
Preface

We are thankful to Almighty ALLAH Who has given us an opportunity to write the book , named ‘Applied Mathematics-I ’ as Textbook, intending to cover the new syllabus for the first year students of Diploma of Associate Engineer (DAE)

Throughout the text, emphasis is on correct methods of computation, correct method for transposition of formulae, logical layout of solutions, neatness and clarity of arrangement of material and the systematic use of all the normal mathematical and other tables.

Topics covered include algebra, trigonometry, vectors & Phasors Algebra, Complex numbers, Number Systems, Boolean Algebra, Straight Line and The Circle.

Normally students face difficulty in solving complicated problems because they do not make a systematic attempt. We have attempted to help the students to overcome the difficulty by providing detailed instructions for an orderly approach. Difficult procedures and types of problems appearing in the exercise are illustrated by carefully explained examples. In the presentation of these illustrated examples, we have avoided unnecessary explanations. It is hoped that this book will help to give students a good foundation in old and new techniques.

Students are reminded that in order to acquire a proper understanding of the subject and its application, it is necessary to learn a number of sound basic rules and methods.No scientific or engineering subject can be fully comprehended and satisfactorily studied without a sound mathematical background.

We would like to express , sincere and thanks to Mr.Jawad Ahmed Qureshi Chief Operating Officer TEVTA,Engr. Mr.Azhar Iqbal Shad G.M Academic,Engr.Mazhar Abbas Naqvi Manager (Curriculum) and Engr. Syed Muhammad Waqar ud- Din Deputy Director(technical) Curriculum Section Academics Wing, who took keen interest and inspired us for the completion of this task.

We made every effort to make the book valuable both for students and teachers , however we shall gratefully welcome to receive any suggestion for the further improvement of the book.

Authors.

A Textbook of

APPLIED

MATHEMATICS-I

Math-123

For

First year

Diploma of Associate Engineer
(DAE)

Including: Objective Type and Short Questions
--

Authors

Sanaullah Khan
Associate Professor
Govt. College of Tech.
Railway Road Lahore

Tahir Hameed
Assistant Professor
Govt. College of Tech.
Raiwind Road, Lahore

Nasir -ud-Din Mehmood
Assistant Professor
Govt. College of Tech.
for Printing & Graphic Arts

Revised by

Muhammad Javaid Iqbal
Associate Professor
Govt. College of Tech.
Railway Road Lahore

Tanvir Haider
Assistant Professor
Govt. College of Tech.
Raiwind Road Lahore

CONTENTS

MATH– 123

PAPER A From Chapter 1 to 7

Chapter 1 Quadratic Equation 1 – 26

- 1.1 Equation:
- 1.2 Degree of an Equation
- 1.3 Polynomial Equation of Degree n
- 1.4 Linear and Cubic Equation
- 1.5 Quadratic Equation
- 1.6 Roots of the Equation
- 1.7 Methods of Solving Quadratic Equation

Exercise 1.1

- 1.8 Classification of Numbers
- 1.9 Nature of the roots of the Equation
- 1.10 Sum and Product of the Roots

Exercise 1.3

- 1.11 Formation of Quadratic Equation from the given roots

Exercise 1.4

- Summary
- Short Questions
- Objective Type Questions

Chapter 2 Binomial Theorem 27 – 47

- 2.1 Introduction
- 2.2 Factorial of a Positive Integer
- 2.3 Combination
- 2.4 The Binomial Theorem
- 2.5 General Term
- 2.6 Middle Term in the Expansion $(a + b)^n$

Exercise 2.1

- 2.7 Binomial Series
- 2.8 Application of the Binomial Series; Approximations:

Exercise 2.2

- Summary
- Short Questions
- Objective Type Questions

Chapter 3 Fundamentals of Trigonometry 48 – 82

- 3.1 Introduction
- 3.2 Types of Trigonometry

-
- 3.3 Angle
 - 3.4 Quadrants
 - 3.5 Measurement of Angles
 - 3.6 Relation between Degree and Radian Measure
 - 3.7 Relation between Length of a Circular Arc and the Radian Measure of its Central Angle

Exercise 3.1

- 3.8 Trigonometric Function and Ratios
- 3.9 Reciprocal Functions
- 3.10 Rectangular Co-ordinates and Sign Convention
- 3.11 Signs of Trigonometric Functions
- 3.12 Trigonometric Ratios of Particular Angles

Exercise 3.2

- 3.13 Fundamental Identities

Exercise 3.3

- 3.14 Graph of Trigonometric Functions

Summary

Short Questions

Objective Type Questions

Chapter 4 General Identities

83 – 113

- 4.1 Introduction
- 4.2 Distance formula
- 4.3 Fundamental law of trigonometry
- 4.4 Deductions from fundamental law

Exercise 4.1

- 4.5 Double Angle Identities
- 4.6 Half Angle identities
- 4.7 Triple angle identities

Exercise 4.2

- 4.8 Conversion of sum of difference to products
- 4.9 Converting Products to Sum or Difference

Exercise 4.3

Short Questions

Objective Type Questions

Chapter 5 Solution of Triangles

114 – 134

- 5.1 Solution of Triangles

Exercise 5.1

- 5.2 Application of Right Angled Triangles
- 5.3 Angle of Elevation and Depression

Exercise 5.2

- 5.4 Law of Sines

Exercise 5.3

- 5.5 The Law of Cosines

Exercise 5.4

5.6 Solution of Oblique Triangles

Exercise 5.5

Summary

Short Questions

Objective Type Questions

Chapter 6**Vectors and Scalars****135 – 163**

6.1 Introduction

6.2 Scalars and Vectors

6.3 Vector Representations

6.4 Types of Vectors

6.5 Addition and Subtraction of Vectors

6.6 Multiplication of a Vector by a Scalar

6.7 The Unit Vectors i, j, k (orthogonal system of unit Vectors)6.8 Representation of a Vector in the form of Unit Vectors i, j and k .

6.9 Components of a Vector when the Tail is not at the Origin

6.10 Magnitude or Modulus of a Vector

6.11 Direction Cosines

Exercise 6.1

6.12 Product of Vectors

6.13 Rectangular form of $\vec{a} \times \vec{b}$ (Analytical expression of $\vec{a} \times \vec{b}$)**Exercise 6.2**

Summary

Short Questions

Objective Type Question

Chapter 7**PHASORS ALGEBRA****164 – 183**

7.1 Introduction

7.2 J as an Operator

7.3 Mathematical Representation of Phasors

7.4 Conjugate Complex Numbers

7.5 Addition and Subtraction of Complex Numbers (Or vectors)

7.6 Multiplication and Division

7.8 Powers and Roots of the Complex Numbers (Vectors)

7.9 Principle Roots

7.10 Derivation of Euler's Relation

Exercise 7

Summary

Short Questions

Objective Type Question

PAPER B From Chapter 8 to 19
--

Chapter 8	Complex Numbers	184 – 208
------------------	------------------------	------------------

- 8.1 Introduction
- 8.2 Complex Number
- 8.3 Properties of Complex Number
- 8.4 Basic Algebraic Operation on Complex Numbers
- 8.5 Additive Inverse of a Complex Number
- 8.6 Multiplicative inverse of a complex number
- 8.7 Conjugate of a complex number

Exercise 8.1

- 8.8 Graphical Representation
- 8.8 Graphical Representation
- 8.9 Modulus of a Complex Number
- 8.10 Polar form of a complex number

Exercise 8.2

- 8.11 Multiplication and Division of Complex Numbers in Polar Form

Exercise 8.3

- Summary
- Short Questions
- Objective Type Question

Chapter 9	Partial Fractions	209 – 231
------------------	--------------------------	------------------

- 9.1 Introduction
- 9.2 Partial fractions
- 9.3 Polynomial
- 9.4 Rational fraction
- 9.5 Proper Fraction
- 9.6 Improper Fraction
- 9.7 Process of Finding Partial Fraction
- 9.8 Type I

Exercise 9.1

- 9.9 Type II

Exercise 9.2

- 9.10 Type III

Exercise 9.3

- 9.11 Type IV

Exercise 9.4

- Summary
- Short Questions
- Objective Type Questions

**Chapter 10 Number Systems and
Arithmetic Operations**

232 – 252

- 10.1 The Decimal Number System
- 10.2 The Binary Number System
- 10.3 Binary and Decimal Number Correspondence
- 10.4 Binary-to-Decimal Conversion
- 10.5 Decimal-to-Binary Conversion
- 10.6 Repeated Division-by-2 Or Multiplication-by-2 Method
- 10.7 Double-Dibble Technique
- 10.8 The Octal Number System
- 10.9 Octal-to-Decimal Conversion
- 10.10 Decimal-to-Octal Conversion
- 10.11 Repeated Division-by-8 Method
- 10.12 Repeated Multiplication-by-8 Method
- 10.13 Octal-to-Binary-Conversion
- 10.14 Octal and Binary Number Correspondence.
- 10.15 Binary-to-Octal Conversion
- 10.16 Binary Arithmetic

EXERCISE 10 Summary

Summary

Short Questions

Objective Type Questions

Chapter 11 Boolean Algebra

253 – 301

- 11.1 Introduction
- 11.2 Two Valued Logical Symbol
- 11.3 Fundamental Concepts of Boolean Algebra
- 11.4 Logical Addition
- 11.5 Logical Multiplication
- 11.6 Logic Gates
- 11.7 Basic Duality in Boolean Algebra
- 11.8 Fundamental Laws and Theorems of Boolean Algebra
- 11.9 De Morgan's Theorems
- 11.10 Sum of Product (Minterm)
- 11.11 Product of sum (Maxterm)
- 11.12 Fundamental Products
- 11.13 NAND and NOR gates
- 11.14 Combination of Gates
- 11.15 Boolean Expression and Logic Diagrams
- 11.16 Karnaugh Maps
- 11.17 Non-Unique Group
- 11.18 Redundant Groups
- 11.19 Dont' Care States
- 11.20 For the given truth table minimize the Boolean expression using Karnaugh map.

Exercise 11

Short Questions

Objective Type Questions

Chapter 12

The Straight Line

302 – 351

12.1 Introduction

12.2 Rectangular Coordinates

12.3 Polar Coordinates

12.4 Relation between Rectangular and Polar Coordinates

12.5 The Distance Formula (distance between two points)

Exercise 12.1

12.6 Segment of Line

12.7 The Ratio Formula (point of division)

Exercise 12.2

12.8 Inclination and Slope of a Line

12.9 Parallel and Perpendicular Lines

12.10 Angle Between Two Lines

Exercise 12.3

12.11 Equation of a Straight Line

12.12 Three Important Forms of the Equation of a Line

Exercise 12.4

12.13 The General Linear Equation

12.14 Reduction of General form $Ax + By + C = 0$ to other forms.

12.15 Intersection of Two Lines

12.16 Concurrent Lines and Point of Concurrence

Exercise 12.5

12.17 The Distance from a Point to a Line

Exercise 12.6

Chapter 13

The Circle

352 – 368

13.1 Circle

13.2 Standard Form of the Equation of a Circle

13.3 Circle Determined by Three Conditions

Exercise 13

Short Questions

Objective Type Questions

