

I

MATHEMATICS AND STATISTICS  
FOR COMMERCE STUDENTS

Objectives :-

To enable the students –

- 1) to acquire knowledge of mathematical notation, terminology conventions and theories.
- 2) to develop interest in the study of mathematics.
- 3) to understand mathematical concepts, principles and postulates.
- 4) to recognize the mathematical methods which are suitable for the solution of the problem under consideration.
- 5) to understand information presented in verbal, graphical or tabular form and to translate such information into mathematical form.
- 6) to develop an ability to select and apply appropriate mathematical methods and techniques to problems in unfamiliar or novel situations.
- 7) to develop an ability to manipulate mathematical expressions.
- 8) to develop an ability to make logical deductions.
- 9) to develop an ability to evaluate and interpret mathematical results.
- 10) to appreciate the role and contribution of mathematics in all fields  
Especially in the field of commerce.

I

**Unit I : Relations and Functions**

(5 Marks)-10 Periods

Types of Relations : Reflexive, symmetric, transitive and equivalence

Relations. One- on onto functions, Composite functions.

Binary Operations: Commutative, associative, finding identity element.

**Unit II : Algebra**

**1) Matrices :**

(7 Marks)-15 Periods

Concept, notation, order, equality, types of matrices, zero matrix, transpose of a matrix, symmetric and skew symmetric matrices.

Addition, Multiplication and scalar multiple of matrices, simple Properties of addition, multiplication and scalar multiplication, Non- commutative of multiplication of matrices and existence of Non-zero matrices whose product is the zero matrix (Restrict to matrix Of order 2). Concept of elementary row and column operation up to order  $2 \times 2$ . Invertible matrices. (Word problems are excluded).

**2) Determinants :**

(7 Marks)-15 Periods

Determinant of a square matrix (up to  $3 \times 3$  matrices), properties of determinants, minors, co -factors and applications of determinants in finding area of triangle. Adjoint and inverse of square matrices. System of linear equations in two or three variables (having unique solution) using inverse of Matrix. Cramer's rule and its application.

**Unit III : Calculus (30 Periods)**

**Limits, Continuity, Differentiability**

**1) Limits :**

(4 Marks)-8 Periods

Revision of algebraic limits, trigonometric, exponential and logarithmic limits.

Note: All formulae of limits without proof.

**2) Continuity:**

(4 Marks)-8 Periods

Left hand limit and right hand limit at a point. Continuity at a point and in an interval. Algebra and continuity (without proof).

Continuity of polynomial, trigonometric, exponential, logarithmic, identity, Modules (without proof). Continuity of composite functions.

**3) Derivatives :**

(9 Marks)-16 Periods

Definition of derivatives, Revision of algebra of derivatives. Derivatives of composite function, chain rule. Derivatives of implicit functions.

Derivatives of  $a^x$ ,  $e^x$ ,  $\log x$ ,  $a^{px+q}$ ,  $e^{ax+b}$ ,  $\log(ax + b)$ , by using first

Principle of derivatives. Derivatives of exponential and logarithmic function. Logarithmic differentiation, Derivative of functions expressed in parametric form. Derivatives of one function w.r.t other function, second order derivative.

## Unit IV : Integrals

(15 Marks)-25 Periods

### 1) Indefinite integration :

Integration as inverse process of differentiation. Properties of indefinite integral. Integration by substitution, by parts and by partial fractions.

Integrals only of the following type :

$$\int \frac{dx}{x^2-a^2} , \int \frac{dx}{a^2-x^2} , \int \frac{dx}{\sqrt{x^2-a^2}} , \int \frac{dx}{\sqrt{x^2+a^2}}$$

$$\int \frac{dx}{ax^2+bx+c} , \int \frac{dx}{\sqrt{ax^2+bx+c}} , \int \frac{px+q}{ax^2+bx+c} dx$$

$$\int \frac{px+q}{\sqrt{ax^2+bx+c}} dx , \int \sqrt{x^2+a^2} dx , \int \sqrt{x^2-a^2} dx , \int \sqrt{ax^2+bx+c} dx$$

$$\int \frac{ae^x+be^{-x}}{ce^x+de^{-x}} dx , \int \frac{a\sin x+b\cos x}{c\sin x+d\cos x} dx , \int \frac{dx}{a\sin x+b\cos x+c}$$

$$\int e^{ax}\sin bx dx , \int e^{ax}\cos bx dx \text{ (either } a=1 \text{ or } b=1)$$

$$\int \frac{1}{x(ax+bx^n)} dx , \int e^{x(f(x)+f^1(x))} dx$$

$$\int \frac{px+q}{(x-a)(x-b)} dx ; a \neq b , \int \frac{px+q}{(x-a)^2} dx , \int \frac{px^2+qx+r}{(x-a)(x-b)(x-c)} dx$$

**N.B:** Integrand and integral involving inverse trigonometric functions are excluded

2) Definite Integral:

Basic properties of definite integrals (without proof). Evaluation of definite integrals.

Unit V : Differential Equation

(7 Marks)-10 Period

Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given (order 2). Solution of differential equation by method of separation of variable, homogeneous differential equations of first order and first degree.

Unit VI : Linear Programming

(7 Marks)-8 Periods

Introduction, definition of related terminology, such as constraints, objective Functions, optimization, different types of linear programming (L.P) problems. Mathematical formulation of L.P.P. Graphical method of solution for problems in 2 variables. Feasible regions in the first quadrant, optimal feasible solution (Up to 3 non-trivial constraints).

Unit VII : Probability

(8 Marks)-15 Periods

Revision of Addition theorem, multiplication theorem on probability(without proof).

Conditional probability, independent events, total probability,

Bayes' Theorem (without proof), problems based on Bayes' Theorem.

Probability distribution, mean, variance and random variable.

Repeated independent(Bernoulli) trials and Binomial Distribution.

Unit VIII : Bill of Exchange

(6 Marks)-10 Periods

Introduction, Bankers Discount, true discount, bankers gain,

To find date of discount, date of draw, period of bill, Interest, due date.

Unit IX : Partnership

(7 Marks)-10 Periods

Investment of capital for unequal period, sharing of profit, partners

Salaries. Interest on capital. Profit sharing on the admission of a new

Partner or retirement of an existing partner.

Unit X : Annuity

(7 Marks)-10 Periods

Annuity and its types, present value and amount in case of ordinary annuity. Annuity due, deferred annuity, Sinking fund (using both log tables and annuity tables).

Unit XI : Application of Calculus

(7 Marks)-10 Periods

Average cost, marginal cost, Total revenue, average revenue, Marginal revenue. Break even analysis. Maximization of total Revenue, and total profit minimization of average cost.

N.B: -Statements of theorems and definitions are included.

-Proofs of theorems are excluded.