

PUNJABI UNIVERSITY, PATIALA

OUTLINES OF TESTS,  
SYLLABI AND COURSES OF READING

FOR

B. A./ B.Sc

Programme Code: MTHB3PUP

Batch 2023 onwards



PUNJABI UNIVERSITY, PATIALA  
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Chanchal  
Law Centre

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Patiala

**B.A./B.Sc. First Year ( Semester-I and II)**  
**MATHEMATICS**  
**BATCH 2023 ONWARDS**  
**FOR SESSIONS( 2023-24, 2024-25 &2025-26)**  
**Outlines of Tests, Syllabus and Courses of Reading**

**CBCS**

**SEMESTER-I**

Code	Title of Paper/Subject	Hrs/Week	Credit	Max Cont. Assmt.	Marks Univ Exam	Total
MTHB1101T	Calculus	4.5	3	15	35	50
MTHB1102T	Algebra and Trigonometry	4.5	3	15	35	50

**SEMESTER-II**

Code	Title of Paper/Subject	Hrs/Week	Credit	Max Cont. Assmt.	Marks Univ Exam	Total
MTHB1201T	Co-ordinate Geometry	4.5	3	15	35	50
MTHB1202T	Differential Equations	4.5	3	15	35	50

In addition to the above papers the students in Semester II are also required to qualify the paper of Drug Abuse: Problem, Management and Prevention. The syllabus of this paper can be obtained from the web site [www.punjabiversity.ac.in](http://www.punjabiversity.ac.in)

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### SEMESTER-III

Code	Title of Paper/Subject	Hrs/Week	Credit	Max Cont. Assmt.	Marks Univ Exam	Total
MTHB2101T	Advanced Calculus	4.5	3	15	35	50
MTHB2102T	Statics	4.5	3	15	35	50

### SEMESTER-IV

Code	Title of Paper/Subject	Hrs/Week	Credit	Max Cont. Assmt.	Marks Univ Exam	Total
MTHB2201T	Mathematical Methods	4.5	3	15	35	50
MTHB2202T	Dynamics	4.5	3	15	35	50

### SEMESTER-V

Code	Title of Paper/Subject	Hrs/Week	Credit	Max Cont. Assmt.	Marks Univ Exam	Total
MTHB3101T	Algebra-I	4.5	3	15	35	50
MTHB3102T	Analysis-I	4.5	3	15	35	50

### SEMESTER-VI

Code	Title of Paper/Subject	Hrs/Week	Credit	Max Cont. Assmt.	Marks Univ Exam	Total
MTHB3201T	Algebra-II	4.5	3	15	35	50
MTHB3202T	Analysis-II	4.5	3	15	35	50

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Department of Mathematics  
K. J. Somaiya Institute of Technology

## MTHB1101T: CALCULUS

Course Outcomes:	
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	To understand Hyperbolic, inverse hyperbolic functions of a real variable and their derivatives.

For Regular Students / Students of Centre  
for Distance and Online Education

Maximum Marks: 50 Marks

Maximum Time: 3 Hrs.

For Regular students: 6 Lectures of  
45 minutes/week

External Marks: 35

Internal Assessment: 15

Pass Percentage: 35%

For Private Students

Maximum Marks: 50 Marks

### 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 eleven short answer type questions covering the entire syllabus uniformly. Each question in Sections A and B will be of 06 marks and Section C will be of 11 marks.

### INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from each of the Sections 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 of real numbers, archimedian property of real numbers.

**Limits:**  $\epsilon$  - $\delta$  definition of the limit of a function, basic properties of limits, infinite limits, indeterminate forms.

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



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## SECTION-B

**Mean value theorems:** Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, their geometric interpretation and applications, Taylor's theorem, Maclaurin's theorem with various form of remainders and their applications.

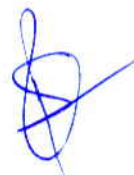
Hyperbolic, inverse hyperbolic functions of a real variable and their derivatives, successive differentiations, Leibnitz's theorem.

### REFERENCES :

1. J. D. Murray & M . R. Spiegel : Theory and Problems of Advanced Calculus, Schaum's Outline Series, Schaum Publishing Co., New York.
2. P.K. Jain and S. K. Kaushik : An Introduction to Real Analysis, S. Chand & Co., New Delhi, 2000.
3. Gorakh Prasad : Differential Calculus, Pothishala Private Ltd., Allahabad.
4. G.B. Thomas & R.L. Finney : Calculus and Analytic Geometry (Ninth Edition), Pearson Publication.
5. Shanti Narayan and P.K. Mittal : Differential Calculus, Edition 2006, S. Chand & Co., New Delhi.

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## MTHB1102T: ALGEBRA AND TRIGONOMETRY

Course Outcomes:	
CO1	To understand D'Moivre's theorem, application 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	To understand Eigen-values, eigen-vectors and characteristic equation of a matrix.

For Regular Students / Students of Centre  
for Distance and Online Education  
Maximum Marks: 50 Marks

Maximum Time: 3 Hrs.  
For Regular students: 6 Lectures of  
45 minutes/week

External Marks: 35

Internal Assessment: 15

Pass Percentage: 35%

For Private Students

Maximum Marks: 50 Marks

### 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 eleven short answer type questions covering the entire syllabus uniformly. Each question in Sections A and B will be of 06 marks and Section C will be of 11 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

D'Moivre's theorem, application of D'Moivre's theorem including primitive  $n$ th root of unity. Expansions of  $\sin n\theta$ ,  $\cos n\theta$ ,  $\sin^n\theta$ ,  $\cos^n\theta$  ( $n \in \mathbb{N}$ ). The exponential, logarithmic, direct and inverse circular and hyperbolic functions of a complex variable. Summation of series including Gregory Series.

#### SECTION-B

Hermitian and skew-hermitian matrices, linear dependence of row and column vectors, row rank, column rank and rank of a matrix and their equivalence. Theorems on consistency of a system of linear equations (both homogeneous and non-homogeneous). Eigen-values, eigen-vectors and characteristic equation of a matrix. Cayley-Hamilton theorem and its use in finding inverse of a matrix. Diagonalization.

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## 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. R.S. Verma and K.S. Shukla : Text Book on Trigonometry. Pothishala Pvt. Ltd., Allahabad.
4. Shanti Narayan and P.K. Mittal : A Text Book of Matrices. S. Chand & Co., New Delhi. Revised Edition, 2007.

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## MTHB1201T: CO-ORDINATE GEOMETRY

Course Outcomes:	
CO1	To understand t transformation of axes in two dimensions
CO2	Able to learn joint equation of pair of straight lines and angle between them. Condition of parallelism and perpendicularity.
CO3	To understand the circle through intersection of two lines, tangents, normals, chord of contact.
CO4	To know General equation of a conic.
CO5	To understand the special properties of parabola, ellipse and hyperbola.

For Regular Students / Students of Centre  
for Distance and Online Education

Maximum Marks: 50 Marks

External Marks: 35

Internal Assessment: 15

Pass Percentage: 35%

For Private Students

Maximum Marks: 50 Marks

Maximum Time: 3 Hrs.

For Regular students: 6 Lectures of  
45 minutes/week

### 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 eleven short answer type questions covering the entire syllabus uniformly. Each question in Sections A and B will be of 06 marks and Section C will be of 11 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

**Transformation of axes in two dimensions:** Shifting of origin, rotation of axes, invariants.

**Pair of Straight Lines :** Joint equation of pair of straight lines and angle between them. Condition of parallelism and perpendicularity. Joint equation of the angle bisectors. Joint equation of lines joining origin to the intersection of a line and a curve.

**Circle :** General equation of circle. Circle through intersection of two lines, tangents, normals, chord of contact, pole and polar, pair of tangents from a point, equation of chord in terms of mid-point, angle of intersection and orthogonality, power of a point

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w.r.t. circle, radical axis, co-axial family of circles, limiting points.

### SECTION-B

**Conic** : General equation of a conic, tangents, normals, chord of contact, pole and polar, pair of tangents from a point, equation of chord in terms of mid-point, diameter, Conjugate diameters of ellipse and hyperbola, special properties of parabola, ellipse and hyperbola, conjugate hyperbola, asymptotes of hyperbola, rectangular hyperbola, Identification of conic in general second degree equations. .

### REFERENCES :

1. S. L. Loney : The Elements of Coordinate Geometry, Macmillan and Company, London, 2<sup>nd</sup> Edition 2007.
2. P.K. Jain and Khalil Ahmad : A Text Book of Analytical Geometry of Two Dimensions, Wiley Eastern Ltd., 1999.
3. Erwin Kreyszig : Advanced Engineering Mathematics, John Wiley & Sons, 1999.
4. Gorakh Prasad and H.C. Gupta : Text Book on Coordinate Geometry, Pothishala Pvt. Ltd., Allahabad, 1955.

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## MTHB1202T: DIFFERENTIAL EQUATIONS

Course Outcomes:	
CO1	To understand Linear differential equations and equations reducible to linear differential equations.
CO2	Able to learn the solution techniques of Linear homogeneous and non-homogeneous differential equations of higher order with constant coefficients.
CO3	Will learn to solve differential equations with variable coefficients.
CO4	Learn to apply Power Series method, Frobenius method
CO5	To understand the recurrence relations, orthogonality, Rodrigue's formula.

For Regular Students / Students of Centre  
for Distance and Online Education

Maximum Marks: 50 Marks

External Marks: 35

Internal Assessment: 15

Pass Percentage: 35%

For Private Students

Maximum Marks: 50 Marks

Maximum Time: 3 Hrs.

For Regular students: 6 Lectures of  
45 minutes/week

### 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 eleven short answer type questions covering the entire syllabus uniformly. Each question in Sections A and B will be of 06 marks and Section C will be of 11 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

**First order differential equations :** Order and degree of a differential equation. Homogeneous differential equations, equations reducible to Homogenous differential equations, Exact differential equations, Linear differential equations and equations reducible to linear differential equations.

**Higher order differential equations :** Wronskian. Solution of Linear homogeneous and non-homogeneous differential equations of higher order with constant

coefficients and with variable coefficients, Differential operator method, Method of Variation of Parameters.

## SECTION-B

**Higher order differential equations** : Linear non-homogeneous differential equations with variable coefficients, Euler's Cauchy method.

**Series solution of Differential equation**: Regular point, ordinary point, Power Series method, Frobenius method, Bessel and Legendre Equations, Legendre and Bessel functions and their properties , recurrence relations, orthogonality, Rodrigue's formula.

### RECOMMENDED BOOKS :

1. George F. Simmons ; Differential Equations with Application and historical Notes (Textbooks in Mathematics) CRC press
2. Rai Singhania ; Ordinary and Partial Differential Equations . S.Chand & Company, New Delhi
3. Zafar Ahsan: Differential Equations and Their Applications. Prentice-Hall of India Pvt. Ltd. New Delhi-Second edition
4. H.T.H. Piaggio ; An Elementary Treatise on Differential equations : Barman Press.



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