

சென்னைப் பல்கலைக்கழகம்
தொலைதரரக் கல்வி நிறுவனம்



B.Sc. Degree Course in
MATHEMATICS
கணிதம்

Syllabus for Core Subjects

Non-Semester

(Effective from the Academic Year 2005 - 2006)

UNIVERSITY OF MADRAS
INSTITUTE OF DISTANCE EDUCATION
CHENNAI - 600 005

B.Sc. MATHEMATICS
SCHEME OF EXAMINATIONS
FIRST YEAR

Paper	Subjects	Duration Hours	Total Marks
	Core Courses - Main Subjects		
I	Algebra and Trigonometry	3	100
II	Calculus, Coordinate Geometry of two dimension and Differential Geometry.	3	100
	Core Course - Allied Subject		
I	Financial Accounting	3	100
	SECOND YEAR		
	Core Courses - Main Subjects		
III	Differential Equation, Laplace Transforms, Vector Calculus, Foruier Series and Fourier Transforms	3	100
IV	Coordinate Geometry of three dimensions, Probability and Statistics.	3	100
	Core Course - Allied Subject		
II	Cost and Management Accounting	3	100
	THIRD YEAR		
V	Algebraic Structures	3	100
VI	Real Analysis	3	100
VII	Dynamics and Complex Analysis	3	100
VIII	Part I - Graph Theory and Part II - Programming in C (Theory and Practicals)	3	100
	Application Oriented Subject		
	Operations Research	3	100

INSTITUTE OF DISTANCE EDUCATION
B.Sc. DEGREE COURSE IN
MATHEMATICS
SYLLABUS
FIRST YEAR

PAPER I - ALGEBRA AND TRIGONOMETRY

Algebra

Theory of Equations : Polynomial equations; Imaginary and irrational roots; Symmetric functions of roots in terms of coefficient; Sum of r th powers of roots; Reciprocal equations; Transformations of equations.

Descartes' rule of signs : Approximate solutions of roots of polynomials by Newton - Raphson Method - Horner's method; Cardan's method of solution of a cubic polynomial.

Summation of Series : Binomial, Exponential and Logarithmic series (theorems without proof); Summation of finite series using method of differences - simple problems.

Trigonometry

Expansions of $\sin x$, $\cos x$, $\tan x$ in terms of x ; $\sin nx$, $\cos nx$, $\tan vx$, $\sin nx$, $\cos nx$, $\tan nx$, hyperbolic and inverse hyperbolic functions - simple problems.

Matrices

Symmetric; Skew Symmetric; Hermitian; Skew Hermitian; Orthogonal and Unitary Matrices; Rank of a matrix; Consistency and solutions of Linear Equations; Cayley Hamilton Theorem; Eigen values; Eigen Vectors; Similar matrices; Diagonalization of a matrix.

Group Theory and Number Theory

Equivalence relations; Groups; subgroups - cyclic groups and properties of cyclic groups - simple problems; Lagrange's theorem; Prime number; Composite number;. decomposition of a composite number as a product of primes uniquely (without proof); divisors of a positive integer n ; congruence modulo n ; Euler function (without proof); highest power of a prime number p contained in $n!$; Fermat's and Wilson's theorems - simple problems.

Logarithms of Complex numbers.

Summation of series

Sums of sines and cosines of n angles which are in A.P.; Summation of trigonometric series using telescopic method, $C + i S$ method.

Reference Books

1. Algebra : T.K. Manickavachagam Pillai and others (S.Viswanathan Publications)
2. Higher Algebra : H.S. Hall and S.R. Knight (HM Publications - 1994)
3. Pure Mathematics : Hardy
4. Trigonometry : P. Duraipandian

5. Plane Trigonometry Part 2 : S.L. Loney (Macmillan and Co. London)
6. Algebra, Analytical Geometry (2D) and Trigonometry; Dr.S. Sudha (Emerald Publishers).
7. Topics in Algebra : I.N. Herstein (Vikas Publishing Co.)
8. Algebra : S. Arumugam (New Gama Publishing House, Palayamkottai)

PAPER II - CALCULUS, COORDINATE GEOMETRY OF 2 DIMENSIONS AND DIFFERENTIAL GEOMETRY

Differential Calculus

nth derivative; Leibnitz's theorem (without proof) and its applications; Partial differentiation. Total differentials; Jacobians; Maxima and Minima of functions of 2 and 3 independent variables - necessary and sufficient conditions (without proof); Lagrange's method (without proof) - simple problems on these concepts.

Integral Calculus

Methods of integration; Properties of definite integrals; Reduction formulae - Simple problems.

Coordinate Geometry

Conics - Parabola, ellipse, hyperbola and rectangular hyperbola - pole, polar, co-normal points, con-cyclic points, conjugate diameters, asymptotes and conjugate hyperbola.

Curvature

Curvature; radius of curvature in cartesian coordinates; polar coordinates; equation of a straight line, circle and conic;

radius of curvature in polar coordinates; p-r equations; evolutes; envelopes.

Asymptotes

Methods (without proof) of finding asymptotes of rational algebraic curves with special cases.

Beta and Gamma functions, properties and simple problems.

Double Integrals; change of order of integration; triple integrals; applications to area, surface and volume.

Reference Books

1. Analytical Geometry : T.K. Manickavachagam Pillai and others (S. Viswanathan Publications)
2. Analytical Geometry of 2 dimensions : P. Duraipandian.
3. Coordinate Geometry : Dr. P. Balasubramanian and others (McGraw Hill Publishers)
4. Calculus : S. Narayanan and Others (S. Viswanathan Publications)
5. Integral Calculus : Shanti Narayanan (S. Chand and Co.)
6. Integral Calculus and Differential Equations : Dipak Chatterji (TATA McGraw Hill publishing company)
7. Calculus : Dr. S. Sudha (Emerald Publishers).

ALLIED PAPER I

FINANCIAL ACCOUNTING

Unit - I

Meaning and scope of Accounting, Basic Accounting Concepts and Conventions - Objectives of Accounting - Accounting Transactions - Double Entry Book keeping - Journal, Ledger, Preparation of Trial Balance - Preparation of Cash Book.

Unit - II

Preparation of Final Accounts of a Sole Trading Concern - Adjustments - Closing Stock, Outstanding and Prepaid items, Depreciation, Provision for Bad Debts, Provision for Discount on Debtors, Interest on Capital and Drawings - Preparation of Receipts and Payments Account, Income & Expenditure Account and Balance Sheet of Non Trading Organizations (simple problems)

Unit - III

Classification of errors - Rectification of errors - Preparation of Suspense Account.

Bank Reconciliation Statement (Only simple problems).

Unit - IV

Depreciation - Meaning, Causes, Types - Straight Line Method - Written Down Value Method (Change in Method excluded) - Insurance Claims - Average Clause (Loss of stock only)

Unit - V

Single Entry - Meaning, Features, Defects, Differences between Single Entry and Double Entry System - Statement of Affairs Method - Conversion Method (Only simple problems).

Unit - VI

Branch Accounts - Dependent branches - Stock and debtors system - Distinction between wholesale profit and retail profit - Independent branch (foreign branches excluded)

Unit - VII

Departmental Accounts - Basis for allocation of expenses - Inter departmental transfer at cost or selling price - Treatment of expenses which cannot be allocated.

Unit - VIII

Hire purchase and instalment - Default and repossession - Hire purchase trading account.

Instalment purchase system.

Unit - IX

Admission of a partner - Retirement of a partner - Death of a partner.

Unit - X

Dissolution of a partnership - Insolvency of a partner (Application of Indian Partnership Act, 1932) - Insolvency of all partners - Gradual realisation of assets and piecemeal distribution.

REFERENCE BOOKS

1. R.L. Gupta & V.K. Gupta - Advanced Accounting, Sultan Chand, New Delhi.
2. T.S. Reddy & Murthy - Financial Accounting, Margham Publications, Chennai.
3. Shukla & Grewal - Advanced Accounting, S.Chand, New Delhi.
4. Jain & Narang - Financial Accounting
5. P.C. Tulsian - Financial Accounting
6. S. Parthasarathy and A. Jaffarulla, Kalyani Publishers, Financial Accounting.
7. R.L. Gupta & Radhaswamy - Advanced Accounting, Volume 1.

SECOND YEAR

PAPER III - DIFFERENTIAL EQUATIONS, LAPLACE TRANSFORMS, VECTOR CALCULUS, FOURIER SERIES AND FOURIER TRANSFORMS

First order but of higher degree equations - solvable for p, solvable for x, solvable for y, Clairaut's form - simple problems.

Second order equations with constant coefficients with particular integrals for e^{ax} , x^m , $e^{ax} \sin mx$, $e^{ax} \cos mx$.

Second order differential equations with variable coefficients

$$ax^2 \frac{d^2y}{dx^2} + bx \frac{dy}{dx} + cy = q(x);$$

Method of variation of parameters; Total differential equations, simple problems.

Partial Differential Equations :

Formation of P.D.E. by eliminating arbitrary constants and arbitrary functions; Complete Integral; Singular Integral; General Integral; Charpit's method and the standard types $f(p,q) = 0$, $f(x,p,q) = 0$, $f(y,p,q) = 0$, $f(z,p,q) = 0$, $f(x,p) = f(y,q)$; Clairaut's form and Lagrange's Equation $Pp + Qq = R$ - Simple problems.

Laplace Transform; Inverse Laplace Transform (usual types); Applications of Laplace Transform to solution of first and second order linear differential equations (constant coefficients) and simultaneous linear differential equations - simple problems.

Vector Differentiation, gradient, divergence, curl, directional derivative, unit normal to a surface.

Vector Integration, line surface and volume integrals; theorems of Gauss, Stokes and Green (without proof) - simple problems.

Fourier Series : Expansions of periodic function of period 2π ; expansion of even and odd functions; half range series.

Fourier transforms : Infinite Fourier transforms (Complex form, no derivation); sine and cosine transforms; simple properties of Fourier Transforms; Convolution theorem; Parseval's Identity.

REFERENCE BOOKS

1. Engineering Mathematics Volume 3 : M.K. Venkataraman (National Publishing Co.)
2. Engineering Mathematics Volume 3 : P. Kandasamy and others (S. Chand and Co.)
3. Integral Calculus and differential equations : Dipak Chatterjee (TATA McGraw Hil Pulishing Company Ltd.)
4. Advanced Engineering Mathematics : Erwin Kreyszig (John Wiley and Sons New York 1999)
5. Calculus : Narayanan and others (S.Viswanathan publishers)
6. Differential Equations & Integral Transforms : Dr.S. Sudha (Emerald Publishers).
7. Vector Analysis : Murray Spiegel (Schaum Publishing company, New York).
8. Vector Analysis : P. Duraipandian and Laxmi Duraipandian (Emerald Publishers)

PAPER IV - COORDINATE GEOMETRY OF 3 DIMENSIONS, PROBABILITY AND STATICS

Planes and lines; reduction to symmetric form of a line given by a pair of planes; conditions of 2 lines to be coplanar and the equation of the plane containing the lines; length and equation of the shortest distance between 2 skew lines; image of a point and a line w.r.t. a plane, bisector planes.

Sphere

Equations of a sphere; general equation; section of a sphere by a plane; tangent plane; radical plane; coaxial system of spheres; orthogonal spheres.

Probability

Probability space; total probability; multiplication law on probability; conditional probability; independent events; Baye's theorem.

Random variables; discrete and continuous; distribution functions; expected value; moments; moment generating function; probability generating function.

Forces :

Types of forces, Magnitude and direction on a resultant of the forces acting on a particle, Lami's theorem, equilibrium of a particle under several coplanar forces, parallel forces, moments, couples - simple problems.

Friction :

Laws of friction, angle of friction, equilibrium of a body on a rough inclined plane acted on by several forces, centre of gravity of simple uniform bodies, triangular lamina, rods forming a triangle, trapezium, centre of gravity of a circular arc, elliptic quadrant, solid and hollow hemisphere, solid and hollow cone, catenary - simple problems.

REFERENCE BOOKS

1. Differential Equations, Fourier Series and Analytical Solid Geometry : P.R. Vittal (Margham Publishers)
2. Engineering Mathematics Volume 3 : M.K. Venkataraman (National Publishing Co.)

3. Engineering Mathematics Volume 3 : P. Kandasamy and Others (S. Chand and Co.)
4. Advanced Engineering Mathematics : Stanley Grossman and William R. Devit (Harper and Row Publisher)
5. Fundamentals of Mathematical statistics : S.C. Gupta and V.K. Kapoor (Sultan Chand and Sons)
6. Mathematics Statistics and Probability by Dr. P.R. Vittal (Margham Publishers)
7. Mechanics - P. Duraipandian and others, S. Chand & Co.
8. Statics - K. Viswanatha Naik and M.S. Kasi, Emerald Publishers.
9. Statics - S. Narayanan and others, S. Chand and Co.
10. Statics - A.V. Dharmapadam, S. Viswanathan and Co.

ALLIED PAPER II

COST AND MANAGEMENT ACCOUNTING

Unit - I

Nature and scope of Cost Accounting. Cost analysis, concepts and Classifications. Installation of costing systems, cost centers and profit centers.

Unit - II

Cost sheets, tenders and quotations. Reconciliation of cost and financial accounts.

Unit - III

Material purchase control, Level, aspects, need and essentials of material control.

Stores control - Stores Department, EOQ, Stores records, ABC analysis, VED analysis.

Material costing - Issue of materials - FIFO, LIFO, HIFO, SAM, WAM, Market price, Base stock method and Standard price method.

Unit - IV

Labour cost - Computation and control. Time keeping, Methods of wage payment - Time rate and Piece rate system. Payroll procedures. Idle time and over time. Labour turnover.

Unit - V

Overheads - Classification, Allocation, Apportionment and Absorption.

Accounting and control of overheads - Manufacturing, Administration, Selling and Distribution. (Primary and Secondary Distribution). Machine Hour Rate.

Unit - VI

Management Accounting - Meaning, scope, importance and limitations - Management Accounting vs. Cost Accounting. Management Accounting vs. Financial Accounting.

Unit - VII

Analysis and Interpretation of Financial Statement - Nature, Objectives, tools - Methods - Comparative Statements, Common Size statement and Trend analysis.

Unit - VIII

Ratio Analysis - Interpretation, benefits and limitations.
Classification of ratios - Liquidity, profitability, turnover, capital structure and leverage.

Unit - IX

Funds flow and Cash flow statements.

Budgets and budgetary control - Meaning, objectives, merits and demerits - Types of Budgets - Production, Cash and Flexible Budgets.

Unit - X

Marginal costing (excluding decision making)
Absorption Costing and Marginal Costing - CVP analysis -
Break Even Analysis - Break Even Chart.

REFERERNC E BOOKS

1. Jain S.P., and Narang K.L. - Cost Accounting.
2. Khanna B.S., Pandey I.M., Aherjia G.K. and Arora M.N. - Practical Costing.
3. Reddy and Murthy - Cost Accounting.
4. N.K. Prasad and V.K. Prasad - Cost Accounting.
5. Dr. S.N. Maheswari - Management Accounting.
6. Chadwick - The Essence of Management Accounting.
7. Charles T. Horngren and Gary N. Sunderi - Information to Management Accounting.
8. Reddy and Murthy - Management Accounting.

THIRD YEAR

PAPER V - ALGEBRAIC STRUCTURES

Groups :

Normal subgroups : Homomorphisms; Automorphisms; Cayley's theorem; Permutation groups; Conjugacy and class equation.

Rings

Definition and examples; Integral domain; homomorphism of rings; ideals and quotient rings; prime ideal and maximum ideal; the field of quotients of an integral domain; Euclidean rings.

Vector Spaces

Definition and examples, linear dependence and independence, dual spaces, inner product spaces.

Linear Transformations

Algebra of linear transformation, characteristic roots, matrices, canonical forms, triangular forms.

Treatment and Content as in "Topics in Algebra" - I.N. Herstein - Wiley Eastern Ltd.

Chapter 2, Sections 2.6, 2.7 (Omit Applications 1 and 2), 2.8, 2.9, 2.10, 2.11.

Chapter 3, Sections 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7.

Chapter 4 - Sections 4.1, 4.2, 4.3, 4.4.

Chapter 6 - Sections 6.1, 6.2, 6.3, 6.4.

REFERENCE BOOKS

1. University Algebra - N.S. Gopalakrishnan - New age international publications, Wiley Eastern Ltd.
2. First Course in Algebra - John B. Fraleigh, 2nd Edition Addison Wesley.
3. Textbook of Algebra - R. Balakrishnan and N. Ramabadrana, Vikas Publishing Co.
4. Algebra - S. Arumugam, New gamma publishing house, Palayamkottai.

PAPER VI - REAL ANALYSIS

Sets and Functions

Set and elements; operations on sets; functions; real valued functions; equivalence; countability; real numbers; least upper bounds.

Sequences of Real Numbers

Definition of a sequence and subsequence; limit of a sequence; convergent sequences; divergent sequences; bounded sequences; monotone sequences; operations on convergent sequences; operations on divergent sequences; limit superior and limit inferior; Cauchy sequences.

Series of Real Numbers

Convergence and divergence; series with non-negative numbers; alternating series; conditional convergence and absolute convergence; tests for absolute convergence; series whose terms form a non-increasing sequence; the class l^2 .

Limits and Metric Spaces

Limit of a function on a real line; metric spaces, limits in metric spaces.

Continuous Functions on Metric Spaces

Functions continuous at a point on the real line, reformulation, functions continuous on a metric space, open sets, closed sets, discontinuous function on the real line.

Connectedness Completedness and Compactness

More about open sets, connected sets, bounded sets and totally bounded sets, complete metric spaces, compact metric spaces, continuous functions on a compact metric space, continuity of inverse functions, uniform continuity.

Calculus

Sets of measure zero, definition of the Riemann integral, existence of the Riemann Integral (statement only) properties of Riemann integral, derivatives, Rolle's theorem, Law of Mean, Fundamental theorems of calculus, Taylor's theorem.

Sequences and Series of Functions

Pointwise convergence of sequences of functions, uniform convergence of sequences of functions.

Reference Books

1. Treatment as in "Methods of Real Analysis" : Richard. R. Goldberg (Oxford and IBH Publishing Co.)

Ch 1 - full.

Ch 2 - Sections 2.1 - 2.10.

Ch 3 - Section 3.1 - 3.4, 3.6, 3.7, 3.10.

Ch 4 - full

Chapter 5 and chapter 6 full, chapter 7 (section 7.1 - 7.8), chapter 8 (section 8.5 only), chapter 9 (sections 9.1 and 9.2 only). R. Bartle and Sherbert. Real Analysis fifth edition, Wiley and sons, New York.

**PAPER VII - PART - I - DYNAMICS AND
PART - II - COMPLEX ANALYSIS
PART I - DYNAMICS**

Kinematics : Kinematics of a particle, velocity, acceleration, relative velocity, angular velocity, Newton Laws of Motion, equation of motion, rectilinear motion under constant acceleration, simple harmonic motion.

Projectiles

Time of flight, horizontal range, range in an inclined plane. Impulse and impulsive motion; collision of two smooth spheres direct and oblique impact - simple problems.

Central forces

Central orbit as plane curve, p - r equation of a central orbit, finding law of force and speed for a given central orbit, finding the central orbit for a given law or force.

Moment of inertia

Moment of inertia of simple bodies, theorems of parallel and perpendicular axes, moment of inertia of triangular lamina, circular lamina, circular ring, right circular cone, sphere (hollow and solid)

Reference Books

1. Mechanics - P. Duraipandian and others, S. Chand and Co.
2. Dynamics - K. Viswanatha naik and M.S. Kasi, Emerald publishers.
3. Dynamics - A.V. Dharmapadam, S. Viswanathan publishers.

PART II - COMPLEX ANALYSIS

Content and treatment as in "Complex Variables and Applications" - Ruel V. Churchill, James W. Brown and Roger F. Verhey - McGrawhill International student edition.

Complex Numbers :

Point at infinity, Stereographic projection.

Analytic Functions

Functions of a complex variable, mappings, limits, theorems of limits without proof continuity, derivatives, differentiation formula, Cauchy - Riemann equations, sufficient conditions; Cauchy - Riemann equations in Polar form, analytic functions, harmonic functions.

Mappings by elementary functions : linear functions, the function $1/z$, linear fractional transformations, the functions $w=z^n$, $w = \exp(z)$, special linear fractional transformation.

Integrals

Definite integrals, contours, line integrals, Cauchy - Goursat theorem (without proof), Cauchy integral formula, derivatives of analytic functions, maximum moduli of functions.

Series

Convergence of sequences and series (theorems without proofs), Taylor's series, Laurent series, zeros of analytical functions.

Residues and Poles

Residues, the residue theorem, the principle part of a function, poles, evaluation of improper real integrals, improper integrals, integrals involving trigonometric functions, definite integrals of trigonometric functions.

Reference Books

1. Theory and Problems of Complex Variables - Murry. R. Spiegel, Schaum outline series.
2. Complex Analysis - P. Duraipandian.
3. Introduction To Complex Analysis - S. Ponnuswamy, Narosa publishers 1993.

PAPER VIII - PART - I - GRAPH THEORY AND PART - II - PROGRAMMING IN C PART I - GRAPH THEORY

Graphs and Sub-graphs

Definition and examples, Degrees, Sub-graphs, Isomorphism, Independent sets and coverings, Intersection graphs and Line graphs, Matrices, Operations on graphs, Degree Sequences, Graphic Sequences - Simple Problems.

Connectedness

Walks, Trails and Paths, Connectedness and components Blocks, connectivity - Simple Problems.

Eulerian and Hamiltonian Graphs

Trees

Planarity

Definition and Properties - Simple Problems.

Directed Graphs

Definitions and Basic Properties, Paths and Connections, Digraphs and Matrices - Simple Problems.

REFERENCE BOOKS

1. Content and treatment as in "Invitation to Graph Theory by S. Arumugam and S. Ramachandran.
2. Scitech Publications (India) Pvt. Ltd. - Chennai - 600 017 - June 2001.
3. Chapters : 2 (Omit 2.5), 3, 4, 5, 6, 8 (omit 8.2, 8.3) and 10 (omit 10.4)

PART II - PROGRAMMING IN 'C' (THEORY)

Introduction - Constants - Variables - Data types - Operators - Precedence of operators - Library functions - Input Statements - Output Statements - Escape sequences - Formatted outputs - Storage classes - Command line arguments - Preprocessor directives.

Control statements - if statement - if else statement - Nested if statement - switch case statement - Conditional Operator - go to statement - while statement - do while statement - for statement - Nested for - continue - exit - break.

Arrays - One dimensional arrays - Declaration - Initialization of arrays - Two dimensional arrays - Multidimensional arrays - Pointers - Functions - Function definition - Function declaration - Calling a function - Call by reference - Call by value.

Categories of functions - Nesting of functions - Recursion - Function with arrays - Strings - Arithmetic operations on characters - comparing strings - String handling functions.

Structure - Structure definition - Structure initialization - Union - Enumerations - User defined data types (typedef) - Files - open - close - input - output - operations on files.

REFERENCE BOOKS

1. A first book at graph theory by John Clark - Allied Publisher
2. Graph Theory by S. Kumaravelu and Susheela Kumaravelu
3. A First course in Graph Theory by S.A. Choudum - Macmillam India Ltd.
4. Introduction to Graph Theory by Robin J. Wilson - Pearson Education Asia.
5. Balaguruswamy, E : Programming in C
6. Venugopal, Programming in C
7. Gottfried, B.S. : Programming with C, Schaum's Outline Series, TMH 2001.

PRACTICALS

Writing 'C' programs for the following :

1. To convert centigrade to Fahrenheit
2. To find the area, circumference of a circle
3. To convert days to months and days
4. To solve quadratic equations
5. To find sum of n numbers
6. To find the largest and smallest numbers
7. To evaluate the sine series, cos series
8. To evaluate the power series
9. To generate Pascal's triangle, Floyd's triangle
10. To add and subtract two matrices
11. To multiply two matrices

12. To evaluate fibonacci series using functions
13. To evaluate Compound Interest using functions
14. To add complex numbers using functions
15. To use string functions.

PAPER IX - APPLICATION ORIENTED SUBJECT

1. OPERATIONS RESEARCH

Linear Programming - formulation - graphical solution - simplex method.

Big - M method - two-phase method - duality - primal - dual relation - dual simplex method.

Revised simplex method - sensitivity analysis.

Transportation problem - assignment problem.

Sequencing problem - n jobs through 2 machines - n jobs through 3 machines - two jobs through m machines - n jobs through n machines.

PERT and CRM :

Project network diagram - Critical path (crashing excluded) - PERT computation.

Queuing theory - Basic concepts - Steady state analysis of M/M/1 and M/M/Systems with infinite and finite capacities.

Inventory models :

Basic concepts - EQQ models : (a) Uniform demand rate infinite production rate with no shortages (b) Uniform demand rate Finite production rate no shortages - Classical newspaper boy problem with discrete demand - purchase inventory model with one price break.

Game theory :

Two - person zero-sum game with saddle point - without saddle point - dominant solving $2 \times n$ or $m \times 2$ game by graphical method.

Integer programming : Branch and bound method.

BOOKS FOR REFERENCE

1. Gauss S.I., Linear Programming, McGraw - Hill Book Company.
2. Gupta P.K. and Hira D.S., Problems in Operation Research, S. Chand & Co.
3. Kanti Swaroop, Gupta P.K. and Manmohan, Problems in Operation Research, Sultan Chand & Sons.
4. Ravindran A., Phillips D.T. and Solberg J.J., Operation Research, John Wiley & Sons.
5. Taha H.A., Operation Research, Macmillan Publishing Company, New York.
6. Linear Programming, transportation, assignment game by Dr. Paria, Books and allied (p) ltd., 1999