



MAHARAJA KRISHNAKUMARSINHJI BHAVNAGAR UNIVERSITY
NAAC Accreditation Grade "B"
(With effect from Academic Year 2015-2016)

Academic Council: 23 / 11 / 2013, R.No. (2)

**Third Year B.Sc.
MATHEMATICS**

Paper No-M-301:	Abstract Algebra	Total Marks: 100
Paper No-M-302:	Mathematical Analysis	Total Marks: 100
Paper No-M-303:	Advanced Numerical Methods & Discrete Mathematics	Total Marks: 100
Paper No-M-304:	Operational Research & Graph Theory	Total Marks: 100
Paper No-M-305:	Complex Analysis	Total Marks: 100
Paper No-M-306:	Practical	Total Marks: 100



T.Y. B.Sc.
MATHAMATICS

Paper No- M-301: Abstract Algebra

Total Marks: 100

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS
Unit-1	Definition of Binary operation. Properties of binary operation and examples. Group and its properties, examples of group, Subgroup and its properties. Group of co-sets and its properties. Lagrange's theorem. Deduction of Lagrange's theorem. Permutation, cycle, transposition, Even and odd permutation, Inverse of permutation, Alternative group and its universal property.	18	20
Unit-2	Cyclic group and cyclic subgroup and its properties, Homomorphism, kernel of Homomorphism. Fundamental theorem of homomorphism, Isomorphism and its properties. Cayle's theorem, Normal subgroup and its properties, Factor group and its properties.	18	20
Unit-3	Definition of ring and its basic properties. Sub ring, Boolean ring, The characteristic of a ring and its properties, Homomorphism of ring. Zero divisors, Integral domain, fields, cancellation laws, properties of integral domain.	18	20
Unit-4	Fermat's theorem and Euler's theorem and Euler's generalization. Unique factorization domain (UFD). Ideals, maximal ideals, principal ideal, Relation between PID and UFD.	18	20
Unit-5	Rings of polynomials, degree of polynomials, product and sum of polynomials GCD of polynomials. Integral domain $D[x]$. Division algorithm of $F[x]$, irreducible polynomials and reducible polynomials. Quaternion and its examples	18	20

Reference books:

1. A first course in abstract – algebra John B. Fraleigh, Addison – Wesley publishing company.
2. Topic in Algebra. I.N. Herstein willey Eastern Ltd. New Delhi
3. Abstract algebra Dr. I. H. Sheth. Prentice Hall of India. New Delhi
4. University Algebra, M. S. Gopalakrishna, willey eastern Ltd.
5. Text book of morden abstract algebra, by shantinarayan, and S chand and co. New Delhi.



T.Y. B.Sc.
MATHAMATICS

Paper No- M-302: Mathematical Analysis

Total Marks: 100

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS
Unit-1	Partitions and Riemann sums, Upper and lower R-Integrals, RIntegrability. The integral as limit some classes of integrable functions properties of integrable functions. Continuity, Derivability of integral functions. Fundamental theorem of integral calculus, mean value theorem of integral calculus.	18	20
Unit-2	Definition and examples of metric space, neighborhood, Hausdroff properties for neighborhood, Definition interior point, limit point, Closed set and open set and its properties and examples.	18	20
Unit-3	Definition of closure, boundary point, isolated point, dense set, perfect set and its properties and example and cantor set and its properties and examples. Continuity in metric space, subspace of metric space Cauchy sequence and in metric space complete metric space.	18	20
Unit-4	Connectedness and compactness of metric space & its examples with their properties. Definition of convergence of improper integrals of both kind. (Infinite region of integral & infinite integrand) Comparison test, Absolute convergence. Abel's test, Dirichet test, Integral as function of parameter. continuity, derivability and integrability of an integral of a function of parameter.	18	20
Unit-5	Uniform convergence of sequence and series of functions test for uniform convergence M-test for sequence and M-test for convergence. Sets and operation on sets. countable and uncountable sets, order axioms properties of ordered fields. Absolute values.	18	20

Reference books:

1. Mathematical Analysis by S. C. Malik and Savita arora
2. D. Somasundaram B. Chaudhary, Narosa publishing house, A first course in mathematical Analysis.
3. R. R. Goldberge methods of Real Analysis. oxford and IBH (India)
4. Mathematical Analysis by J.M.Sharma
5. Mathematical Analysis by S.K.Chetierjea.



T.Y. B.Sc.
MATHAMATICS

Paper No- M-303: Advanced Numerical Methods & Discrete Mathematics

Total Marks: 100

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS
Unit-1	Relationship between roots and coefficient equations with real, coefficient and imaginary roots, Rational coefficient and irrational roots, symmetric functions of roots, transformation of equations, multiple roots ,Solution to numerical, Algebraic and transcendental Equations by Secant Method, Ramanujan's Method, Muller's Method, Graeffe's Root-Squaring Method, Lin-Bairstow's Method, Horner's method .	18	20
Unit-2	Simultaneous linear algebraic equations : Gauss Elimination method, Gauss Jordan method of factorization or triangularisation. Crout's method, inverse of matrix by crout's method , Jacobi method of iteration, Gauss seidel iteration method.	18	20
Unit-3	Relations, Equivalence relations, Equivalence class and Partitions. Partial order relations (posets), Hasse diagram. Lattice as posets, properties of lattices.	18	20
Unit-4	Lattice as algebraic systems. Sub lattice Direct product of two lattices, complete lattice, Distributive lattice. Definition and example of Boolean algebra, Boolean algebra of circuit and switches, Direct product of two Boolean algebra. Homomorphism Atoms of Boolean algebra. Stone's representation theorem.	18	20
Unit-5	The set $A(x)$ of all the atoms of Boolean algebra, and its properties. Isomorphism of finite Boolean algebra. Boolean functions, Expressions, Min terms, Max terms A expression as sum of product/ product of sum canonical form expression by cube array method.	18	20

Reference books:

1. Foundation of discrete mathematics. K.D. Joshi, New Age international Ltd. Publishers.
2. Elements of Discrete mathematics (IInd edition) by Liu. NC. Graw Hill. International edition.
3. Discrete mathematical structures with applications to computer science. By Trembley I.P. and Manohar R.
4. Numerical methods By Dr. V. N. Vedamurthy, Dr. S. N. Iyengar
5. Numerical Analysis By. S. S. Sastry
6. Introduction to numerical Analysis By. C. E. Froberg Addison Wesley, 1979
7. Numerical method, problem and solutions By M.F. Jain, S. R. K. Iyengar, R. K. Jain New age international Pvt. Ltd.



T.Y. B.Sc.
MATHAMATICS

Paper No- M-304: Operation Research & Graph Theory

Total Marks: 100

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS
Unit-1	The linear programming problems, Formulation of LPP, matrix of the LPP. general form, canonical form, standard form of the LPP. Graphical method to solve LPP. Some definitions and basic properties of convex sets, convex functions and concave functions.	18	20
Unit-2	Theory and application of simplex method of solution of a LPP. Big M. Method, (penalty method). The two phase method. (without alternative solution and unbounded solution). Principle of Duality in LPP. Primal LPP and its dual LPP. Fundamental theorem of duality.	18	20
Unit-3	The transportation problem. Mathematical and matrix form of T.P. balance and unbalance T.P. Initial solution by NWCM. LCM and VAM. Modi method and its solution. Assignment problem, mathematical model of assignment problem, method for solving assignment problem and its examples. Game theory game pure strategies, game with mix strategies.	18	20
Unit-4	A simple graph, vertices, edges, loops, multiple edges, labeled graphs, unlabeled graphs, The union, intersection and direct sum of two graphs. A walk, closed walk, The length of a walk, a path. Euler graphs, Hamiltonian paths and circuits, tree, binary tree, spanning tree. Cut-set, connectivity and separability, planar graph and their representations, Euler's formula, Kuratowski's graphs.	18	20
Unit-5	Vector space associated with a graph, circuit and cut set, subspace, orthogonal vectors. Vertex coloring proper coloring, chromatic index. A cyclic digraphs and De cyclization. Matrix representation of graph, Adjacency, incidence matrices, path matrix, circuit matrix, cut-set matrix, Relationship of these matrices.	18	20

Reference books:

- (1) Operation Research by J. K. Sharma
- (2) Operation Research by Manmohan & Kantiswaroop.
- (3) Operation Research (IInd edition) by R. Panneerselram.
- (4) Operation Research by Nita Shah (IIIrd edition).
- (5) Graph theory with application to engineering and computer science. By. Narsingh Deo. 1993. Prentice Hall of India Pvt. Ltd.
- (6) Introduction to graph theory Robin J. Wilson. Rongrman addition Wesley longman Limited, 4th edition.
- (7) Introduction to graph theory. Douglas B. west prentice Hall of India Pvt. Ltd.



T.Y. B.Sc.
MATHAMATICS

Paper No- M-305: Complex Analysis

Total Marks: 100

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS
Unit-1	De'moivre's theorem and its application. Expansions of $\cos n\theta$, $\sin n\theta$, $\tan n\theta$ in terms of $\cos \theta$, $\sin \theta$, $\tan \theta$. Expansions of $\cos n\theta$, $\sin n\theta$ in series of cosines or sines of multiples of θ (n being positive integer), Expansion of trigonometric functions $\sin \theta$, $\cos \theta$, $\tan \theta$ in terms of $e^{i\theta}$.	18	20
Unit-2	Exponential, circular and hyperbolic functions for complex variables. Logarithmic functions, Inverse circular and inverse hyperbolic functions for complex variable. Mapping by elementary functions (Möbius transformations)	18	20
Unit-3	Functions of complex variables, limits, theorems on limit. Continuity and differentiability of complex functions. Analytic functions, Cauchy Riemann equations in Cartesian form and in polar forms and its examples and its properties.	18	20
Unit-4	Laplace equation in Cartesian form and in polar form. Harmonic functions and conjugate Harmonic functions and relation between harmonic, conjugate harmonic and analytic functions.	18	20
Unit-5	Residues : Cauchy's residues theorem, poles, evaluation of improper real integrals and definite integrals of trigonometric functions. $W = Z^2$, $W = 1/Z$, $W = e^z$, $W = Z^n$ transformation linear fractional transformation, Bilinear transformation formation with properties conformal mapping is and its examples.	18	20

Reference books:

- (1) Complex variables and applications IVth Edition : by R. V. Churchill and J. W. Brown
- (2) Theory of function of a complex variables by Shantinarayan. S Chand and Co.
- (3) Complex variables introduction and application. By Mark Ablowitz and A.S. Fokas
Cambridge. University press.



T.Y. B.Sc.
MATHAMATICS

Paper No- M-306: Mathematics Practical

Total Marks: 100

Practical Based On M -301 to M -305

Section A :

1. Practical problem on group
2. Practical problem on permutation group (to find order & to check odd & even permutation)
3. Practical problem on cyclic group
4. Practical problem of S_3 .
5. Practical problem & factor group.
6. Practical problem on irreducible polynomials.
7. Practical problem on reducible polynomials.
8. Practical problem on quaternion.
9. Practical problem on sum & product of polynomials.
10. Practical problem on Fermat's theorem .
11. Practical problem on Euler's generalization.

Section B:

1. Practical problem of R-integrable function (Based on first definition)
2. Practical problem of R-integrable function (Based on second definition)
3. Practical problem of integral calculus based on Mean-value theorem.
4. Cantor set is perfect set.
5. Practical problem of convergence of improper integral of infinite region of Integral.
6. Practical problem of convergence of improper integral of infinite region of Integrand.
7. Practical problem of uniform convergence by M-test for sequence.
8. Practical problem of uniform convergence by M-test of series.

Section C:

1. Practical problem of direct product of two lattices.
2. Hasse-diagrams of different lattices.
3. Practical problem of Boolean algebra.
4. Practical problem of expression by cube array method.
5. To find solution of numerical & algebraic equation by Ramanujan's method.
6. To find solution numerical & algebraic equation by Muller's method.
7. To find solution of numerical & algebraic equation by Graeffe's Root-Squaring method.
8. To find solution of numerical & algebraic equation by Lin-Bairstow's Method.
9. To find solution of numerical & algebraic equation by Horner's method.
10. To find solution of transcendental equation by the Gauss Elimination Method.
11. To find solution of transcendental equation by the Gauss Jordan Method.
12. To find solution of transcendental equation by crout's method
13. To find inverse of matrix crout's method
14. To find Solution of Simultaneous linear equations by Jacobi method of iteration,
15. To find Solution of Simultaneous linear equations by Gauss seidel iteration method



Section D:

1. Practical problem of chromatic index of graph by proper coloring
2. Adjacency matrix of graph
3. Incidence matrix of graph
4. Path matrix of graph
5. Kongsberg bridge problem of graph theory & its solution given by Euler
6. Solve the LPP by Simplex method
7. Solve the LPP by Big-M-Method
8. Solve the LPP by Two-phase method
9. To find dual of primal LPP.
10. To find initial solution of T.P. by NWCM
11. To find initial solution of T.P. by LCM
12. To find initial solution of T.P. by VAM
13. To find optimum solution of T.P. by MODI method
14. To find optimum solution of Assignment problem.

Section E:

1. To find solution of algebraic equation by De'moivre's theorem
2. Practical problem of mapping of elementary functions
[$w = \sin z$, $w = \cos z$, $w = az + b/cz + d$, $w = \sin h z$, $w = \cos h z$]
3. Practical problem of continuity & differentiability of complex function on
4. Practical problem based on analytic function
5. Practical problem of evaluation of improper real integrals by Cauchy's residue theorem
6. Practical problem of evaluation of definite integral of trigonometric functions by Cauchy's residue theorem