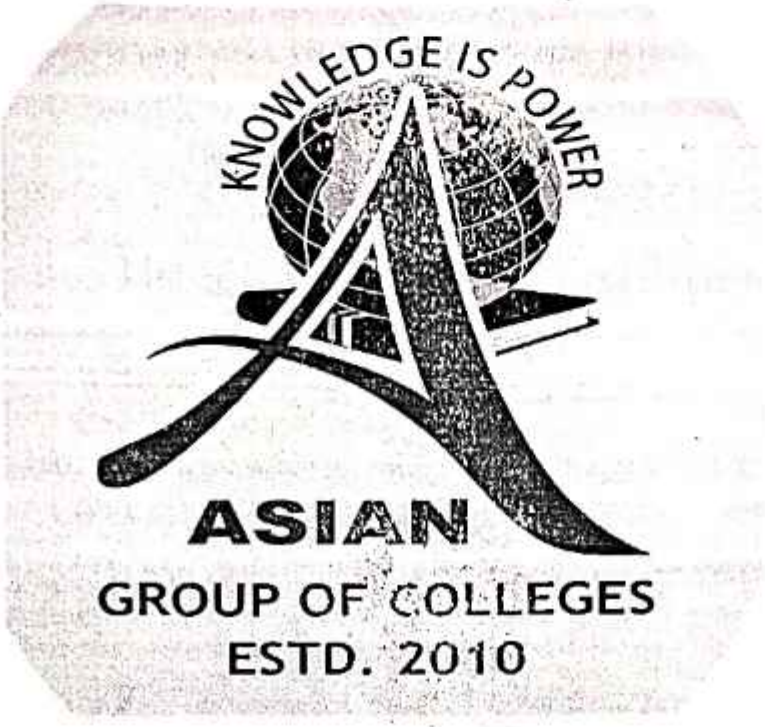
Asian Educational Institute, Patiala

(An Autonomous College)

School of Science and Mathematics



SYLLABUS

UG Programme B.A. / B.Sc.(Honours)

MAJOR - MATHEMATICS

(Semester-I, II)

Session : 2024-25

Semester-I

Type of Course	Course code	Course title	Teaching hrs	Credits
Major- Mathematics	BMATH101T	Algebra and Trigonometry	4 hrs per week	04
Major- Mathematics Lab	BMATH101L	Practical (Algebra and Trigonometry)	2 hrs per week	01

Semester-II

Type of Course	Course code	Course title	Teaching hrs	Credits
Major- Mathematics	BMATH102T	Calculus-I	4 hrs per week	04
Major- Mathematics Lab	BMATH102L	Practical (Calculus-I)	2 hr per week	01

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Semester-I

ALGEBRA AND TRIGONOMETRY

Subject Code: BMATH101T

Major Theory

Max. Marks: 100 **Credits: 04**

End-Semester Exam: 70 **Total teaching hrs.: 50**

Internal Evaluation: 30 **Pass Marks: 40%**

Course Objective: The main goal of this course is to deliver basics of binomial theorem, properties of binomial coefficients. The course introduces the concept of De Moivre's theorem and its applications, eigen values and eigen vectors of a matrix. To understand nature of solution of a linear system of equations.

Course Outcomes: The students will be able to:

CO1: To understand D' Moivre's theorem, applications of D' Moivre's theorem.
CO2: To know about exponential, logarithmic, direct and inverse circular and hyperbolic functions of a complex variable.
CO3: To understand summation of series including Gregory series.
CO4: To know Hermitian and Skew- Hermitian matrices, linear dependence of row and column vectors.
CO5: Determine the sum of infinite binomial series, the rank of a matrix, eigen values, eigen vectors and solve linear system of equations using matrices.

Instructions for the paper setter:

The Question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having ten short answer type questions covering the entire syllabus uniformly. Each question in sections A and B will be of 10 marks and section C will be of 30 marks.

Instructions for the candidates

Candidates are required to attempt five questions in all selecting two questions from each of the section A and B and compulsory question of Section C.

SECTION-A

Principle of mathematical induction, recall of binomial theorem for positive index, properties of binomial coefficients, summation of infinite binomial series, solution of trigonometric equations, D'Moivre's theorem, applications of D' Moivre's theorem including primitive nth root of unity, expansions of $\sin n\theta$, $\cos n\theta$, $\sin^n\theta$, $\cos^n\theta$ ($n \varepsilon N$). summation of series including Gregory series, the exponential, logarithmic, direct and inverse circular and hyperbolic functions of a complex variable.

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SECTION-B

Recall of determinant of a matrix, properties of determinants . Hermitian and skew- Hermitian matrices, linear dependence of row and column vectors, row rank, column rank and rank of a matrix and their equivalence, eigen- values, eigen- vectors and characteristic equation of a matrix, theorems on consistency of a system of linear equations (both homogeneous and non-homogeneous),Cayley- Hamiltonion theorem and its use in finding inverse of a matrix, diagonalization.

REFERENCES:

1. K.B. Datta: Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi,2000.
2. S.R. Knight and H.S. Hall : Higher Algebra, H.M Publications , 1994.
3. Shanti Narayan and P. K. Mittal :A text book of matrices, S. Chand and Co., New Delhi, Revised Edition,2007.

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PRACTICAL (ALGEBRA AND TRIGONOMETRY)

Subject Code: MATH101L

(Major Practical)

Max. Marks: 25 **Credit: 01**

End Semester Practical Exam: 17 **Total teaching hrs: 28**

Internal Evaluation: 8 **Pass Marks: 40%**

Course outcomes:

CO1: The objective of the course is to make the student familiar with different computer software such as MATLAB/Python etc.

CO2: The students will be able to compute various operations on matrices by using different software such as MATLAB/Python etc.

General Guidelines for End- Semester Practical Examination:

1. **The student will be allotted one programme out of the programmes mentioned in syllabus and asked to perform.**
2. **The distribution of marks is as follows:**
   - **(i) One full programme to be performed by student (10 marks)**
   - **(ii) Viva-voce (04 marks)**
   - **(iii) Record (practical file) (03 marks)**

Practical/ Lab work to be performed in Computer Lab.

List of the practical to be using Python/MATLAB etc.

1. Introduction to the software and commands related to the topic.
2. Computation of addition and subtraction of matrices.
3. Computation of multiplication of matrices.
4. Computation of Rank of matrix.
5. Computation of trace and transpose of matrix.
6. Computation of Inverse of a matrix,
7. Eigen values and eigen vectors, application to diagonalization of matrices.
8. Solving the system of homogeneous and non- homogeneous linear algebraic equations.

Semester-II

CALCULUS-I

Subject Code: BMATH102T

Major Theory

Max.Marks: 100 **Credits: 04**

End-Semester Exam: 70 **Total teaching hrs: 50**

Internal Evaluation: 30 **Pass Marks: 40%**

Course Objectives: The main goal of this course is to understand the order completeness properties of real numbers. Able to learn basic properties of limits, infinite limits, indeterminate forms.To understand Continuous functions, types of discontinuities, continuity of composite functions. To know Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem and their geometric interpretation and applications. To understand hyperbolic, inverse hyperbolic functions of a real variable and their derivatives.

Course Outcomes: The students will be able to

CO1: To understand the order completeness properties of real numbers.

CO2: Able to learn basic properties of limits, infinite limits, indeterminate forms.

CO3: To understand Continuous functions, types of discontinuities, continuity of composite functions.

CO4: To know Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, their geometric interpretation and applications.

CO5: Find limits, infinite limits, indeterminate forms, understand hyperbolic, inverse hyperbolic functions of real variable and their derivatives.

Instructions for the paper setter:

The Question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having ten short answer type questions covering the entire syllabus uniformly. Each question in sections A and B will be of 10 marks and section C will be of 30 marks.

Instructions for the candidates

Candidates are required to attempt five questions in all selecting two questions from each of the section A and B and compulsory question of Section C.

SECTION-A

Properties of real numbers: Order property of real numbers, bounds, l.u.b. and g.l.b., order completeness property, archimedian property of real numbers.

Limits: ε-δ definition of the limit of a function, basic properties of limits, indeterminate forms, infinite limits.

Continuity : Continuous functions, types of discontinuities, continuity of composite functions, sign of a function in a neighbourhood of point of continuity ,continuity of f(x), maximum and minimum value theorem, intermediate value theorem.

SECTION-B

Mean value theorems: Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem and their geometric interpretation and applications, Taylor's theorem, Maclaurin's theorem with various forms of remainders and their applications, exponential functions, trigonometric functions, hyperbolic, inverse hyperbolic functions of a real variable and their derivatives, successive differentiations , Leibnitz theorem. Applications of derivatives: Tangents and normals, differentials and approximations, errors.

REFERENCES:

1. J.D. Murray and M. R. Spiegel: Theory and Problems of Advanced Calculuds, Schaum's outline Series. Schaum Publishing Co. New York
2. P.K. Jain and S. K. Kaushik : An Introduction to real analysis, S. Chand and Co. , New Delhi, 2000.
3. Gorakh Prasad : Differential calculus, Pothishala Privatr Ltd. Allahabad.
4. Shanti Narayan and P.K. Mittal: Differential Calculus, Edition 2006, S.Chand & Co., New Delhi.

85.

PRACTICAL (CALCULUS-I)

Subject Code: MATH102L

(Major Practical)

Max. Marks:25 **Credit: 01**

End Semester Practical Exam: 17 **Total teaching hrs: 28**

Internal Evaluation: 8 **Pass Marks: 40%**

Course Outcomes:

CO1: To prepare students to understand and practice notions of basic calculus with the help of computer.

CO2: The students will be able to computer n^{th} derivative of various functions by using different computer software.

General Guidelines for End- Semester Practical Examination:

1. **The student will be allotted one programme out of the programmes mentioned in syllabus and asked to perform.**
2. **The distribution of marks is as follows:**

(i) One full programme to be performed by student (10 marks)
(ii) Viva-voce (04 marks)
(iii) Record (practical file) (03 marks)

Practical/ Lab work to be performed in Computer Lab.

List of the practical to be using Python/MATLAB etc.

1. Introduction to the software and commands related to the topic.
2. Finding the n^{th} derivative of algebraic and logarithmic functions.
3. Finding the n^{th} derivative of $e^{ax}\sin(bx + c)$, $e^{ax}\cos(bx + c)$.
4. Finding the Taylor's and Maclaurin's expansions of the given functions.
5. Finding the n^{th} Derivative of e^{ax} , trigonometric and hyperbolic functions.

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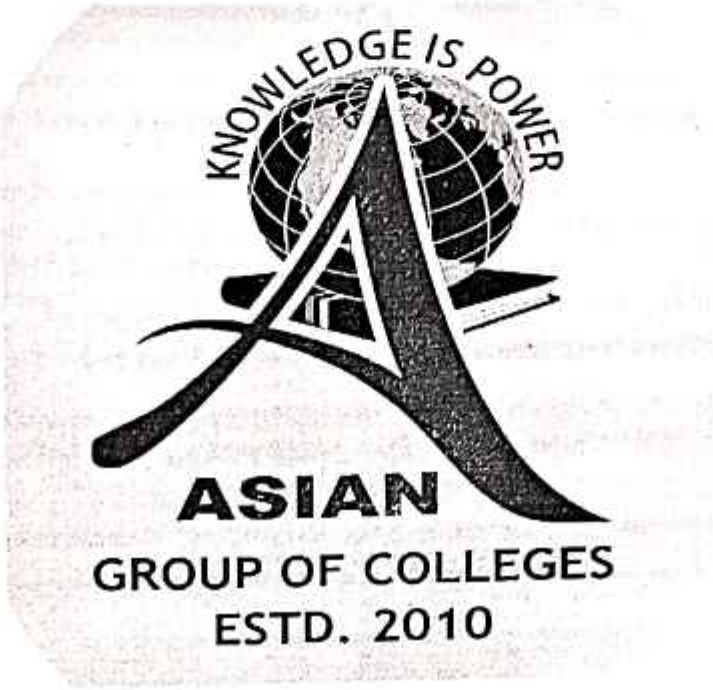

SYLLABUS

UG Programme B.A. / B.Sc.(Honours)

MINOR - MATHEMATICS

(Semester-I, II)

Session : 2024-25

Semester-I

ALGEBRA AND TRIGONOMETRY

Subject Code: BMATH101T

Minor Theory

Max.Marks: 75 **Credits: 03**

End-Semester Exam:50 **Total teaching hrs.: 40**

Internal Evaluation: 25 **Pass Marks: 40%**

Course Objective: The main goal of this course is to deliver basics of Binomial theorem, Properties of Binomial coefficients. The course introduces the concept of De Moivre's theorem and its applications, eigen values and eigen vectors of a matrix. To understand nature of solution of a linear system of equations.

Course Outcomes: The students will be able to:

CO1: To understand D' Moivre's theorem, applications of D' Moivre's theorem.

CO2: To know about exponential, logarithmic, direct and inverse circular and hyperbolic functions of a complex variable.

CO3: To understand summation of series including Gregory series.

CO4: To know Hermitian and Skew- Hermitian matrices, linear dependence of row and column vectors.

CO5: Determine the sum of infinite Binomial Series, the rank of a matrix, eigen values, eigen vectors and solve linear system of equations using matrices.

Instructions for the paper setter:

The Question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having ten short answer type questions covering the entire syllabus uniformly. Each question in sections A and B will be of 10 marks and section C will be of 10 marks.

Instructions for the candidates

Candidates are required to attempt five questions in all selecting two questions from each of the section A and B and compulsory question of Section C.

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SECTION-A

Principle of mathematical induction, Recall of binomial theorem for positive index, properties of binomial coefficients, summation of infinite binomial series.Solution of trigonometric equations. D'Moivre's theorem, application of D' Moivre's theorem including primitive nth root of unity, expansions of sin $n\theta$, cos $n\theta$, $\sin^n\theta$, $\cos^n\theta$($n \varepsilon N$),summation of series including Gregory series, the exponential, logarithmic, direct and inverse circular and hyperbolic functions of a complex variable.

SECTION-B

Recall of determinant of a matrix, properties of determinants , Hermitian and skew- Hermitian matrices, linear dependence of row and column vectors, row rank, column rank and rank of a matrix and their equivalence, eigen- values, eigen- vectors and characteristic equation of a matrix,theorems on consistency of a system of linear equations (both homogeneous and non-homogeneous),Cayley- Hamilton theorem and its use in finding inverse of a matrix. diagonalization.

REFERENCES:

1. K.B. Datta: Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi,2000.
2. S.R. Knight and H.S. Hall : Higher Algebra, H.M Publications , 1994.
3. Shanti Narayan and P. K. Mittal :A text book of matrices, S. Chand and Co., New Delhi, Revised Edition,2007.

89.

PRACTICAL (ALGEBRA AND TRIGONOMETRY)

Subject Code: MATH101L

(Minor Practical)

Max. Marks:25 **Credit: 01**

End Semester Practical Exam: 17 **Total teaching hrs: 28**

Internal Evaluation: 8 **Pass Marks: 40%**

Course outcomes:

CO1: The objective of the course is to make the student familiar with different computer software such as MATLAB/Python etc.

CO2: The students will be able to compute various operations on matrices by using different software such as MATLAB/Python etc.

General Guidelines for End- Semester Practical Examination:

1. **The student will be allotted one programme out of the programmes mentioned in syllabus and asked to perform.**
2. **The distribution of marks is as follows:**
   - **(i) One full programme to be performed by student (10 marks)**
   - **(ii) Viva-voce (04 marks)**
   - **(iii) Record (practical file) (03 marks)**

Practical/ Lab work to be performed in Computer Lab.

List of the practical to be using Python/MATLAB etc.

1. Introduction to the software and commands related to the topic.
2. Computation of addition and subtraction of matrices.
3. Computation of multiplication of matrices.
4. Computation of rank of matrix.
5. Computation of trace and transpose of matrix.
6. Computation of Inverse of a matrix.
7. Eigen values and eigen vectors, application to diagonalization of matrices.
8. Solving the system of homogeneous and non- homogeneous linear algebraic equations.

Semester-II

CALCULUS-I

Subject Code: BMATH102T

Minor Theory

Max. Marks: 75 **Credits: 03**

End-Semester Exam: 50 **Total Teaching hrs: 40**

Internal Evaluation: 25 **Pass Marks: 40%**

Course Objectives: The main goal of this course is to understand the order completeness properties of real numbers. Able to learn basic properties of limits, infinite limits, indeterminate forms.To understand Continuous functions, types of discontinuities, continuity of composite functions. To know Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem and their geometric interpretation and applications. To understand hyperbolic, inverse hyperbolic functions of a real variable and their derivatives.

Course Outcomes: The students will be able to

CO1: To understand the order completeness properties of real numbers.

CO2: Able to learn basic properties of limits, infinite limits, indeterminate forms.

CO3: To understand Continuous functions, types of discontinuities, continuity of composite functions.

CO4: To know Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, their geometric interpretation and applications.

CO5: Find limits, infinite limits, indeterminate forms, understand hyperbolic, inverse hyperbolic functions of real variable and their derivatives.

Instructions for the paper setter:

The Question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having ten short answer type questions covering the entire syllabus uniformly. Each question in sections A and B will be of 10 marks and section C will be of 10 marks.

Instructions for the candidates

Candidates are required to attempt five questions in all selecting two questions from each of the section A and B and compulsory question of Section C.

SECTION-A

Properties of real numbers: Order property of real numbers, bounds, l.u.b. and g.l.b., order completeness property, archimedian property of real numbers.

Limits: ε-δ definition of the limit of a function, basic properties of limits, indeterminate forms, infinite limits.

Continuity : Continuous functions, types of discontinuities, continuity of composite functions, sign of a function in a neighbourhood of point of continuity ,continuity of f(x), maximum and minimum value theorem, intermediate value theorem.

SECTION-B

Mean value theorems: Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem and their geometric interpretation and applications, Taylor's theorem, Maclaurin's theorem with various forms of remainders and their applications.exponential functions. trigonometric functions, hyperbolic, inverse hyperbolic functions of a real variable and their derivatives, successive differentiations , Leibnitz theorem, applications of derivatives: Tangents and normals, differentials and approximations, errors.

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3. Gorakh Prasad : Differential calculus, PothishalaPrivatr Ltd. Allahabad.
4. Shanti Narayan and P.K. Mittal: Differential Calculus, Edition 2006, S.Chand& Co., New Delhi.

PRACTICAL (CALCULUS-I)

Subject Code: MATH102L

(Minor Practical)

Max. Marks:25 **Credit: 01**

End Semester Practical Exam: 17 **Total teaching hrs.: 28**

Internal Evaluation: 8 **Pass Marks: 40%**

CO1 : To prepare students to understand and practice notions of basic calculus with the help of computer.

CO2 : The students will be able to computer n^{th} derivative of various functions by using different computer software.

General Guidelines for End- Semester Practical Examination:

1. **The student will be allotted one programme out of the programmes mentioned in syllabus and asked to perform.**
2. **The distribution of marks is as follows:**

(i) One full programme to be performed by student (10 marks)
(ii) Viva-voce (04 marks)
(iii) Record (practical file) (03 marks)

Practical/ Lab work to be performed in Computer Lab.

List of the practical to be using Python/MATLAB etc.

1. Introduction to the software and commands related to the topic.
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3. Finding the n^{th} derivative of $e^{ax}\sin(bx + c)$, $e^{ax}\cos(bx + c)$.
4. Finding the Taylor's and Maclaurin's expansions of the given functions.
5. Finding the n^{th} Derivative of e^{ax} , trigonometric and hyperbolic functions.

Semester-I

Type of Course	Course code	Course title	Teaching hrs	Credits
Multi- Disciplinary course (MDC)	BMATH-MDC-I	Quatitative Ability-I (Mathematics)	2 hrs per week	02

Semester-II

Type of Course	Course code	Course title	Teaching hrs	Credits
Multi- Disciplinary course (MDC)	BMATH-MDC-II	Quatitative Ability-II(Mathematics)	2 hrs per week	02

MDC

Subject Code: BMATH-MDC-I

Quantitative Ability-I

Max. Marks: 50 **Credits: 02**

End-Semester Exam: 35 **Total teaching hrs.: 25**

Internal Evaluation: 15 **Pass Marks: 40%**

Course Outcomes:

CO1: Able to develop logical reasoning that are necessary for building a stable career foundation.

CO2: Able to learn various calculations which are important in daily life.

CO3: Able to develop numerical fluency.

CO4: Able to develop logical thinking that assist in developing hypotheses, testing the derived hypotheses and finally drawing conclusions.

CO5: Students will be able to learn cognitive skills such as problem solving, decision making, critical thinking.

Instructions for the paper setter:

The Question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having ten short answer type questions covering the entire syllabus uniformly. Each question in sections A and B will be of 5 marks and section C will be of 15 marks.

Instructions for the candidates

Candidates are required to attempt five questions in all selecting two questions from each of the section A and B and compulsory question of Section C.

SECTION-A

Number System- Types of real numbers, how to find that a given number is prime or not, divisibility rules, cyclicity (find last digit and last two digit of a number), factors, multiples, application of HCF and LCM, highest power dividing a factorial, remainders, Euler Totient function, Wilson's theorem (all theorem without proof only applications).

SECTION-B

Percentage- Relation between fraction and percentage, change of base, successive percentage changes, profit, loss and discount, average, mixtures and alligations, word problems of average, ratio and proportion, simple interest and compound interest.

Reference Books:

1. Quantitative Aptitude by R.S. Aggarwal, S. Chand publications.
2. Quatitative Aptitude by Arun Sharma, McGraw Hill Education, India.
3. Maths in Moments Quatitative Aptitude, Arihant Publications limited.

MDC

Subject Code: BMATH-MDC-II

Quantitative Ability-II

Max. Marks: 50 **Credits: 02**

End-Semester Exam: 35 **Total teaching hrs.: 25**

Internal Evaluation: 15 **Pass Marks: 40%**

Course Outcomes:

CO1: Able to develop logical reasoning that are necessary for building a stable career foundation.

CO2: Able to learn various calculations which are important in daily life.

CO3: Able to develop numerical fluency.

CO4: Able to develop logical thinking that assist in developing hypotheses, testing the derived hypotheses and finally drawing conclusions.

CO5: Students will be able to learn Cognitive skills such as problem solving, decision making, critical thinking.

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The Question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having ten short answer type questions covering the entire syllabus uniformly. Each question in sections A and B will be of 5 marks and section C will be of 15 marks.

Instructions for the candidates

Candidates are required to attempt five questions in all selecting two questions from each of the section A and B and compulsory question of Section C.

SECTION-A

Time and Work, time speed distance- relationship between time speed distance, average speed, relative speed, problems of trains, boats and stream, circular motion. area of two- dimensional geometric figures: triangles, quadrilaterals, circle, volume and surface area: cuboid, cylinder, cone, sphere, heights and distances.

SECTION-B

Algebra – polynomials, elementary curves, remainder theorem, system of linear equations, quadratic equations, graphical interpretations of discriminant, Vieta's formula, finding roots by intersection of graphs, permutation and combination.

Reference Books:

1. Quantitative Aptitude by R.S. Aggarwal, S. Chand publications.
2. Quatitative Aptitude by Arun Sharma, McGraw Hill Education, India.
3. Maths in Moments Quatitative Aptitude, Arihant Publications limited.