups, Quotient Groups [Q-1]
A:4 Homomorphism , Isomorphism , Automorphism of groups [Q—1]

Module B
REAL ANALYSIS [Q- 5 / L-25]

B:1 Limit of a sequence,monotonic sequene and their convergence,
Lim sup&Lim.inf. Subsequence, algebraic operations and limit, Cauchy sequence,General principle of convergence [Q—2]
B:2 Notion of convergent and divergent series of positivel term ,comparison tests,Cauchy's root test, D'Alembert's ratio test. D' Morgan and Bertrand test. Cauchy condensation test, Gauss's ratio test. [Q-2]
B:3Alternating series and Leibnitz test. Absolutely convergent series. [Q—1]

Module –C
STATICS [Q - 3 /L -15]
C:1 Reduction of system of coplanar forces, equation of resultant, condition for equilibrium .Astatic equilibrium and center[Q—2].
C:2 Laws ,Angles and Cone of friction, equilibrium on a rough inclined plane,particle constrained to move on a rough curve under any given forces.[Q-1].

Books Recommended:

1. Group Theory—Surjeet Singh/A.R.Vashishtha
2. Real Analysis –Dr. K.K.Jha/ Dr. A Dasgupta.
3. Mecahnics - Singh and Sen.

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Paper VI
Time:3 hrs **Full marks:80** **Pass marks-36**

Module A
SET THEORY[Q- 6 / L-30]

A1: Indexed family of sets, Generalised Set Operations & Demorgan's laws,Set Mappings [Q-1]
A:2 Equivalence relations and related fundamental theorem on partitions [Q-1]
A:3 Bijection :Countable and uncountable sets.[Q-1]
A:4Domination & Cardinality :Cantor,s Theorem,Cardinal Arithmetic, Schroeder –Bernstein theorem,Cardinality of power of a set. Continuum hypothesis. [Q-2]
A:5 Partial order relations &related concepts of upper bounds,lower bounds, inf ,sup, maximal and minimal elements &Lattice (definition and examples only)statement of Zorn's lemma [Q-1]

Module B
COMPLEX ANALYSIS [Q- 6 / L- 30]

B:1 Real Function of two variables, simultaneous and iterated limits ;continuity, Partial derivatives, differentiability and related necessary &sufficient condition[Q-2]
B:2 Function of complex variables: Limit ,continuity, derivative, Cauchy – Riemann equation, Analytic functions, Harmonic function ,Constuction of Analytic functions, Milne Thompson's method. [Q-2]
B:3 Geometric import of some standard transformations e:g.on method
W= z+c ,w=cz, w=1/z, w=(az+b)/(cz+b) (bilinear) [Q-1]
B:4 Conformal transformation as transformation effected by analytic function. Special conformal transformations $w=z^2$,$w=e^2$,w=sin z [Q-1]

Books Recommended
1. Set theory - K.K.Jha
2. Complex Analysis-J.N.Sharma / A.R.Vashishtha

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Semester –IV

Paper VII
Time:3 hrs **Full marks:80** **Pass marks-36**
Module –A
LINEAR ALGEBRA –I [Q--3 ,L—15]
A:1 N-Vectors,Linear Dependence and Independence , related properties, subspaces of space of n-vectors, Span,Basis and Dimensions,Row rank and Column rank matrix [Q-2]
A:2 System of linear equations,Solution spaces AX=0.Consistencey conditions and the nature of general solutions of AX=B [Q-1]
Module –B
GAME THEORY [Q-3 , L – 15]
B:1 Decision making and conflict.Rectangular games.Two-person and zero-sum game.Pure strategy and Mixed strategy.[Q-1]
B:2 Saddle point and its existence.Optimal strategy and value of the game.Maximum and minimum solution. Necessary and sufficient condition for a given strategy to be optimal in a game. Concept of Dominance [Q-1]
B:3.Fundamental theorem of rectangular games. Algebraic method.Graphical method and Dominance method of solving Rectangular games . Inter-relation between the theory of Games and L.P.P.[Q -1]

Module C
FOURIER SERIES and INTEGRAL TRANSFORMS [Q-6 ,L—30]
C:1 Fourier series:Definition,Euler,s formulae,conditions for Fourier expansion and application . [Q-1].
C:2 Fourier Transform :Definition.Fourier Integral theorem,Fourier sine and cosine integrals,Properties of fourier transforms ,Fourier transforms of elementary functins. [Q-2]
C:3 Laplace,s transform:Definition. Transform of elementary functions, proportion. Inverse Laplace transform. Transform of derivatives and integrals. Multiplication by t^n division by t convolution theorem and application to differential equation.[Q-3]

Books recommended:

1. A text book of Matrices by Shanti Narayan.
2. Integral transform by A.R. Vasistha and D.C. Agarwal /Goyal and gupta.
3. Linear programme by R.K.Gupta/ Laljee Prasad.
4. Higher Engneering Mathematics—B.S.Grewal (ch 9,19,20)

Paper - VIII

Time:3 hrs **Full marks:80** **Pass marks-36**

Module -A

DIFFERENTIAL EQUATION I [Q-4,L—20]

A:1 First order higher degree, Clairaut's form, singular solution, orthogonal trajectories [Q—1]

A:2 Linear Equations with constant co-efficients,

Homogeneous linear equations with variable co-efficient [Q—1]

A:3 Second order linear equation: solution by changing independent variable and by variation of parameters .[Q--2]

A:4 Simultaneous Equation $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$ and total differential equation $Pdx+Qdy+Rdz=0$ together with their geometrical significance [Q-1]

Module –B

ANALYSIS –1 [Q - 5 /L -30]

B:1 Limit and Continuity: Limit, continuity, discontinuity, Properties of functions continuous in closed intervals, functions of bounded variations.[Q- 1]

B:2 Derivability : Derivability, relationship with continuity, Rolle,s therem.Lagrange,s theorem. Cauchy's Mean value theorem. Taylor,s theorem. Maclaurin's theorem, Remainder after n terms. Power Series. Expansion of $(1+x)^n$,sinx,cosx,, e^x log(1+x) using Suitable remainder after n terms. [Q—2]

B:3 Riemann integration : Definition, Darboux theorem I &II, Integratibility conditions ,particular classes of bounded integrable functions ,Primitive, Fundamental theorems, First and Second mean value theorem [Q-2]

Module -C

DYNAMICS [Q-3/ L-15]

C:1 Rectilinear motion with variable acceleration, Simple Harmonic Motion, Motion in a straight line under inverse square law, Hooke's law, Extension of elastic strings horizontal and vertical[Q-1].

C:2 Kinematics in two dimensions: Radial ,transverse, tangential, and normal, velocities and accelerations,Simple pendulum. [Q—1]

C:3 Rectilinear motion (Kinetics):Newton's law,work, power, energy principle. Impulse, torque and angular momentum, conservation of energy, momentum.

[Q—1]

Books recommended:

1. Differential equation by J.N.Sharma /Dasgupta/Piaggio/Murrey.
2. Real Analysis by Sharma and Vashishtha/ Shanti Narayan
3. Dynamics by Shaligram Singh.
4. Mechanic by Singh and Sen

B.Sc(Hons.) Part III

Answer eight Questions from Group A and eight Questions from Group B
Each question in Group A contains 2 marks and each question in group B contains 8 marks.

Semester-V

Paper-IX
Time:3 hrs **Full marks:80** **Pass marks-36**

Module A
Real Analysis II(Advanced integral calculus) [Q-6,L--30]

A:1 Convergence of improper integrals, comparison test, Absolute convergence. Abel's and Dirichlet's tests. Frullani's integrals, Definition and convergence of Beta and Gamma function, their properties, duplication formula, inter-relation. [Q-2]
A:2 Multiple integrals via Dirichlet's theorem, Liouville,s extension ,change of order of integration and change of variables [Q-2]
A:3 Vector Integration :line integral, suface integral, Green's theorem in R^2,Stroke,s theorem, Gauss's divergence theorem. [Q-2]

Module –B
Abstract Algebra [Q—6, L--30]

B:1 Rings, Field and integral domain. Preliminary results, special kinds, subrings and ideals. Kinds of ideals. [Q-3]
B:2 Quotient rings, Fields and Homomorphism. [Q - 1]
B:3 Fundamental theorem of homomorphism, First and Second theorem of Isomorphism. [Q - 1]
B: 4 Field Of quotients and embeddings Theorem , Polynomial rings, Euclidean , ring and unique factorization in it .[Q-1]

Books Recommended

1. Mathematical Analysis-Sharma &Vasistha/Shanti Narayan
2. Integral Calculus – Williamson (chap II)
3. Calculus (Vol 1,2)—Courant and John.
4. Vector Analysis-Shanti Narayan.
5. Modern Algebra- Surjeet Singh &Quazi Zameerudin. (ch 7,8,9)

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Paper –X
Time:3 hrs **Full marks:80** **Pass marks-36**

Module -A
Metric space [Q 5 / 30 lectures]

A:1 Definition and example of metric space. Open sets ,interior,closed sets and closure. [Q—2]
A:2 Convergence ,completeness, Baire's theorem, cantor's intersection therem ,Diffrence equation [Q—2]
A:3 Continuous maps ,uniform Continuity and related theorem [Q-1]

Module B
Special Functions [Q –7/ L- 35]

B1: Series Solution: Ordinary point; Singular point (regular).Generalised methods and form of series solution (Indicial equation –frobenius method) [N.B. Results of analysis regarding validity of series solution are to be taken for granted [Q-2]
B2: Bessel's equation : Solution , recurrence formula for Jn (x),Generating function for Jn(x),Equation reducible to Bessel equation .Orthogonality of Bessel's equation .
[Q-2]
B3: Legendre equation : Solution , Rodrigue's formula, Legendre's Plynomials, Generating function for Pn(x) .Orthogonality of Legendre's polynomials[Q-2]
B4:Hyper geometric function ,Special cases, Integral representation, Summation theorems [Q -1]

Books recommended:
1.Differential equation -- Piaggio.
2. Advanced Differential equation -- A.F.D Raisinghania
3. Topology—K.K.Jha.

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Paper XI
Time:3 hrs **Full marks:80** **Pass marks-36**

Module -A
Numerical Analysis [Q-6,L-30]

A1: Solution of cubic and biquadratic equation. Bisection , Regula Falsi and Newton Raphson Method [Q-1]
A2: Operator D , Δ ,E., Factorial Notation : Ordinary and divided difference formula, Lagrange's interpolation [Q 2]
A3: Numerical differentiation ,derivative when ordinates are equally spaced. [Q- 1]
A4: Numerical Integration , quadrature formula ,Simpson's 1/3 rd rule and $3/8^{th}$ rule, Integration using Newton's interpolation formula [Q-1]
A5: Numerical solution of ordinary differential equation ,Difference equation with constant co-efficients [Q-1]

Note: (simple calculator allowed)

Module -B
Basics of Computer Science and Programming (Q-6/L -30)

B:1Binary System .Octal and Hexadecimal system .Conversion to and from decimal system,Codes,Bits and Bytes and words. Memory of computer; Arithmetic and logical operation on numbers.Precision AND,OR.XOR,NOT and shit /rotate operation.Algorithm anf Flow Chart. [Q- 3]
B:2 Programming in C: Programmer's model of a computer.Algorithm and Flow charts.Data types .Arithmetic and input/output instructions.Decisions control structure.Decision statements.Logical and conditional operaters.Loop.Case control structure Functions Recursions, Preprocessors.Arreys Pupetting of strings.Structures.Pointer,file formatting. [Q – 3]Books recommended:

1. Numerical Analysis by –J.B. Scarborough
2. Numerical Analysis—Gupta and Mallik
3. Numerical Analysis –Sastry/Laljee Prasad.
4. Higher Engineering Mathes-B.S.grewel.
5. The C programming Language –PH 1989-B.W. Kennigham & D.M.Ritchie.
6. Programming in C --V.Rajaraman&.Practical Math--I. B.Prasad (for AMIE)

Paper XII
Time:3 hrs **Full marks:80** **Pass marks-36**

Module -A
Statics [Q—5 ,L--25]

A:1 Conditions for equilibrium of forces in three dimension. [Q-1]
A:2 Wrench ,pitch ,Null lines.[Q-1]
A;3 Principle of virtual Work and its application in two dimensional cases [Q1]
A:4 Common catenaries [Q-1]
A;5 Stable equilibrium, energy test of stability (problems involving one variable only) [Q-1]

Module - B
Dynamics [Q- 7 ,L--35]

B:1 Motion of a particle under a central force. Differential equation of a Central orbit in both polar and pedal co-ordinates [Q-2]
B:2 Newton,s law of gravitation ,planetary orbit , Keppler's laws of motion[Q-2]
B:3 Motion of a Projectile under gravity in a non-resisting medium[Q-1]
B:4 Motion of the centre of mass and motion relative to the centre of mass. D'Alembert's principle. [Q- 1]
B:5 Motion of a rigid body about a fixed axis . Compound pendulum [Q 1]

Books recommended:

1. Statics---S.L. Loney /S.A. Mollah
2. Dynamics : Loney /Ramsey/Singhania/S.A.Mollah.

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Semester-VI

Paper XIII
Time:3 hrs **Full marks:80** **Pass marks-36**

Module -A
Statistics and Probability [Q—6/30 L]

A:1Co-effcient of Correlation, Rank; Correlation and spearman's formula [Q-1]
A:2Curve fitting and method of least square. Lines of regression, Regression co-efficient and `their properties. [Q—1]
A:3 Probability: Random variable, Concept, Cumulative distribution function, Discrete and continuous random variable, Expectation, Mean, Variance. [Q—2]
A:4 Descrete and continuous distribution :Bionomial, Poisson and Normal distribution [Q—2]

Module -B
Linear Algebra II[Q-6 / L -30]

B1:Vector Space: Definition and properties; Subspaces ,linear dependence, dimensions, and basis of a finite dimensional vector space, Quotient space, Direct sums and complements, Matrices and change of basis.
B 2: Inner Product &Norm in a.l.s., properties of inner product. Schwartz inequality, Orthonormal set, Orthonormal basis and Gram-schmidt construction for finite dimensional inner product space.
B 3:Linear transformation: Definition, Sylvester law of nullity, Algebra of linear transformations, Dual spaces, Principle of duality.

Books recommended:
1. Modern Algebra- Surjeet Singh &Quazi Zameerudin.[11&12]
2. Introduction to Topology and modern Analysis –G.F. Simmons.
3. Mathematical statistics – Kapoor and Saxena

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Paper—XIV
Time:3 hrs Full marks:80 Pass marks-36

Module -A
Fluid Mechanics [Q 6 / L -30]

A:1 Nature and properties of fluid pressure and pressure of heavy liquids[Q1]
A:2 Equilibrium of fluides under given system of forces [Q-1]
A:3 Centre of pressure. [Q—1]
A:4 Thrust on plane and curved surfaces. [Q—1]
A:5 Lagrangian and Eulerian methods, Equation of Continuity .[Q—1]
A:6 Euler's equation of motion of a perfect fluid, Bernoulli's theorem. [Q—1]

Module -B
Graph Theory [Q- 6 / L -30]

B:1 Introduction to graph theory: Graphs, Degree of a vertex, degree sum theorem, Isomorphic and Homomorphic graph, Subgraphs and Complements [Q—2].
B:2 Paths and connectivity, Connected components, Complete, Regular, Bi-pertite graphs, Eulerian and Hamiltonian graphs, Weighted graphs, Matrices associated with graphs [Q—2].
B:3 Trees, Spanning trees ,Graph Colouring, Chromatic Number, Five Colour Theorem. [Q—2]

Books Recommended:

1. Hydrostatics –J.P.Sinha/P.N.Chatterjee.
2. Hydrodynamics—Bhudeo Sharma/Shanti swarup/M.d Raisinghania.
3. A first course in Graph theory –S.A.Chandum-Mc-Milla publisher,India.
4. Theory and Problems of Graph theory –V.Balakrishna,Schaum,s outline series.
5. Real Analysis –Sharma & Vashshtha/shanti Narayan /Lalji Prasad

Paper –XV
Time:3 hrs Full marks:80 Pass marks-36
Module —A
Partial Differential equation II [Q – 6,L- 30]

A :1 Partial Differential Equations :Formation , Linear partial d.c of order 1,Lagrange,s method [Q-2]
A:2 Non linear equation of order 1, Four forms and Charpit's method [Q-2]
A:3 Homogeneous linear Equation with constant co-efficient ,rules C.F and P. [Q-1]
A:4 Non linear equation of second order, Monge,s method.[Q-1]

Module –B
Mathematical Modelling [Q-6/ L -30]

B:1 Basis of Mathematical Modelling. [Q--1]
B: 2 Difference and differential equations, Growth model, Single species population growth (non-age structured) model. The spread of technological innovation. [Q--1]
B:3 Higher order linear models: A model for the detection of diabetes. [Q--1]
B:4Non linear population growth models: Prey –predator's model, Epidemic growth models. [Q--1]
B:5 An application in environment: urban waste water management planning models. [Q--1]
B:6 Mathematical modeling through difference and differential equations in economics and finance. [Q--1]

Books Recommended:

1. Differential equation—Piaggio
2. Engineering mathematics –Kresyg,/B.S.Grewal.
3. Modules in applied mathematics-Published in volume 1-4,Springer- Verlog 1982.
4. Advanced diff.equation—M.D.Raisinghania.
5. Mathematical Modelling –J.N.Kapoor.

24.7.15
24.07.2015
18
24/7/15
24.7.15

Paper XVI
Time:3 hrs **Full marks:80** **Pass marks-36**
Module - A
Operation Research [Q – 6/ L-30]

A:1 Convex sets in R^n and their properties. L.L.P problem formulation and solution by graphical method.[Q--1]

A:2 Simplex method including M-method and two phase method .Degeneracy and revised simplex [Q-2]

A:3 Duality simplex method [Q- 1]

A:4 Transportation and assignments [Q- 1]

A:5 Deterministic replacement models ,sequencing problems on two machines and n jobs [Q-1]

Module -B
Computer based Numerical &Statistical techniques [Q-6 / L--30]

B:1 .Numerical solution of equation.-Algorithm and C-programming for finding a real root of an equation by Balzano bisection method ,Regula-falsi method ,Fixed point iteration method ,Newton –Rafhson method. [Q-1]

B:2.Interpolation :Algorithm and C-programming for computing difference table and for Interpolation by Newton, s forward ,backward inter polation formula, Lagrange,s and Newton,s divided difference interpolation formula. [Q – 1]

B:3.Numerical differentiation using forward difference formula. [Q –1]

B:4.Numerical integration: algorithm and C-prog, using Trapezoidal and Simpson's 1/3 rd rule and numerical solution of ODE by 4th order Runge-kutta method. [Q -1]

B:5.Sample characteristic: Algorithm and C-prog. For finding different sample characteristic line mean, variance, co-efficient of skewness etc and curve fitting. Algorithm and C-programming for fitting a Straight. Line and a parabola to a bivariate data for least square method. [Q – 2]

Books recommended:

1. Linear programming—R.K.Gupta./Lalji Prasad
2. An introduction to Applied Probability (John Wiley and sons,1979)
3. Programming in C—E. Balagurusamy

24.7.15

24.07.2015

24/7/15

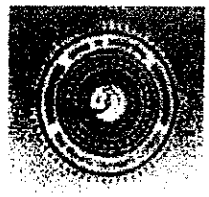
K. C. Prasad

T. Kaur

24.7.15

RANCHI WOMEN'S COLLEGE, RANCHI

(Autonomous College)



Constituent Unit

of

Ranchi University, Ranchi

MATHEMATICS-- Subsidiary Undergraduate Syllabus

T. Kaur

Usha Sin

K. C. Prasad
Retd. Prof & Head
Univ. Dept. of Maths.
R.U., Ranchi.

Nanda Bay

RANCHI WOMEN'S COLLEGE, RANCHI

(AN AUTONOMOUS UNIT OF RANCHI UNIVERSITY FROM 2012)

DEPARTMENT OF MATHEMATICS

COURSES OF STUDY FOR MATHEMATICS SUBSIDIARY

Number of Papers - 4

Full Marks - 400

Number of Semester - 4

B.Sc. Subsidiary Part – I : 200 Marks.

B.Sc. Subsidiary Part – II : 200 Marks.

Session 2015 — 2018

B.A/ B.Sc Subsidiary

Contents of course

B.A/ B.Sc Part–I

SEMESTER	PAPER	CONTENTS	QUESTIONS
I	I	Co-ordinate Geometry, Differential Calculus, Vectors	4, 7, 4
II	II	Three dimensional Geometry,Matrices, Integral Calculus,Discrete mathematics.	3, 3, 6,3

B.A/ B.Sc Part–II

SEMESTER	PAPER	CONTENTS	QUESTIONS
III	III	Set theory,Real Analysis ,Abstract Algebra and Complex Variables	4, 5, 3 ,3.
IV	IV	Mechanics, Linear programming, Real Analysis I, Differential Equations	5, 2, 4, 4.

Ranchi Women's College Ranchi

Autonomous Under Ranchi University

Department of Mathematics

Syllabus for three years Bachelor of Science/Arts course.

Mathematics – Subsidiary

Part-I

Semester – 1 paper- 1

Time – 3 Hrs. Full marks – 100 Pass Marks – 33

Answer 10 questions from group A and 10 questions from group B.

Each question in group A contains 2-marks and each question in group B contains- 8-marks.

Group - A

Co-ordinate Geometry [Q-4 / L – 20]

A1. Transformation of axes with and without change of origin [Q-1]

A2. Condition of general equation of second degree to represent parabola, ellipse, hyperbola and reduction to standard forms. [Q-1]

A3. Equations of tangents and normals (using Calculus) Chord of contact, Polar and pair of tangents. [Q-2]

Group – B

Differential Calculus [Q-7/L-35]

B1. Successive differentiation, n^{th} derivatives of some standard functions, Leibnitz theorem, n^{th} derivatives of some rational functions. [Q - 1]

B2. Expansion, Taylor's Theorem, Maclaurin's Theorem, partial Differentiation. [Q -2]

B3. Tangents and Normal's, Curvature. [Q -2]

B4. Asymptotes, Maxima and Minima of functions of two variables. [Q -2]

Group – C.

Vectors [Q-4/ L- 20]

C1 : Product of three and four vectors[Q-1]

C2 : Work Done, Moment of a Vector about a fixed point and about a fixed line, Spinning of a Vector About a line. [Q -1]

C3 : Point function, Differentiation of a Vector function of a scalar variable. [Q-1]

C4 : Gradient, Divergence, and Curl. Second order operators in Cartesian Co-ordinate Systems. [Q-1]

Books recommended :-

1.Co-ordinate Geometry by Askwrith/ J.Jha/ Lalji Prasad/ Das Gupta and Prasad.

2.Differential Calculus – by Joseph Edward/ Das and Mukherjee/ Shanti Narayan/ Lalji Prasad.

3.Vector Analysis – Shanti Narayan/ Jha and Das/ Lalji Prasad

PART – I

semester – II **paper-2**

Answer 10 questions from group A and 10 questions from group B.

Each question in group A contains 2-marks and each question in group B contains- 8-mark

GROUP – A

Three Dimentional Geometry [Q-3/L-15]

A 1.Points in space ,Rectangular ,Spherical polar and Cylindrical polar co-ordinates ,Direction Cosines and Ratios , Angle between two straight lines ,perpendicular and parallel lines ,Projection of aline [Q-2]

A2. The plane and the straight line, Shortest distance between two skew straight lines. [Q-1]

GROUP – B

Matrices : [Q-3/L-15]

B1. Preliminaries,Transpose, Conjugate, Special types (Singular, Non-singular) Symmetric, Non-symmetric , , Hermitian , Skew-Hermitian , Orthogonal and unitary . Algebra of matrics : Scalar multiplication , addition , multiplication , Laws of operation [Q-I]

B2. Adjoint, Inverse, Partitioning, characteristic equation , Caley Hamilton theorem [Q-I]

B3. Rank of a matrix : Definition Elementary transformations of a matrix, Invariance of rank through elementary transformations. [Q-1]

Group C

Integral Calculus [Q-6/L-30]

C1. Integration of rational and irrational functions. [Q-I]

C2. Evaluation of definite integrals, Reduction formula. [Q-2]

C3. Curve tracing, Length and Area. [Q-2]

C4 Volume and surface area of Solid of revolutions. [Q-I]

GROUP – D

Discrete Mathematics [Q-3/L-15]

D1. Logic : Logical connective , Negation , Qualifier, Compound statements, thruth table [Q-1]

D2. Lattices : Defination s and properties, sub – lattices, Distributive and complemented lattices, types of lattices [Q-1]

D3. Boolean algebra: Defination , Duality, Sub- Algebra, Boolean algebra as lattices, Boolean Function and expressions, Switching circuits . [Q-1]

Books recommended :

1.Analytical Geometry of three dimensions – by Jagdish Jha/ Lalji Prasad

2.Text book of Matrics – by Shanti Narayan /J.N Sharma / A.R. Vasistha

3. Integral Calculus – by Das and Mukherjee/ Shanti Narayan

4. Discrete Mathematics- by M.K Gupta

PART – II

Semester – III **paper-3**

Answer 10 questions from group A and 10 questions from group B.

Each question in group A contains 2-marks and each question in group B contains- 8-mark

Group A

Set theory [Q-4/L-20]

A1. Indexed family of sets, Generalized set operations , De Morgan 's Laws, Set Mappings (Direct and Inverse) [Q-1]

A2. Equivalence Relation, Partition , Fundamental theorem of equivalence relation . [Q-1]

A3. Bisection : Countable and uncountable sets. [Q-1]

A4. Partial ordering and total ordering relations, Concepts of l.u.b., g.l.b, Supremum and Infimum, Maximal and minimal Elements, (Definitions and examples). [Q-1]

Group B.

Real Analysis . [Q-5/L-25]

B1. Axioms for the real number system , least upper bound and Greatest lower Bounds . Limit of a sequence , Subsequence, Cauchy sequence , an Cauchy's general principal of convergence , Algebraic operations on limits, Monotonic Sequences and their convergence. [Q-2]

B2. Notion of convergent and divergent series of positive terms. Cauchy's general principle of convergence, Comparison test, D' Alemberts' ratio test, Cauchy root test, Cauchy;s Condensation test, Raabe's test. [Q-3]

Group C.

Abstract Algebra [Q-3/L-15]

C1. Binary operations, Notion of groups and Abelian groups with examples, Preliminary results (Uniqueness of identity element, inverse of an element and others) Equivalent definitions of group. [Q-1]

C2. Sub groups, examples and some important results, Cyclic groups, cosets of a sub group Lagrange's' theorem. [Q-2]

Group D.

Complex variable. [Q-3/L-15]

D1. Functions of complex variables. Limit, Continuity, Derivability, Cauchy – Riemann Equations, Analytic Function, Harmonic Function, Construction of analytic function, Milne Thompson method.

D2. Conformal transformations :

Conformal transformation as transformation effected by analytic function. [Q-1]

D3. Impart of some elementary transformation :

W = z+c, w = cz, w=1/z, w = c [Q-1]

Books recommended :

1. Advanced set theory- by Dr. K.K. Jha
2. Real Analysis- by Dr. K.K. Jha/Das Gupta and Prasad
3. Modern Algebra – Surjeet Singh, and Quazi Zameeruddin/ A.R.Vasishtha.
4. Complex variables by - M.L.Khanna/ J.N.Sharma/ Goel and Gupta.

Part – II

Semester – IV paper-4

Answer 10 questions from group A and 10 questions from group B.

Each question in group A contains 2-marks and each question in group B contains- 8-mark

Group A

Mechanics : [Q-5/L-25]

A1. Reduction of system of coplanar forces, Equation of resultant, Condition for equilibrium. [Q-1]

A2. Laws of friction, Angle and cone of friction, Equilibrium on a rough inclined plane, Particle constrained to move on a rough curve under given forces. [Q- 1]

A3. Rectilinear Motion, Compounding of two simple harmonic motion,Motion under inverse square law.[Q-1]

A4. Radial and Transverse ;, Tangential and Normal velocities and accelerations. Angular velocity and acceleration. [Q- 1]

A5. Simple pendulum [Q – 1]

Group – B.

Linear programming Problem. [Q-2/L-10]

B1.Covex sets in R^n and their properties [Q-1]

B2. Formulation of L.P.P problem and solution by graphical Method. [Q -1]

Group – C.

Real Analysis [Q-4/L-20]

C1. Limit, Continuity, Discontinuities, Uniform continuity, Properties of functions continuous in closed intervals, [Q-2]

C2. Derivability of a function, Relationship with continuity, Rolle's Theorem, Lagrange's and Cauchy's theorem, Mean Value Theorems , Taylor's theorem , and its remainder after n terms, McLaren's theorem, Power series , Expansion of $(1+x)^n$, sinx, cosx, e^x, and log (1+x) using suitable remainder after n terms. [Q-2]

Group – D.

Differential Equations [Q-4/L-20]

D1. Differential equations of first order higher degree, Claire's form, Singular solutions, Orthogonal Trajectories [Q -1]

D2. Linear equations with constant co-efficient, Homogeneous linear equations with variable Co- efficient . [Q -1]

D3. Second order linear equations : Solution by changing independent variable and by variation of parameters. [Q -1]

D4. Simultaneous equation $dx = dy = dz$ and total differential equation $Pdx + Qdy + Rdz = 0$ together with their geometrical significance. [Q -1]

Books recommended:

1. Mechanics –by Dr Saligram Singh/ P.Singh and D.K.Sen.
2. Linear Programming by Lalji Prasad./ R.K. Gupta
3. Real Analysis by-Shanti Narayan / Sharma Vashitha
3. Ordinary and partial Differential Equation by M.D. Raisinghania.
4. Differential Equations : J.N.Sharma, Das and Gupta , Lalji Prasad.