BHAKT KAVI NARSINH MEHTA UNIVERSITY, JUNAGADH

MATHEMATICS

Syllabus of B.Sc.Semester-5 & 6

According to Choice Based Credit System

Effective from June – 2020

SyllabusofB.Sc.Semester-5 AccordingtoChoiceBasedCreditSystem Effective from June – 2020

- **Program:** B.Sc.
- **Semester:** 5
- **Subject:** Mathematics
- **Course codes:**
  05(A)-Theory
  06 (A)-Theory
  07 (A)-Theory
  05 (B)-Practical
  06 (B)- Practical
  07 (B)- Practical
  1 Project
- **Total Credit Of The Semester 5:** 24 Credit

B. Sc. MATHEMATICS SEMESTER: V

- **The Course Design of B. Sc. Sem.- V(Mathematics) according to choice based credit system (CBCS) comprising of Paper Number, Paper Name, No. of theory lectures per week, No. of practical lectures per week , total marks of the each paper are as follows :**

SR.NO.	SUBJECT	NO. OF THEORY LECTURE PER WEEK	NO. OF PRACTICAL LECTURE PER WEEK	TOTAL MARKS	Credit Of Each Paper.
1	**PAPER 05 (A) (Theory) Mathematical Analysis-1 &Abstract Algebra - I**	6	-	70(External)+ 30 (Internal) = 100 Marks	4
2	**PAPER 06 (A)(Theory) Programming in C & Numerical Analysis-1**	6	-	70(External)+ 30 (Internal) = 100 Marks	4
3	**PAPER 07 (A) (Theory) Boolean Algebra & Complex Analysis-1**	6	-	70(External)+ 30 (Internal) = 100 Marks	4
4	**PAPER 05 (B) (Practical) Programming with SCILAB**	-	6	35(External)+ 15(Internal) = 50 Marks	3
5	**PAPER 06 (B)(Practical) Programming in C language**	-	6	35(External)+ 15(Internal) = 50 Marks	3
6	**PAPER 07 (B) (Practical) Numerical Analysis – I**		6	35(External)+ 15(Internal) = 50 Marks	3
7	**Project Work & Viva (Might be cancelled and English might be introdueced from the Ac. Year 2018-19)**	• 1 Guidance Lecture.for a group of 3 to 5 students / week. • Evaluation of project will be in SIXTH semester		The title of the project workto be decided and data will be collected in this semester	3
			Total credit of the semester V		**24**

Marks Distribution of Each Paper
for
Theory and Practical (for SEMESTER-V)

• **Total Marks of Each Theory Paper [External Examination]**	**70 Marks**
• **Total Marks of Each Theory Paper [Internal Examination]**	**10 Marks Assignments +** **10 Marks Internal exam. +** **05 Marks MCQ – test +** **05 Marks Attendence =** **30 Total Marks**
• **Total Marks of Each Practical Paper [External Examination]**	**35 Marks**
• **Total Marks of Each Practical Paper [Internal Examination]**	**15 Marks** **[Continuous internal assessment of practical work]**

Format of Question Paper
(*Effective from Academic Year 2019-20 onwards*)

- **There shall be FIVE questions from all five units one each of 14 marks.**
- **Each question will be of the following form.**

Question no.	**(A)**	**Answer any Two out of Three**	**10 Marks**
	(B)	**Answer any One out of Two**	**04 Marks**
		TOTAL	**14 MARKS**

-: Project Work:-

(Might be cancelled and English might be introdueced from the Ac. Year 2019-20)

- There will be a project on any topic in Mathematics preferably not covered in the syllabus.
- The project will be assigned in the teams (groups) of at least one and at most five students.
- There will be one lecture per week to guide and motivate for each group of students.
- Topic of the project may be selected based on the following
  1. Demand of mathematics required to cater the need of industries and the society as a whole.
  2. New topic not taught up to final semester.
  3. The topic may be an extension of topic covered in any of the topics/subject taught up to sixth semester.
  4. Innovative teaching methodology of Mathematics may also be selected as a topic of the project work.
  5. Students may also construct innovative models based on mathematical concepts even those taught at secondary or higher secondary level.
  6. Every project or even model must be submitted with proper documentation about the concept and the model.

- **During the fifth semester students will be**
  1. Introduced and assigned title of the project,
  2. Teams will be formed for the same.
  3. Each group will study, search reference, collect data and work-out details for their topic of project-work.

- **During the sixth semester**
  1. Students will finalize, document, submit and get the project work certified in their names.
  2. The project work must be submitted by the student in the fourteenth week of the sixth semester.
  3. Only on the submission of project dissertation the student will be issued hall ticket for the end semester theory and practical examination.
  4. The dissertation may be typed or hand-written and be limited to 40 to 70 pages of A4 size.
  5. Project work shall be evaluated by an external and one internal examiner which will be followed by presentation of the work and viva-voce.
  6. Students will be required to undergo verification, evaluation and viva of the project-work they have done.
  7. Certified documentation of the project-work done by each group is mandatory. The certified documentation should be produced while appearing for viva and evaluation of project during final examination of sixth semester.
- The project work will be evaluated for 100 marks of which **60% marks** will be allotted for the **dissertation** and **40% for the presentation** and **viva-voce**
- **TheEvaluation of the project work will be done at the end of the sixth semester.For the Evaluation of the project work there shall be three hours duration at the end of the sixth semester.There shall be batch of 15 students for project and viva.**

B.Sc. Mathematics
SEMESTER - 5
Mathematics PAPER 05 (A) (Theory)
Mathematical Analysis -I and Abstract Algebra - I

UNIT 1: **Metric Spaces:** [14 Marks]
Definition and examples of metric space,
neighborhood, limit points,interior points, Open and closed sets, Closure, derived set and interior, boundary points. Dense sets, Cantor sets [**includeCantor set is closed]but [OMIT: - cantor set is compact and complete**.]

UNIT 2: **Riemann Integral:** [14 Marks]
Partitions and Riemann sums, Upper andlower R-integrals, R-integrability, The integral as limit, Some classes of integrable functions , Properties of integrable function, Properties of R-integrable function., Statement of **Darboux's theorem** (without proof)

UNIT 3: [14 Marks]
[a] Riemann Integral
Continuity, Derivability of the integral functions, Fundamental theorem of integral calculus, Mean valuetheorem of integral calculus.

[b] **Abstract Algebra**
Definition of Binary Operation ,Properties of B.O. & Examples , Group & its Properties, Examples of Group.

UNIT 4: **Subgroups and Symmetric Group** [14 Marks]
Subgroup & Its Properties, Cosets& Its Properties, Lagrange's theorem.
Permutation, Transposition, Even & Odd Permutation, Symmetric Group, Inverse of Permutation, Alternative Group & Its Universal Property.

UNIT 5: **Isomorphism and other properties** [14 Marks]
Cyclic Group & Cyclic Subgroup & Its Properties, Deduction Of Lagrange's Theorem. Definition of Isomorphism, Equivalence Relation.
Cayley Theorem, Automorphism, Properties of isomorphism, Normal subgroup and quotient group.

Text Book for MATHEMATICS PAPER05 (A) (Theory) Unit – 3[b],4 and 5Group Theory

Abstract Algebra

By : Dr. I. H. Sheth,

Prentice Hall Of India,

New Delhi.

Course of Mathematics PAPER – 05 Abstract Algebra - I

is covered by following Chapters/ Sectionsof the above mentioned book namely Abstract Algebra

Chapter 4: § 4.1, § 4.2, § 4.3, § 4.4, §4.5 [OMIT: Example 4.1.11]

Chapter 6: § 6.1, § 6.2[OMIT: Example 6.2.7], § 6.3,

- [**Omit**:- § 6.4], § 6.5

[**Omit:**-Generalized associative law, Theorem: 6.5.2, Theorem: 6.5.3]

§ 6.6, § 6.7

Chapter 7: § 7.1, § 7.2, § 7.3

Chapter 8: § 8.1, § 8.2, § 8.3 [**Omit:**-Theorem: 8.2.2]

Chapter 9: § 9.1, § 9.2, § 9.3

Chapter 10: § 10.1, § 10.2

Chapter 11

- **Omit :-**Chapter 11 Cyclic Groups
- [The whole chapter is to be omitted]

Chapter 12:

- § 12.3, § 12.4 [**Omit:**- §12.5]

[Remaining sections of this chapter will be covered in 6th semester]

References

(1) Topics in Algebra, 1. N. Herstein, Willey Eastern Ltd. New Delhi

(2) A text Book of Modern Abstract Algebra, by Shantinarayan, S.Chand & Co., New Delhi.

(3) Fundamentals of Abstract Algebra, D. S. Malik, J. N. Mordoson and M. K. Sen, McGraw Hill International Edition - 1997

(4) University Algebra, M. S. Gopalakrishna, Wiley Eastern Ltd.

(5) Abstract Algebra, By Bhattacharya, Yallo Publications.

(6) Modern Algebra, By Kazizamiudia&Sursit, Vikas Publication. Delhi.

(7) Text Book: Abstract Algebra, Dr. I. H. Sheth, NiravPrakashan, Ahmedabad.

(8) Mathematical Analysis (2nd edition) by S. C. Malik &Arora, New Age Inter. Pvt.'

(9) Mathematical Analysis, by T. M. Apostol

(10) Real Analysis, by R. R. Goldberg (Chapters: 4,5,6, 7,9 & 10.1)

(11) A course of Mathematical Analysis, by Shantinarayan, S. Chand & Sons.

(12) Metric space, by E. T. Capson

(13) Metric space, P. K. Jain & Ahmad, Narora Publishing House

(14) Real Analysis by Sharma and Vasishtha Krishna Prakashan, Meerut-2.

(15) Mathematical Analysis, by Dr. Goyal and Gupta, KrishnaPrakashan, Meerut-2.

B.Sc. Mathematics
SEMESTER -5
MATHEMATICS PAPER06 (A)(Theory)
Programming in C and Numerical Analysis - I

UNIT 1: [14 Marks]

History of C, C character set, Constants, Variables, Keywords, Type Declaration, Type Conversion, Hierarchy of operators, printf&scanf functions, if statement, if-else statements, Nested if-else, Logical operators, Conditional operators, including simple programs relevant to this unit.

UNIT 2: [14 Marks]

While loop, for loop, do while loop, break statement, Continue statement goto statement, Introduction to User Defined Functions.**[Omit:- switch case statement, Pointersand Recursion]**Data types in C Integers: long and short types, signed and unsigned characters, Signed and unsigned float and doubles, including simple programs relevant to this unit.

UNIT 3: [14 Marks]

C processors, meaning ,Only Macro Expansion, Macros with Arguments,
[OMIT:-File inclusion and various directivesConditional Compilation #if and #elif Directives Miscellaneous Directives #undef Directive #pragma Directive]
Arrays, meaning: one dimensional and two dimensional, only initialization and use in simple programs **[OMIT:-no pointers and no three dimensional array, Arrays and functions.]**, including simple programs relevant to this unit.

UNIT 4: [14 Marks]

Simultaneous linear algebraic equation:
Direct methods: Gauss elimination method, Gauss Jordan method, Method of factorization (L.U. Decomposition), Crout's method.Iterative methods: Jacobi's method, Gauss Seidal's method.
Empirical laws and curve fitting.
The linear law, Laws reducible to linear laws, Principle of least square, Fitting a straight line, a parabola and exponential curve and the curve $y = ax^b$

UNIT 5: [14 Marks]

Finite differences:
Finite differences(forward , backward and central),
Differences of polynomials,Factorial polynomial, ReciprocalFactorial polynomial , Polynomial factorial notation, Error propagation in difference table, Other difference operators(Shift, averaging, differential and unit) and relation between them.
Interpolation with equal intervals:
Gregory- Newton forward interpolation formula, Gregory- Newton backward interpolation formula, Equidistance terms with one or more missing values.

Text Book for MATHEMATICS PAPER06 (A) (Theory)
PROGRAMMING IN C is as follows:
'LET USC' By : Yashvant Kanetker 5th Edition,
BPB Publications, New Delhi.

Course of PROGRAMMING IN C(THEORY)

i.e. UNIT 1,2 and 3is covered by following Sections/Chaptersof the book "LET USC"

- **Chapter 1**
  Getting Started
  [Omit:- the section of Associativity of Operator]
  Chapter 2
  The decision control Structure [Whole chapter]
- **Chapter 3**
  The loop control Structure [Whole chapter]
  For the topic of"**User Defined Functions"** refer to
  any other standard book
- **Chapter 4**
  The case control Structure
  [Omit: - Switch –Case Statement and related sections]
  Only The goto keyword and its usage.
- **Chapter 5 :-**
  [Omit:- The whole Chapter 5 – namely "Functions and Pointers"of the book "LET USC"]
- **Chapter 6:-**
  Data Types Revisited
  [Omit:- Storage Classes like Automatic Storage Class Register Storage Class, Static Storage Class ,
  External Storage Class, Which to Use When…etc.]
- **Chapter 7:-**
  The C Preprocessor
  Features of C Preprocessor, Macro Expansion, Macros with Arguments, Macros versus Functions
  [OMIT:- File Inclusion Conditional Compilation, #if and #elif Directives, Miscellaneous Directives,
  #undef Directive, #pragma Directive]
- **CHAPTER 8:-**
  Arrays.What are Arrays, A Simple Program Using Array,More on Arrays, Array Initialization, Bounds Checking, Passing Array Elements to a Function,Two Dimensional Arrays, Initializing a 2-Dimensional Array
  [OMIT:-Pointers and Arrays, Passing an Entire Array to a Function, The Real Thing, Memory Map of a 2-Dimensional Array, Pointers and 2-Dimensional Arrays, Pointer to an Array, Passing 2-D array to a Function, array of pointers, three dimensional array, summary.]

The scope of the syllabus of **UNIT 4 & 5**is roughly indicated as under:
"Numerical methods" by Dr. V. N. **Vedamurthy**& Dr. N. Ch. S. N. Iyengar, Vikas Publishing house.
Chap. 1. (Except 1.4,1.5,1.11,1.12), Chap. 4 (Except 4.4,4.7), Chap. 5. (Except 5.12), Chap. 6

Reference Books: (for Unit4 & 5)

(1) Introduction to Numerical Analysis (2nd Edition) by C.E.Froberg Addision Wasley, 1979
(2) Numerical Mathematical Analysis, by J. B.Scarforough, Oxford & IBH Publi.Co. Pvt.Ltd., 1966
(3) Numerical method, Problems & Solutions, by M. K. Jain, S. R. K.Iyengar, R. K. Jain, New Age International Pvt. Ltd., 1996.

B.Sc. Mathematics
SEMESTER -5
MATHEMATICS PAPER07(A)- (Theory)
Boolean Algebra&Complex Analysis - I

UNIT 1: [14 Marks]

Relations:

Relationsand different types of relations. Binary relations, Equivalence relations and partitions, partial order relations, Posets, Hasse diagram, Lattices as posets, Properties of lattices, Lattices as algebraic systems, Sub lattices, Direct product of two lattices, Homomorphism, order isomorphism of two posets, Isomorphic lattices, Complete lattices,Distributive lattices, Complemented lattices.

UNIT2: [14 Marks]

Boolean algebra:

Definition, Examples BA, Direct product of two BA, homomorphism, Atoms of BA, Anti atoms, Stone's representation theorem, The set A(x) of all atoms of BA and its properties. Isomorphism of a finite of finite BA and $(P(A), \subseteq)$, Boolean functions / expressions, Minterms, Maxterms, Representation ofa B. expression as a sum of product Canonical form. Karnaugh map. Minimization of a B. expression by cube array representation and by Karnaugh map.

UNIT3: [14 Marks]

Analytic functions:

Functions of complex variables, limits, Theorems on limits, Continuity and differentiability, of complex functions, harmonic functions, Entire functions and analytic functions.

UNIT 4: [14 Marks]

Cauchy's integral formula:

Cauchy Riemann conditions in Cartesian and polar form.Definite integral contours, line integrals Cauchy-Goursat theorem**(without proof),** Cauchy's integral formula.

UNIT 5: [14 Marks]

Fundamental theorem of algebra:

Higherorder derivative of analytic function, Morera's theorem, Cauchy's inequality and Liouville's theorem, Fundamental theorem of algebra, Maximum modulus theorem.

Text Book of Mathematics PAPER07(A)for the UNITs3, 4 & 5
COMPLEX ANALYSIS-1

" Complex Variables and Applications"
Fifth Edition,
Rul V. Churchill and James Ward Brown.
Mc Graw Hill Publishing Company.

Chapter 2

- Sections 9 to 21.

Chapter 4

- Sections30 to 35.

- Sections36 to 37.
  [Lemmaand Cauchy-Goursat theorem(in sections)36 **without proof),**

- Sections39to43.

References

(1) Theory of functions of Complex variables, by Shantinarayan, Chand & Co.

(2) Complex variables, Introduction and applications, by Mark Ablowitz and A. S. Fokas, Cambridge University Press.

(3) Graph theory with application to engineering and computer science. by Narsingh Deo. 1993,Prentice Hall of India Pvt. Ltd.

(4) Foundation of Discrete Mathematics, K. D. Joshi, New Age International Ltd. Publishers.

(5) A first look at Graph theory, by Clark.

(6) Discrete Mathematical Structures with applications to computer science, byTrembley 1.P. and Manohar R.

(7) Elements of Discrete Mathematics (2nd edition) by L. Liu, Me. Tata GrawHill, International edition, Computer Science series, 1986.

(8) Discrete Mathematics, By Vatsa, Vikas Publications.

(9) Introduction Graph Theory, By R. J. Willsons

(10) Discrete Mathematics Structure, By. Dugragi, Narosa Pub.

B.Sc. Mathematics
SEMESTER - 5
Mathematics PAPER –05 (B) (Practical)
Programming with SCILAB

- **Total Marks:- 35 Marks (External)+ 15 Marks(Internal)= 50 Marks / 3 hours**

1) To find the inverse of a matrix using **GAUSS-ELIMINATION** method..
2) To find inverse of given matrix using **GAUSS-JORDAN** method
3) To find **Eigen values** and **Eigen vectors** of given matrix
4) To find inverse of given matrix using **CAYLEY-HAMILTON** theorem
5) To solve given system of simultaneous linear algebraic equations using**GAUSS-JORDAN** method.
6) To solve given system of simultaneous linear algebraic equations using **GAUSS-JACOBI** method.
7) To solve given system of simultaneous linear algebraic equations using **GAUSS-SEIDAL'S** method.
8) To draw graphs of **Cycloid**
9) To draw graphs of **Catenaries**
10) To draw graphs of **spiral r = exp(-theta/10).**

Notes :

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-5**.**
- At the time of examination candidate must bring his/her own practical journal duly certified and signed by **H.O.D.**
- There shall be one question paper of **35 Marks** and **3 Hours** for practical examination
- There shall be **15 marks** for Internal Practical Examination
  (i.e. Continuous internal assessment of performance of each student during thepractical work.)

Formatof Question Paper for Practical Examination

Question 1	Answer any THREE out of FIVE	[9+9+9=	27 Marks
Question 2	Journal and Viva:	[	8 Marks
Question 3:	Internal Practical Examination	[	15 Marks
	TOTAL	**[**	**50 Marks**

B.Sc. Mathematics
SEMESTER - 5
Mathematics PAPER –06 (B)(Practical)
Programming in C language

- **Total Marks:- 35 Marks (External)+ 15 Marks(Internal) = 50 Marks / 3 hours**

(1) To write a program to find net salary of the employee.
(2) To write a program to solve the quadratic equation,
(3) To write a program to reverse a number,
(4) To write a program to verify a number whether it is palindrome or not.
(5) To write a program to find sum of the digits,
(6) To write a program to print Armstrong numbers,
(7) To write a program to find compound interest for given years,
(8) To write a program to find nPr and nCr.
(9) To write a program to find number of odd number and even numbers.
(10) To write a program to generate arithmetic and geometric progressions.
(11) To write a program to find prime number between two numbers,
(12) To write a program to solve the equation by Bisection method or
(13) To write a program to solve the equation by N-R method.
(14) To write a program to add and multiply two matrices.

Notes :

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-5**.**
- At the time of examination candidate must bring his/her own practical journal duly certified and signed by **H.O.D.**
- There shall be one question paper of **35 Marks** and **3 Hours** for practical examination
- There shall be **15 marks** for Internal Practical Examination
  (i.e. Continuous internal assessment of performance of each student during thepractical work.)

Formatof Question Paper for Practical Examination

Question 1	Answer any THREE out of FIVE	[9+9+9=	27 Marks
Question 2	Journal and Viva:	[	8 Marks
Question 3:	Internal Practical Examination	[	15 Marks
	TOTAL	**[**	**50 Marks**

B.Sc. Mathematics
SEMESTER - 5
Mathematics PAPER –07 (B)(Practical)
Numerical Analysis – I

- **Total Marks:- 35 Marks (External)+ 15 Marks(Internal)= 50 Marks / 3 hours**

1) Fitting (1) a straight line and (2) $y = e^{ax}$
2) Fitting (1) a parabola and (2) $y = ax^b$
3) Gauss elimination
4) Gauss Jordan method
5) Jacobi's method
6) Gauss Seidel's method
7) Finite differences.
8) Gregory-Newton's forwardinterpolation formula.
9) Gregory-Newton's backward interpolation formula.
10) Equidistance terms with one or more missing values

Notes :

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-5**.**
- At the time of examination candidate must bring his/her own practical journal duly certified and signed by **H.O.D.**
- There shall be one question paper of **35 Marks** and **3 Hours** for practical examination
- There shall be **15 marks** for Internal Practical Examination
  (i.e. Continuous internal assessment of performance of each student during thepractical work.)

Formatof Question Paper for Practical Examination

Question 1	Answer any THREE out of FIVE	[9+9+9=	27 Marks
Question 2	Journal and Viva:	[	8 Marks
Question 3:	Internal Practical Examination	[	15 Marks
	TOTAL	**[**	**50 Marks**

SyllabusofB.Sc.Semester-6 AccordingtoChoiceBasedCreditSystem Effective from June – 2019

(Updated on 15 / 02 / 2019 and updation implemented from June - 2019)

• **Program:**	**B.Sc.**
• **Semester:**	**6**
• **Subject:**	**Mathematics**
• **Course codes:**	**08 (A) -Theory** **09 (A) -Theory** **10 (A) -Theory** **08 (B) - Practical** **09 (B) - Practical** **10 (B) - Practical** **1 Project**
• **Total Credit Of The Semester**	**24 Credit**

B. Sc. MATHEMATICSSEMESTER : VI

- **The Course Design ofB. Sc. Sem.- VI(Mathematics) according to choice based credit system (CBCS) comprising of Paper Number, Name, No. of theory lectures per week, No. of practical lectures per week , total marks of the course are as follows :**

SR.NO.	SUBJECT	NO. OF THEORY LECTURE PER WEEK	NO. OF PRACTICAL LECTURE PER WEEK	TOTAL MARKS	Credit Of Each Paper.
1	**PAPER 08 (A) (Theory)** **Graph Theory & Complex Analysis-II**	6	-	70(External)+ 30 (Internal) = 100 Marks	4
2	**PAPER 09 (A)(Theory)** **Mathematical Analysis-II& Abstract Algebra-II**	6	-	70(External)+ 30 (Internal) = 100 Marks	4
3	**PAPER 10 (A)**(Theory) **Optimization & Numerical Analysis-II**	6	-	70(External)+ 30 (Internal) = 100 Marks	4
4	**PAPER 08 (B) (Practical)** **Introduction to GeoGebra**	-	6	35(External)+ 15(Internal) = 50 Marks	3
5	**PAPER 09 (B)(Practical) Numerical Analysis-II**	-	6	35(External)+ 15(Internal) = 50 Marks	3
6	**PAPER 10 (B)(Practical)** **Optimization**	-	6	35(External)+ 15(Internal) = 50 Marks	3
7	**Project Work & Viva (Might be cancelled and English might be introdueced from the Ac. Year 2018-19)**	1 Guidance Lect. For a group of 2 to 5 students / week	Project work to be finalized and certified and evaluated.	**60Marks (Dissertation) + 40 Marks (Viva) = 100 Marks**	3
				Total credit of the semester five	**24**

Marks Distribution of Each Paper
for
Theory and Practical (for SEMESTER-VI)

• **Total Marks of Each Theory Paper [External Examination]**	**70 Marks**
• **Total Marks of Each Theory Paper [Internal Examination]**	**10 Marks Assignments +** **10 Marks Internal exam. +** **05 Marks MCQ test +** **05 Marks Attendence =** **30 Total Marks**
• **Total Marks of Each Practical Paper [External Examination]**	**35 Marks**
• **Total Marks of Each Practical Paper [Internal Examination]**	**15 Marks** **[Continuous internal assessment of practical work]**

Format of Question Paper
(*Effective from Academic Year 2019-20 onwards*)

- **There shall be FIVE questions from all five units one each of 14 marks.**
- **Each question will be of the following form.**

Question no.	**(A)**	**Answer any Two out of Three**	**10 Marks**
	(B)	**Answer any One out of Two**	**04 Marks**
		TOTAL	**14 MARKS**

B.Sc. Mathematics
SEMESTER - 6
MATHEMATICS PAPER – 08 (A)(Theory)
GRAPH THEORYandCOMPLEX ANALYSIS - II

UNIT1: [14 Marks]

Graph theory:

Basic definitions and simple examples, Directed, Undirected, multi-graph, mixed graph. Incidence relation and degree of the graph. Empty, complete, regular graphs. Sub graph, connected and disconnected graphs.

Walk and unilateral components, Euler graphs, Unicursal graph, Operation of graph circuit & tree. Hamiltonian path and cycles, tree, Binary and Spanning trees.

UNIT 2: [14 Marks]

Cut-set, connectivity and separability

[OMIT:-1-isomorphism, 2-isomorphism]

planner graphs and their different representation, Dual of a planner graph, Euler's formula, Kuratowski's first and second non-planner graph, vector space associated with a graph, Circuit subspace and cut sets subspace, Orthogonal space.

Vertex coloring, Chromatic number, Index number and partition, Cyclic graph and decyclization of cyclic graphs, Matrix representation of a graph, Adjacency matrix, Incidence matrix, Path matrix, Rank of the adjacency matrix.

[OMIT :- Circuit matrix, Fundamental circuit matrix and cut set matrix, Relation ship of these matrices]

UNIT 3: [14 Marks]

Mapping and Conformal mapping:

Elementary functions, mapping by elementary functions, Mobious mapping, linear function, Bilinear mapping $w=(az+b)/(cz+d)$, $w = z^2$, $w = 1/z$, $w = \exp(z)$,

[OMIT:w = sin z,w = cos z,w = cosh z ,w = sinh z]

Transformations, Conformal mappings and their examples.

UNIT 4: [14 Marks]

Power series:

Definition of complex sequence, Complex series and power series Expansion of a complex function in Taylor's series and Laurent's series.

UNIT 5: [14 Marks]

Residues and poles:

Definition of a singular point, Isolated singular points, Zeros of complex functions, Poles and residues of complex function, Cauchy's residue's theorem, Evaluation of improper real integrals by residue theorem and evolution of definite integral of trigonometric functions by residue theorem.

Text book for Mathematics PAPER – 08(Unit 1 & 2)

Graph theory

Graph theory with application to engineering and computer science
By: - Narsingh Deo,
Prentice Hall of India Private Limited, New Delhi.

Chapter: 1

- § 1.1, § 1.3, § 1.4, § 1.5
- **[OMIT : - § 1.2 and § 1.6]**

Chapter: 2

- § 2.1, § 2.2, § 2.3, § 2.4, § 2.5, § 2.6, § 2.7, § 2.8, §2.9
- **[OMIT: - §2.10**]

Chapter: 3

- § 3.1, § 3.2, § 3.3, § 3.5, § 3.6, § 3.7, § 3.8
- **[OMIT: -§ 3.4, § 3.9, § 3.10]**

Chapter: 4

- § 4.1, § 4.2, § 4.3, § 4.4, § 4.5,
- **[OMIT: - § 4.6, § 4.7, § 4.8]**

Chapter: 5

- § 5.2, § 5.3, § 5.4, § 5.5, § 5.6
- **[OMIT: - § 5.1, § 5.7, § 5.8, § 5.9]**

Chapter: 6

- § 6.1, § 6.5, § 6.7, § 6.9
- [**OMIT: - § 6.2, § 6.3, § 6.4, § 6.8]**

Chapter: 7

- § 7.1, §7.8, §7.9
- [**OMIT: - § 7.2, § 7.3, § 7.4, § 7.5, § 7.6, § 7.7]**

Chapter: 8

- § 8.1, §8.2, §8.5
- [**OMIT: - § 8.3, § 8.4, § 8.6**

Chapter: 9

- § 9.1, § 9.11
- [**OMIT: - § 9.2to § 9.10]**

Text Book of Mathematics Paper 08 Unit 3, 4 & 5 is as follows

"Complex Variables and Applications"
Fifth Edition,
RuelV. Churchill and James Ward Brown.
Mc Graw – Hill Publishing Company

Chapter 5

- Sections 44, 45, 46, 47, 48 [Omit Sections: -49, 50, 51],

Chapter 6

- Sections53 to 58, 60 [**OMIT:**- Sections 59]

Chapter 7

- Sections 64, 65, 66, 67, 68, 70
  [**OMIT** Sections**:** - 63, 71, 72]
  [**OMIT: - Chapter 8**]

References

(1) Theory of functions of a Complex variables, by Shantinarayan, Chand & Co.
(2) Complex variables, Introduction and applications, by Mark Ablowitz and A. S. Fokas, Cambridge University Press.
(3) Graph theory with application to engineering and computer science.by Narsingh Deo. 1993,Prentice Hall of India Pvt. Ltd.

(4) Foundation of Discrete Mathematics, K. D. Joshi, New Age International Ltd. Publishers.
(5) A first look at Graph theory, by Clark.
(6) Discrete Mathematical Structures with applications to computer science, by Trembley 1.P. and Manohar R.
(7) Elements of Discrete Mathematics (2nd edition) by L. Liu, Me. GrawHill, International edition, Computer Science series, 1986.
(8) Discrete Mathematics, By Vatsa, Vikas Publications.
(9) Introduction Graph Theory, By R. J. Willsons
(10) Discrete Mathematics Structure, By. Dugragi, N

B.Sc. Mathematics
SEMESTER - 6
MATHEMATICS PAPER – 09 (A)(Theory)
MATHEMATICAL ANALYSIS- IIand ABSTRACT ALGEBRA - II

UNIT1: [14 Marks]

Compactness in Metric Spaces
Cover, Open cover, Finite sub cover, Compact set, Properties of compact sets **Connected sets, Separated sets, Bolzano-Weirstrass theorem, Countable set.** Homeomorphism of two metrics, Sequential compactness, totally bounded space.

UNIT 2: [14 Marks]

Laplace Transforms
Definition of Laplace Transforms, Laplace Transforms of elementary Function Inverse Laplace Transforms, Laplace Transforms of Derivative

UNIT 3: [14 Marks]

Application of Laplace Transforms to Differential Equations.
Laplace Transforms of Integrals, Laplace Transforms Differentiation and integration of Laplace Transforms, Convolution theorem, Application to Differential Equations.

UNIT 4: [14 Marks]

First fundamental theorem of homomorphism of groups and Rings
Homomorphism of groups,Kernel of homomorphism, First fundamental theorem of homomorphism of groups.Ring and its properties, Subring, **[OMIT:- Boolean ring, Euclidean ring]**
Field, Zero divisor, Integral domain, Characteristics of ring, Cancellation law,Ideals, Principal ideal, ,Polynomial ring, **[OMIT:- Quotient ring. Maximal ideal]** Polynomial, Degree of polynomial, Factor and remainder theorem of polynomial, Product, sum and division of polynomials.

UNIT 5: [14 Marks]

Polynomial Rings
Reducible and irreducible polynomials, Factorization of polynomials(unique Factorization theorem **(without proof),[OMIT:- Eisenstein's criterion**]
Division algorithm theorem of polynomial
G.C.D. of polynomials, Quaternion **[OMIT:- Ring homomorphism, Euler and Fermat's theorem]**

Text book for Mathematics PAPER – 09 (A)
MATHEMATICAL ANALYSIS- II(Unit2 and 3)
For Laplace Transforms
'Advanced Mathematics for Pharmacy' By: - Mahajan Publishing House, Ahmedabad
Chapter: - 17 Laplace Transforms
§ 17.1, § 17.2, § 17.3, § 17.4, § 17.5, § 17.6
[OMIT :- Application to Differential Equations]

Text Book for MATHEMATICS PAPER 09 (A)
"Abstract Algebra" By: Dr. I. H. Sheth, Prentice Hall Of India, New Delhi.

Course of Mathematics PAPER –09(A) (Unit 4 & 5)are covered by following Chapters/ Sectionsof the above mentioned book Abstract Algebra

Chapter 12: § 12.1, § 12.2, § 12.6
Chapter 13: § 13.1, § 13.2, § 13.3, § 13.4
Chapter 14: § 14.1, § 14.2, § 14.3, § 14.4
Chapter 15: § 15.1, § 15.2, § 15.4 **[OMIT:-§ 15.3]**
Chapter 18: § 18.1, § 18.2, § 18.3,
§ 18.4 [**Omit: Theorem: 18.4.8**
i. e. unique Factorization theorem **(without proof)**],
§ 18.5**[OMIT: - § 18.6 - Eisenstein's criterion]**
§ 18.7.

References:

(1) Topics in Algebra, I. N. Herstein, Willey Eastern Ltd. New Delhi

(2) A text Book of Modern Abstract Algebra, by Shantinarayan, S.Chand & Co., New Delhi.

(3) Fundamentals of Abstract Algebra, D. S. Malik, J. N. Mordoson

and M. K. Sen, McGraw Hill International Edition - 1997

(4) University Algebra, M. S. Gopalakrishna, Wiley Eastern Ltd.

(5) Abstract Algebra, By Bhattacharya, Yallo Publications.

(6) Modern Algera, By Kazi zamiudia & Sursit, Vikas Publication. Delhi.

(7) Text Book: Abstract Algebra, Dr. 1. H. Sheth, Nirav Prakashan, Ahmedabad.

(8) Mathematical Analysis (2nd edition) by S. C. Malik & Arora, New Age Inter. Pvt.'

(9) Mathematical Analysis, by T. M. Apostol

(10) Real Analysis, by R. R. Goldberg (Chapel' 4,5,6, 7,9 & 10.1)

(11) A course of Mathematical Analysis, by Shantinarayan, S. Chand & Sons.

(12) Metric space, by E. T. Capson

(13) Metric space, P. K. Jain & Ahmad, Narosa Publishing House

(14) Real Analysis by Sharma and Vasishtha Krishna Prakashan, Meerut-2.

(15) Mathematical Analysis, by Dr. Goyal and Gupta, Krishna Prakashan, Meerut-2.

B.Sc. Mathematics
SEMESTER - 6
MATHEMATICS PAPER – 10 (A)(Theory)
OPTIMIZATIONand NUMERICAL ANALYSIS - II

UNIT1: [14 Marks]

Linear Programming Problems

The linear programming problems, Formulation of LPP, Matrix form 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 function. Basic definitions to use Simplex method, Simplex method, Big-M method (Penalty method), Two phase method to solve LPP(without alternative solution and unbounded solution)

UNIT 2: [14 Marks]

Transportation and Assignment Problems

Principle of duality in LPP, Primal LPP and method to find its dual LPP (Simple problems of above articles). The transportation problems: Mathematical and matrix form of TP. Initial solution of TP by NWCM, LCM and VAM, Optimum solution of TP by Modi method (u-v method) (except degenerate solution), Balanced and unbalanced TP(Simple problem), Assignment problem: Mathematical and matrix form of AP, Hungarian method to solve method(simple method).

UNIT 3: [14 Marks]

Central difference interpolation&interpolation with unequal intervals:

Gauss's forward, Gauss's backward, Sterling's, Bessel's and Laplace- Everett's interpolation formulae.

Divided differences, Properties of divided difference, Relation between divided differences and forward difference, Newton's divided difference formula, Lagrange's interpolation formula, Inverse interpolation, Lagrange's inverse interpolation formula,

UNIT 4: [14 Marks]

Numerical Differentiation& Integration::

Numerical Differentiation, Derivativesusing Gregory-Newton's forward difference formula, Derivatives using Gregory-Newton's backward difference formula, Derivative using Sterling's formula.Numerical Integration, General quadrature formula, Trapezoidal rule, Simpson 's 1/3 rule, Simpson's 3/8 rule.

UNIT 5: [14 Marks]

Numerical solution of ordinary differential equations

Solution by Taylor's series method, Taylor's series method for simultaneous first order differential equations, Picard's method, Picard's method for simultaneous first order differential equations, Euler's method, Improved Euler's method, Modified Euler's method.

Runge's method, Runge-Kutta methods, Higher order Runge-Kutta methods, Runge-Kutta methods for simultaneous first order differential equations, R-K methods for simultaneous first order differential equations, Predictor-Connector methods, Milne's method.

Text Book forMathematics PAPER – 10 (A) (Theory)OPTIMIZATION(Unit - 1 & 2)

Operations Research- Theory and Applications,
J. K. Sharma, Second Edition,
MACMILLAN INDIA LTD

Course of Mathematics PAPER – 10 (A)OPTIMIZATION
is covered by following Chapters/ Sectionsof the above mentioned book

Chapter2:-
- § 2.6 [Only]

Chapter3:-
- § 3.1,§ 3.2, § 3.3 **[Omit:-§ 3.4]**

Chapter4
- § 4.1,§ 4.2, § 4.3, § 4.4 **[Omit:-§ 4.5 and§ 4.6]**

Chapter5
- § 5.1,§ 5.2, § 5.3 **[Omit:-§ 5.4, § 5.5]**

Chapter9
- § 9.1 to § 9.5 § 9.6
- **[Only § 9.6.1 Unbalanced Supply and Demand]**
- **[Omit: - § 9.6.2, § 9.6.3, § 9.6.4… etc in § 9.6]**
- **[Omit: - § 9.7, § 9.8]**

Chapter10 § 10.1 to § 10.3
- **Appendix A** A.10 and A.12
- **[Omit: - § 10.4 to§ 10.6]**
- **[Omit: - the rest]**

The scope of the syllabus of **UNIT – 3, 4 & 5**is roughly indicated as under:

"Numerical methods" by Dr. V. . Vedamurthy & Dr. N. Ch. S. N. Iyengar, Vikas Publishing house.

Chap.7 (Except 7.7,7.8), Chap. 8. (Except 8.8), Chap. 9. (Except 9.5, 9.13), Chap. 11. (Except 11.1, 11.2,11.3, 11.6, 11.9, 11.17, 11.20)

Reference Books:

(1) Introduction to Numerical Analysis (2nd Edition) by C.E.Froberg Addision Wasley, 1979

(2) Numerical Mathematical Analysis, by J. B.Scarforough, Oxford & IBH Publi.Co. Pvt.Ltd., 1966

(3) Numerical method, Problems & Solutions, by M. K. Jain, S. R. K.Iyengar, R. K. Jain, New Age International Pvt. Ltd., 1996.

B.Sc. Mathematics
SEMESTER -6
MATHEMATICS PAPER – 08 (B) (PRACTICAL)

Introduction to GeoGebra

1) Introduction to the interface of GeoGebra.
2) Use of tool bars to draw various Geometric Shapes like lines, line segments, triangles, polygons, circles and conics and to find centroid, in-center, circum –enter, ortho-center, area, parameter of triangles.
3) Verification of important theorems of geometry (like Pythagoras theorem, Thales theorem) using GeoGebra.
4) Drawing of various types of Graphs like complete graph, bipartite graph, directed and undirected graph, Graphs containing parallel ages, self loop, pendent vertex, isolated vertex, binary tree etc.
5) Drawing of graphs of functions of one variable and to find properties of the function (like increasing, decreasing, continuity, differentiability, area, length, curvature, multiple points, min-max, range, tangent, normal etc.,) using function inspector (include piece wise continuous functions also).
6) Drawing of graphs of curves when equation of the curves are given in Polar or parametric form (Cardioids, rose curves, lemniscates etc.,) Using slider.
7) To find $L(P, f)$ and $U(P, f)$ for a given function f and for given partition P.
8) Solve an LPP by Graphical Method using Geogebra.
9) Numerical methods: bisection, regulafalsi, NR, successive approx. (animation through navigation using spredsheet).
10) Numerical Calculus: Trapezoidal rule, Euler method, improved Eulermethod, modified Euler method.

Notes :

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-6**.**
- At the time of examination candidate must bring his/her own practical journal duly certified and signed by **H.O.D.**
- There shall be one question paper of **35 Marks** and **3 Hours** for practical examination
- There shall be **15 marks** for Internal Practical Examination (i.e. Continuous internal assessment of performance of each student during thepractical work.)

Formatof Question Paper for Practical Examination

Question 1	Answer any THREE out of FIVE	[9+9+9=	27 Marks
Question 2	Journal and Viva:	[	8 Marks
Question 3:	Internal Practical Examination	[	15 Marks
	TOTAL	**[**	**50 Marks**

B.Sc. Mathematics
SEMESTER -6
MATHEMATICS PAPER – 09 (B) (PRACTICAL)
NUMERICAL ANALYSIS – II

1) Gauss forward interpolation formula.
2) Gauss backward interpolation formula.
3) Sterling's or Bessel's formula
4) Laplace-Everett's formula
5) Interpolation with unequal intervals.
6) Numerical differentiation.
7) Numerical integration.
8) Taylor's or Picard's
9) Euler's method.
10) Runge's method
11) Runge-Kutta's method
12) Milne's method

Journal and viva.

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	TOTAL	**[**	**50 Marks**

B.Sc. Mathematics
SEMESTER -6
MATHEMATICS PAPER – 10 (B) (PRACTICAL)
OPTIMIZATION

1) Solve the given LPP using Graphical method.
2) Solve the given LPP using Simplex method.
3) Solve the given LPP using BIG -M method.
4) Solve the given LPP using TWO-PHASE method.
5) Obtain DUAL of the given Primal LPP;
6) Find the initial solution of given transportation problem using NWCM method.
7) Find the optimum solution of given transportation problem using LCM method.
8) Find the optimum solution of given transportation problem using VAM method.
9) Find the optimum solution of given transportation problem using MODI method.
10) Find the optimum solution of given assignment problem.

Journal and viva.

Notes :

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- **10** practical should be done during semester-6**.**
- At the time of examination candidate must bring his/her own practical journal duly certified and signed by **H.O.D.**
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