Note : Internal Assessment is not Applicable for the B.A. courses offered by Department of Distance Education, Punjabi University, Patiala.

B.A./ B.Sc. Mathematics-Part I

Outlines of Tests, Syllabi and Courses of Reading

Sessions (2020-21, 2021-22 &2022-23)

Semester-I

Paper-I	Calculus-I
Paper-II	Differential Equations
Paper-III	Linear Algebra

Semester-II

Paper-IV	Calculus-II
Paper-V	Partial Differential Equations
Paper-VI	Analytic Geometry

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.punjabiuniversity.ac.in

B.A./B.Sc .-Ist Year (Ist Semester)
MATHEMATICS
FOR SESSIONS(2020-21, 2021-22 & 2022-23)

Paper I: Calculus-I

For Regular Students **Maximum Time: 3 Hrs.**
Maximum Marks: 50 Marks **Teaching Hours : 50**
External Marks: 40
Internal Assessment: 10
Pass Percentage: 35%
For Distance Education Students /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 eight 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 16 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

Differential Calculus: $\in$ - δ definition of the limit of a function. Basic properties of limits. Continuous functions and classification of discontinuities. Differentiability, Derivative of nth order, Leibnitz theorem, Asymptotes. Test for concavity and convexity , Points of inflexion, Tracing of Curves with $y'$and y''(Standard curves in Cartesian form without use of Grapher).

Section-B

Functions of several variables: Limits, continuity and differentiability of two variables. Partial derivatives and its Linearization, Chain rule, Partial derivative with constrained variables. Homogeneous functions, Euler theorem and its applications, Extreme values and saddle points, Lagrange multipliers, Taylor's theorem and its linear and quadratic approximation.

RECOMMENDED BOOKS :

1. Malik and Arora ,Mathematical Analysis, New Academic Science, 2017
2. Thomas and Finney ,Calculus and Analytic Geometry, Ninth Edition.
3. R. K. Jain and S.R.K. Iyengar:Advanced Engineering Mathematics, Narosa Publishing House.

PAPER-II: DIFFERENTIAL EQUATIONS

For Regular Students **Maximum Time: 3 Hrs.**
Maximum Marks: 50 Marks **Teaching Hours: 50**
External Marks: 40
Internal Assessment: 10
Pass Percentage: 35%
For Distance Education Students /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 eight 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 16 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, Separable differential equations, 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, Method of Variation of Parameters.

Section-B

Higher order differential equations : Differential operator method, 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 Apllication 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 Elementry Treatise on Differential equations : Barman Press.

PAPER-III: LINEAR ALGEBRA

For Regular Students **Maximum Time: 3 Hrs.**

Maximum Marks: 50 Marks **Teaching Hours : 50**

External Marks: 40

Internal Assessment: 10

Pass Percentage: 35%

For Distance Education Students /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 eight 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 16 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.

Objective: This course familiarizes the students with the study of matrices which is used in solving linear equations and basic notions in linear algebra that are often used in mathematics and other sciences.

Section-A

Elementary operation on matrices, Inverse of a matrix using Gauss Jordan Method. Linear independence of row and column vectors, Row rank, Column rank and their equivalence. Eigen values, Eigen vectors and the characteristic equation of a matrix, Diagonalization, Cayley-Hamilton theorem and its use in finding inverse of a matrix, Consistency of a system of linear equations.

Section-B

Vector spaces, Examples, Linear Dependence, Linear Combinations, Bases and Dimension, Subspaces, Linear transformation, Algebra of linear transformations, Matrices as linear transformations, Matrices and change of basis, Kernel and image,

Rank and Nullity theorem.

RECOMMENDED BOOKS :

1. Gibert Strang: Linear Algebra and its Applications, Cengage Learning Publishers (Fourth Edition)
2. P.B. Bhattacharya, S.K.Jain & S.R.Nagpaul : first course in Linear Algebra, New Age International (P) Limited
3. Serge Lange: Introduction to Linear Algebra, Springer
4. Kenneth Hoffman , Kunze : Linear Algebra, PHI (Second Edition)
5. Charles W. Curtis: Linear Algebra An Introductory Approach, Springer

B.A./ B.Sc .-Ist Year (2nd Semester)

MATHEMATICS

FOR SESSIONS (2020-21, 2021-22 & 2022-23)

PAPER-IV: CALCULUS-II

For Regular Students **Maximum Time: 3 Hrs.**

Maximum Marks: 50 Marks **Teaching Hours : 50**

External Marks: 40

Internal Assessment: 10

Pass Percentage: 35%

For Distance Education Students /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 eight 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 16 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.

Objective: The objective is to introduce Vector Analysis and the Calculus of Several Variables and their applications

Section-A

Integral Calculus

Double integrals, Double integrals in Polar Form, Change of order and change of variable in double integral. Triple integrals in Rectangular co-ordinates. Triple integrals in Cylindrical and Spherical co-ordinates. Applications to evaluation of Areas, Volume, Centre of Gravity and Moments of Inertia.

Section-B

Vectors in the plane , Cartesian Co-ordinates and vectors in spaces, Dot and cross products. Lines and planes in space, Line integrals, vector fields , work circulations and flux, Path independence, Potential Functions and Conservative Fields, Green theorem in Plane, surface area and surface integrals, Stokes Theorem and the divergence theorem.

RECOMMENDED BOOKS :

1. Malik and Arora ,Mathematical Analysis, New Academic Science, 2017
2. Thomas and Finney ,Calculus and Analytic Geometry, Ninth Edition.
3. R. K. Jain and S.R.K. Iyengar:Advanced Engineering Mathematics,Narosa Publishing House.

PAPER-V: PARTIAL DIFFERENTIAL EQUATIONS

For Regular Students **Maximum Time: 3 Hrs.**

Maximum Marks: 50 Marks **Teaching Hours : 50**

External Marks: 40

Internal Assessment: 10

Pass Percentage: 35%

For Distance Education Students/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 eight 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 16 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.

Objective: The objective of the course is to equip the students with the knowledge of Partial differential equations of first, second and higher orders and their applications

Section-A

Partial differential equations : Partial differential equation of first order, Lagrange's solution,, Integral surfaces passing through a given curve, surfaces orthogonal to a given system of surfaces, Partial differential equation of first order but of any degree , Charpit's general method of solution.

Partial differential equations of second and higher order : Partial differential equations of the second order and their classification into hyperbolic, elliptic and parabolic types, canonical forms.

Section-B

Homogeneous and non-homogeneous partial differential equations with constant coefficients. One dimension Wave and Heat Equation. Two dimensional Laplace equation by separation of variable method and D'Alembert's solution of wave equation.

RECOMMENDED BOOKS :

1. George F .Simmons ; Differential Equations with Apllication and historical Notes(Textbooks in Mathematics) CRC press

2 . Rai Singhania : Ordinary and Partial Differential Equations" , S.Chand & Company, New Delhi

3. I. N. Sneddon : Elements of Partial Differential Equations, Mc Graw Hill Book Co.

4. Zafar Ahsan: Differential Equations and Their Applications, Prentice-Hall of India Pvt. Ltd. New Delhi-Second edition

5. H.T.H. Piaggio : An Elementry Treatise on Differential equations : Barman Press.

PAPER-VI : ANALYTIC GEOMETRY

For Regular Students **Maximum Time: 3 Hrs.**

Maximum Marks: 50 Marks **Teaching Hours : 50**

External Marks: 40

Internal Assessment: 10

Pass Percentage: 35%

For Distance Education Students /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 eight 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 16 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.

Objective: This course introduces two and three dimensional geometry. It familiarizes the students with the study of conics, oblique axes, cone , cylinder and conicoid

Section-A

General Equation of Second Degree: conic section, centre of conic section, principal axes and eccentricity of a conic, axis, latus rectum, vertex and focus of a parabola, tracing of cones

Polar Equation of a conic: tracing of the conic, chord joining two points, tangents, normals, polar, director circle and asymptotes.

Introduction of Oblique Axes: distance between two points, equation of a line, angle between two lines, length of perpendicular, angle between the pair of lines, oblique axes from rectangular axes, invariants, equation of circle, parabola, ellipse, hyperbola

Section-B

Sphere: Section of a sphere by a plane. sphere through a given circle. Intersection of a line and sphere, tangent line, tangent plane, angle of intersection of two spheres and condition of orthogonality

Cone: general second degree equation of a cone, its intersection with a plane and with a line, enveloping cone, right circular cone, the cone $ax^2 + by^2 + cz^2 = 0$

Cylinder: enveloping cylinder, right circular cylinder

RECOMMENDED BOOKS :

1. P.K. Jain and Khalil Ahmad: Text Book of Analytical Geometry. New Age International Publishers, Third Edition

2. Shanti Narayan and P.K Mittal: Analytical Solid Geometry, 17^{th} Revised Edition , S.Chand and Co., New Delhi, 2006.

3. N.Saran and R.S. Gupta : Analytical Geometry of Three Dimensions,Pothishala Pvt. Ltd. Allahabad.