

**K S K V KACHCHH UNIVERSITY**

**T Y B SC**

**MATHEMATICS**

**NEW SYLLABUS**

**WITH EFFECT FROM JUNE - 2009**

PAPER VI  
ABSTRACT ALGEBRA

Unit-1

Groups, Examples of groups, Elementary properties of a Group.  
Subgroups, Cosets.

Unit-2

Lagrange's theorem and applications, Permutation groups, Normal subgroups,  
Quotient group. .

Unit-3

Group Isomorphisms, Cyclic groups and their properties, Group Homomorphisms.  
Rings, Properties and examples of Rings. Integral domains and fields. characteristic  
of a ring,

Unit-4

Subrings, Ideals, Principal ideal rings and Quotient rings, Polynomial rings, Degree  
of a polynomial, the integral domain  $F[X]$ .

Unit-5

Ring Homomorphisms, Embedding of an integral domain into a field, Prime ideals  
and Maximal ideals, their characterization through quotient.

The course is mainly covered by a book :

Abstract Algebra --- Dr. I. H. Sheth, Published by Prentice Hall of India

REFERENCES :-

- \* Bhattacharya P.B., Jain S.K. and Nagpal S.R., Basic Abstract Algebra, Foundation books, New Delhi.
- \* Fraleigh J. B., A First Course in Abstract Algebra, Narosa Publishing, New Delhi
- \* Gallian J.A., Contemporary Abstract Algebra, Narosa Publishing House, New Delhi
- \* Herstein I.N., Topics in Algebra, Vikas Publishing, New Delhi

## PAPER-VII

### MATHEMATICAL ANALYSIS

#### UNIT-1

Sets and operations on sets, Functions and their properties, countable and uncountable sets, Real valued functions, bounded subsets of  $\mathbb{R}$ .

#### UNIT-2

Sequences of real numbers, Limit of a sequence. Convergent sequences, divergent sequences, bounded sequences, Monotonic sequences. Operations on convergent sequences, limit superior and limit inferior, Cauchy sequences.

#### UNIT-3

The definition of the Riemann integral, Properties of the Riemann integral, Fundamental Theorems of Integral Calculus, Mean value theorems of Integral Calculus.

#### UNIT - 4

Metric spaces - Definition and examples, limits of sequences in a metric space, bounded sets, limits of functions in a metric space, Continuous functions in a metric space, Open sets in a metric space, Closed sets in a metric space.

#### UNIT - 5

Complete Metric spaces, its properties, Totally bounded sets, Compact metric spaces, Continuous functions on compact metric spaces, Continuous function on compact metric spaces.

The Course is covered by :

A first course in mathematical analysis by D. Somasundaram, B. choudhary ( Narosa publishing house )

- Unit -1 Chapter 1, Art.1.1 to 1.6
- Unit -2 Chapter 2, Art.2.1 to 2.8, 2.10, 2.11
- Unit -3 Chapter 8, Art. 8.1,8.3, 8.4
- Unit -4 Chapter 5, Art.5.1, 5.2, 5.4 to 5.8
- Unit -5 Chapter 6, Art.6.1 to 6.3, 6.4 (omit Theorem 7), 6.5 and (omit Theorem 7)

Books for reference :

1. Fundamental of mathematical analysis  
- G.Das, S. Pattanayak
  2. Principals of mathematical analysis  
- Walter Rudin
  3. Mathematical Analysis  
- T.M. Apostol
- Four periods per week for the paper.

PAPER -VIII  
GRAPH THEORY

UNIT-1

The Definition of a graph, Vertex, Edge, Loop for a graph, parallel edges, isolated vertex, adjacent vertices, simple graph, graph isomorphism, complete graph, empty graph, bipartite and complete bipartite graph, incident edge, adjacent edges, degree of a vertex, regular graph, k-cube graph, subgraphs of a graph, complement of a graph, self-complementary graph, join of two graphs

UNIT-2

Walk in a graph, trivial walk, closed and open walks, trail in a graph, path in a graph, connected graph, cycle in a graph, wheel graph, eccentricity of a vertex, radius and diameter of a graph, the adjacency and incidence matrix of a graph, .

UNIT-3

Tree, forest, bridge of a graph, spanning trees, cut vertex of a graph, vertex connectivity of a graph, internally disjoint paths

UNIT-4

- i) Euler trail, Euler tour, Euler graph, Hamiltonian path, Hamiltonian cycles, Hamiltonian graphs, Maximal non-Hamiltonian graph.
- ii) Vertex colouring of a graph, chromatic index of a graph, Maximum vertex degree of a graph, Kempe Chain argument, critical graphs.

UNIT-5

Plane and planer graphs, Jordan curve, Face of a graph, Euler's formula, polyhedral graph, Platonic bodies, The dual of a plane graph.

The course is covered by:

1. A first look at Graph Theory – John Clark, Derek Allan Holton (Allied Publishers Limited)

Unit 1 : Chapter 1 (Articles 1.1 to 1.5)

Unit 2 : Chapter 1 (Articles 1.6,1.7)

Unit 3 : Chapter 2 (Articles 2.1, 2.2, 2.3,2.6)

Unit 4 : i) Chapter 3 (Articles 3.1 (omit Fleury's algorithm, Thm. 3.5), 3.3)

ii) Chapter 6 (Articles 6.1(omit the proof of thm. 6.5), 6.3)

Unit 5 : Chapter 5 (Articles 5.1, 5.2, 5.3, 5.6)

Reference Books :

- 1) Graph theory with applications to engineering and computer science – Narsingh Deo.
- 2) Introduction to Graph Theory – Robin J. Wilson
- 3) Discrete mathematics and its applications – Kenneth H. Rosen

- Four Periods per week for the paper.

PAPE R –IX (A) (Weightage 80 %)

OPERATIONS RESEARCH

UNIT-1

Formulation of LPP, Graphical Method, Simplex Method, Two Phase Method, Big – M method

UNIT-2

Dual of an LPP, Theorems on Duality, Dual Simplex Method.

UNIT-3

Integer Linear Programming Problems (Cutting plane method and its examples).

UNIT-4

Transportation Problems, North – West Corner Method, Lowest Cost Entry Method, VAM Method, Modi Method for optimal solution, Triangular Basis.

UNIT-5

Assignment Problems, Hungarian Method to solve Assignment problems.

The course is mainly covered by :

- Operations Research (Theory and Applications) ---- J. K. Sharma, Third Edition, Published by MACMILLAN INDIA LTD.
1. Unit 1 : Chapter 2 ( Article 2.8 ), Chapter 3, Chapter 4
  2. Unit 2 : Chapter 5 ( Articles 5.2.1, 5.2.4, Appendix 5.A ), Chapter 27
  3. Unit 3 : Chapter 7 ( Articles 7.4, 7.5 )
  4. Unit 4 : Chapter 9 ( Articles 9.4, 9.5, 9.6, Appendix 9 A )
  5. Unit 5 : Chapter 10 ( Article 10.3.4 )



Reference Books :

1. Mathematical Models in Operation Research by J. K. Sharma-McGraw Hills
2. Linear Programming By G. Hadley- Narosa Publishing House.

PAPER –IX (B) (Weightage 20 %)

COMPUTER AIDED OPERATIONS RESEARCH PRACTICALS

Content for the practicals :

Introduction of Software QM and its applications in the problems of OR

## PAPER-X (Optional),

### Number Theory and Combinatorics

#### Unit-1

The Division algorithm, the Greatest common divisor, the Euclidean algorithm, The Diophantine equation  $ax + by = c$

#### Unit - 2

The fundamental Theorem of Arithmetic, the sieve of Eratosthenes, the Gold bach conjecture and other conjectures about prime numbers.

Congruence and its basic properties, Linear congruences, The Chinese remainder theorem

#### Unit-3

Fermat's Little theorem, Wilson's theorem, Number-theoretic functions  $\phi$ ,  $\mu$  and, the Mobius inversion formula, the greatest integer function.

#### Unit - 4

Euler's Phi-function, Euler's theorem, Properties of the Phi-function.

The order of an integer Modulo  $n$ , primitive roots for primes, Euler's criterion for quadratic residues.

#### Unit-5

(i) Permutations and Combinations.

Addition Principle, Multiplication Principle, Permutations, Circular permutation, The injection and Bijection Principles, Arrangements.

(ii) Binomial Coefficients.

The Binomial Theorem, Combinatorial identities.

The course is covered by the following two books :

1) Elementary Number Theory by David M. Burton (6th Edition) published by  
Tata McGraw- Hill Edition

Unit-1 Ch.2, Articles 2.2 to 2.5

Unit-2 Ch. 3, 4, Articles 4.2 and 4.4

Unit-3 Ch. 5, Article 5.2 (Omit theorem 5.2), 5.3

Ch. 6, Articles 6.1 to 6.3 (Omit Theorem 6.11)

Unit-4 Ch. 7 (Articles 7.2 to 7.4)

Ch. 8 (Articles 8.1, 8.2)

Ch. 9 (Articles 9.1, 9.2 (upto theorem 9.6))

2) Principles and Techniques in combinatorics By Chen Chaun-Chong and  
Koh Khee-Meng (World Scientific Pub.)

Unit 5 Ch. 1, Articles 1.1 to 1.6

Ch. 2, Articles 2.1 to 2.3

Books for Reference :

- 1) Number Theory – S. G. Telang
- 2) Elementary theory of Numbers – C. Y. Hsung
- 3) The Higher Arithmetic – H. Devenport
- 4) A First course in combinatorial Mathematics – Ian Anderson
- 5) Elements of Discrete Mathematics – C. L. Liu

- Four periods per week for the paper.

PAPER -X (OPTIONAL)

MECHANICS

(Will be uploaded shortly)