Outlines of Tests

B.Sc.(H.S.) First Year in Mathematics and Computing

Semester I

(I) Preliminary English (common to all Hons. School)

(II) Environmental Education -do-

(III) Major Papers-2

Paper I: Math 301S: Calculus-I
Paper II: Math 302S: Matrices and Theory of Equations

(IV) Subsidiary Courses-2

(1) Statistics and Computational Methods

Paper I: SC 101S: Probability & Statistical Methods-I
Paper II: SCP 102S: Practicals of Statistical Methods-I

(2) Computer Applications

Paper I: CA 103S: Computer Fundamentals and Introduction to ‘C’ Language
Paper II: CAP 104S: Practicals of ‘C’ Language

Semester II

(I) Preliminary English (Common to all Hons. School)

(II) Environmental Education -do-

(III) Major Papers-2

Paper I: Math 321S: Calculus-II
Paper II: Math 322S: Coordinate Geometry

(IV) Subsidiary Courses-2

(1) Statistics and Computational Methods

Paper I: SC 121S: Probability & Statistical Methods-II
Paper II: SCP 122S: Practicals of Statistical Methods-II
(2) Computer Applications

Paper I : CA 123S : Advanced Programming in ‘C’ Language
Paper II : CAP 124S : Practicals of ‘C’ Language

Semester III

(i) Major Papers-3

Paper I : Math 401S : Number Theory
Paper II : Math 402S : Analysis-1
Paper III : Math 403S : Ordinary Differential Equations

(IV) Subsidiary Courses-2

(1) Statistics and Computational Methods


(2) Computer Applications

Paper I: CA 203S : Programming with JAVA
Paper II: CAP 204S : Practicals of Programming with JAVA

Semester-IV

(i) Major Papers-3

Paper I : Math 421S : Algebra
Paper II : Math 422S : Analysis-II
Paper III : Math 423S : Mechanics

(IV) Subsidiary Courses-2

(1) Statistics and Computational Methods

Paper I : SC 221S : Applied Statistics-II
Paper II : SCP 222S : Practicals of Applied Statistics-II

(2) Computer Applications

Paper I : CA 223S : Software Engineering and Minor Project
Paper II : CA P224S : Practicals of Software Engineering and Minor Project
 Semester V

Paper-I : Math 501S : Algebra
Paper-II : Math 502S : Calculus of Several Variables and Improper Integrals
Paper-III : Math 503S : Some Special Functions and Integral Transforms
Paper-V : Math 505S : Discrete Mathematics and Graph Theory
Paper-VI : CA 506S : Relational Database Management System and Mathematical Package

 Semester VI

Paper-I : Math 521S : Linear Algebra
Paper-II : Math 522S : Lebesgue Integration and Fourier Series
Paper-IV : Math 525S : Numerical Analysis
Paper-V : CA 526S : Advanced Java
ENVIRONMENT EDUCATION

(25 Hrs. course)

1. Environment Concept

Introduction, concept of biosphere – lithosphere, hydrosphere, atmosphere; Natural resources - their need and types: Principles and scope of Ecology; concepts of ecosystem, population, community, biotic interactions, biomes, ecological, succession.

2. Atmosphere:

Parts of atmosphere, components of air: pollution, pollutants, their sources, permissible limits, risks and possible control measures.

3. Hydrosphere:

Types of aquatic systems; Major sources (including ground water) and uses of water, problems of the hydrosphere, fresh water shortage; pollution and pollutants of water, permissible limits, risks and possible control measures.

4. Lithosphere:

Earth crust, soil - a life support system, its texture, types, components. pollution and pollutants, reasons of soil erosion and possible control measures.

5. Forests:

Concept of forests and plantations, types of vegetation and forests, factors governing vegetation, role of trees and forests in environment, various forestry programmes of the Govt. of India, Urban Forests, Chipko Andolan.

6. Conservation of Environment:

The concepts of conservation and sustainable development, why to conserve, aims and objectives of conservation, policies of conservation; conservation of life support systems - soil, water, air, wildlife, forests.

7. Management of Solid Waste:

Merits and demerits of different ways of solid waste management - open dumping, landfill, incineration, resource reduction, recycling and reuse, vermicomposting and vermiculture, organic farming.

8. Indoor Environment:

Pollutants and contaminants of the in-house environment; problems of the environment linked to urban and rural lifestyles: possible adulterants of the food; uses and harms of plastics and polythene: hazardous chemicals, solvents and cosmetics.

9. Global Environmental issues:

Global concern, creation of UNEP; Conventions on climate change, Convention on biodiversity: Stratospheric ozone depletion, dangers associated and possible solutions.
10. **Indian Laws on Environment:**

   Indian Laws pertaining to Environmental protection: Environment (Protection) Act, 1986; General information about laws relating to control of air, water and noise pollution. What to do to seek redressal.

11. **Biodiversity:**

   What is biodiversity, levels and types of biodiversity, importance of biodiversity, causes of its loss, how to check its loss; Hotspot zones of the world and India. Biodiversity Act, 2002.

12. **Noise and Microbial Pollution:**

   Pollution due to noise and microbes and their effects.

13. **Human Population and Environment:**


14. **Social Issues:**

   Environmental Ethics: Issues and possible solutions, problems related to lifestyle, sustainable development; Consumerisms and waste generation.

15. **Local Environmental Issues:**

   Environmental problems in rural and urban areas. Problem of Congress Grass & other weeds, problems arising from the use of pesticides and weedicides, smoking etc.

**Practicals:**

Depending on the available facility in the college, a visit to vermicomposting units or any other such non-polluting eco-friendly site or planting/caring of vegetation/trees could be taken.

*Note: Above 15 topics to be covered in 25 hour lectures in total, with 2 lectures in each topics from 2 to 11 and one each for the topics land 12 to 15.*

- **Examination Pattern:**
  Fifty multiple choice questions (with one correct and three incorrect alternatives and no marks deduction for wrong answer or un-attempted question)
  - All questions compulsory i.e. no choice.
  - Qualifying marks 33 per cent i.e. 17 marks out of 50.
  - Total marks : 50
  - Duration of Examination: 60 minutes.
  - Spread of questions: Minimum of 2 questions from each of the topics 1 and 12 to 15. Minimum of 4 questions from topics 2 to 11.
Outlines of tests syllabi and courses of reading for B.Sc. (Honour School) First Year English Subsidiary (Semester System)

FIRST SEMESTER

SECTION A

1. Fluency in English 20 Marks
   Units- I, II, III, IV

2. Shorts Stories 10 Marks
   Unit I to VI

3. Poems 20 Marks
   Unit I to IX

SECTION B

Writing and Grammar

1. Paragraph Writing 12 marks

2. Formal Letters and E-mails 10 marks 8 marks

3. Applied Grammar:
   - Types of Sentences
   - Sentence Linkers
   - Correction of Sentences
   20 marks

SECOND SEMESTER

SECTION A

1. Fluency in English 20 Marks
   Units-VIII, IX, XIV, XVI

2. Short Stories 10 Marks
   Unit to VII to XII

3. Poem 20 Marks
   Unit X to XVIII
SECTION B

Writing and Grammar

1. Resume Writing 10 Marks
2. Précis Writing 8 Marks
3. Report Writing 12 Marks
4. Applied Grammar 20 Marks
   - same word as different part of speech
   - Formation of words
   - One Word substitution
   - Idioms & Phrases

TEXTS PRESCRIBED:

1. Fluency in English Eds. Mukti Sanyal & Tulika Prasad
   Macmillam Publishers
2. Twelve Contemporary Shorts Stories O.U.P.
3. The Silver Lute Macmillam Publishers

NOTE:

1. The book ‘Twelve contemporary Short Stories’ is meant for discussion and evaluation purposes.
2. Mode of Testing: All the questions of Section A would have Internal choice. Question 1 and 2 Essay type. Question 3 and 4 from poems based on central idea or summary.

RECOMMENDED READING:

B.Sc.(Honours School) 1st Year in Mathematics & Computing
Examinations 2011-2012
Semester I

Major Papers

Paper I

MATH 301S:  Calculus-I

(7 hrs/week (including tutorials)/Marks: 100)
Time : 3 hrs.

Note :  1. The question paper will have eight questions. Candidates will attempt five
questions.
2. There will be four questions from each part and the students will be required
to answer atleast two questions from each part.
3. All questions carry equal marks.

PART –I

Differential Calculus

\( \varepsilon - \delta \) definition of the limit of a function. Basic properties of limits. Continuous functions and
Test for concavity. Points of inflexion. Tracing of Curves.
(Scope as in Chapters 1,2,3 of Calculus and Analytic Geometry by Thomas and Finney, Ninth
Edition)

Integral Calculus

Integration of functions. Reimann sum and definite integrals. Properties, Area and the Mean
value theorem, The fundamental theorem.
(Scope as in Chapters 4 of Calculus and Analytic Geometry by Thomas and Finney, Ninth
Edition)

Part II

Integral Calculus

Applications of integrals. Areas between curves. Finding volumes by slicing. Volumes of
solids of Revolution-Disks and Washers. Cylindrical Shells. Lengths of plane curves. Areas of
surfaces of revolution.
(Scope as in Chapters 5 of Calculus and Analytic Geometry by Thomas and Finney, Ninth
Edition)
Infinite Series:
(Scope as in Chapters 8 of Calculus and Analytic Geometry by Thomas and Finney, Ninth Edition)

Suggested Readings
3. Lipmen Bers: Calculus.

Paper II

MATH 302S: Matrices and Theory of equations
(7 hrs/week (including tutorials)/Marks: 100)

Time : 3 hrs.

Note : 1. The question paper will have eight questions. Candidates will attempt five questions.
2. There will be four questions from each part and the students will be required to answer atleast two questions from each part.
3. All questions carry equal marks.

PART –I


PART-II

Polynomials, Euclid’s Algorithm greatest common divisor, unique factorization of polynomials over a field F of numbers (statement only), Fundamental theorem of Algebra (statement only), roots and their multiplicity, Irreducible polynomials over Q, R, C. Relationship between roots and the coefficients, Fundamental theorem of symmetric polynomials (without proof) Evaluation of symmetric functions of roots. Rational roots of polynomials with integral coefficients. Descartes rule of sign, Strum’s theorem (statement only) Solution of cubic equation and biquadratic equation.
References

Subsidiary Paper – Computer Applications

SEMESTER-I

PAPER I - CA 103S: COMPUTER FUNDAMENTAL AND INTRODUCTION TO ‘C’ LANGUAGE

Theory (5 hrs/week/marks : 75)
(Time : 3 hrs.)

Note:
1. The question paper will have eight questions. Candidates will attempt five questions.
2. There will be four questions from each part and the students will be required to answer at least two questions from each part.
3. All questions carry equal marks.

PART I

Introduction and uses of computers, block diagram of computers, uses of CPU and I/O devices, software and hardware, application software and system software, primary and secondary storage devices. Introduction to flowcharts and algorithms.

PART II

Introduction to ‘C’ language: Data types, constants and literals. Operators: arithmetic, relational and logical, precedence and order of Evaluation. Statements for: decision control, loop control and case control. Functions and storage classes in C.

Suggested Readings
1. Computer Fundamentals by B. Ram,
2. Let Us C by Yashwant Kanetkar, BPB publications.
PAPER II (PRACTICAL)- CAP 104S : PRACTICALS OF ‘C’ LANGUAGE (PART-I)
(3 hrs/week/marks : 25)

Development of programs in C.

The distribution of marks in practical will be as under:

<table>
<thead>
<tr>
<th></th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical Exercises</td>
<td>12</td>
</tr>
<tr>
<td>Record of practicals</td>
<td>4</td>
</tr>
<tr>
<td>Viva-voce</td>
<td>4</td>
</tr>
<tr>
<td>Internal Assessment</td>
<td>5</td>
</tr>
</tbody>
</table>
Semester II

Major Papers

MATH 321S: Calculus-II

(7 hrs/week (including tutorials)/Marks: 100)

Time: 3 hrs.

Note:

1. The question paper will have eight questions. Candidates will attempt five questions.
2. There will be four questions from each part and the students will be required to answer at least two questions from each part.
3. All questions carry equal marks.

PART-I

Vector Analysis


(Scope as in Chapters 10, 11 and 14 of Calculus and Analytic Geometry by Thomas and Finney, Ninth Edition)

PART-II

Multivariable Functions:


(Scope as in Chapters 12 and 13 of Calculus and Analytic Geometry by Thomas and Finney, Ninth Edition).

Suggested Readings

3. Lipmen Bers: Calculus.
MATH 322S: Coordinate Geometry

(7 hrs/week (including tutorials)/Marks: 100)
Time : 3 hrs.

Note : 1. The question paper will have eight questions. Candidates will attempt five questions.
2. There will be four questions from each part and the students will be required to answer atleast two questions from each part.
3. All questions carry equal marks.

Part –I

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 and Normals, Chord of contact, pole and polar, pair of tangents from a point, equation of chord in terms of midpoint, angle of intersection and orthogonality, power of a point w.r.t circle, radical axis, co-axial family of circles ,limiting points.

Conic: General equation of conic, Tangents, normals, chord of contact, pole and polar, of tangents from a point, equation of chord in terms of midpoint, diameter. Conjugate diameters of ellipse and hyperbola, special properties of parabola, ellipse and hyperbola, conjugate hyperbola, asymptotes of hyperbola, rectangular hyperbola.

Transformation of axes in two dimensions: shifting of origin, rotation of axes, the second degree equation $S=ax^2+2hxy+by^2+2gx+2fy+c=0$, its invariants $t$, $\Delta$ and $O$. Reduction of the second degree equation into standard form. Identification of curves represented by $S=0$ (including pair of lines)

Polar coordinates: Polar equations of straight lines ,circles and conics. Polar equation of chords, tangents normals only.

Part-II

Review of lines and planes in 3-dimension, change of axes, shift of origin, rotation of axes, 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, power of a point w.r.t a sphere, Radical planes, radical axis, radical centre, coaxial family of spheres, limiting points, Cylinder, Cone with vertex at origin as the graph of homogeneous equation of second degree in $x,y,z$, cone as a surface generated by a line passing through fixed curve and a fixed point outside the plane of the curve, reciprocal cones, right circular and elliptic cones, right circular cone as a surface of revolution obtained by rotating the curve in a plane about an axis, enveloping cones, ellipsoid, equations of hyperboloids, paraboloids in the standard form, tangent planes and normals.

References

Subsidiary Papers

SEMESTER-II

PAPER I - CA 123S: ADVANCED PROGRAMMING IN ‘C’ LANGUAGE

Theory (5 hrs/week/marks : 75)
(Time : 3 hrs.)

Note: 1. The question paper will have eight questions. Candidates will attempt five questions.
2. There will be four questions from each part and the students will be required to answer atleast two questions from each part.
3. All questions carry equal marks.

PART I

Arrays: declaring an array, initializing an array. one dimensional arrays: array manipulation; searching, insertion, deletion of an element from an array; finding the largest/smallest element in array; two dimensional arrays, addition/multiplication of two matrices, transpose of a square matrix; null terminated strings as array of characters.

Pointers: concept of pointers, address operators, pointer type declaration, pointer assignment, pointer initialization pointer arithmetic, indirection operator, pointers to pointers, functions and pointers, arrays and pointers, pointer arrays.

PART II

Structures and Unions: basic of structures, structures variables, initialization, structure assignment, nested structure, structure and functions, structures and arrays: arrays of structures, structures containing arrays unions.

Self Referential Structures and Linked Lists: creation of a singly linked list, traversing a linked list, insertion into a link list, deletion from a linked list.

File processing: concept of files, file operation in various modes and closing of a file, reading from file, writing onto a file.

Suggested Readings

1. Let Us C by Yashwant Kanetkar, BPB publications.
2. C Programming Language by Brian W. Kernighan and Dennis M. Ritchie, Prentice hall.
3. Programming with C by Byron Gottfried, Tata Mcgrawhill.
PAPER II (PRACTICAL)- CAP 124SA : PRACTICALS OF ‘C’ LANGUAGE (PART-II)
(3 hrs/week/marks : 25)

Development of programs in C.

The distribution of marks in practical will be as under:

<table>
<thead>
<tr>
<th></th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical Exercises</td>
<td>12</td>
</tr>
<tr>
<td>Record of practicals</td>
<td>4</td>
</tr>
<tr>
<td>Viva-voce</td>
<td>4</td>
</tr>
<tr>
<td>Internal Assessment</td>
<td>5</td>
</tr>
</tbody>
</table>
B.Sc. (Hons. School) Second Year

Semester III

Major Papers

Paper I : Math 401S : Number Theory

[7 hrs per week (including tutorials)]
Max.Marks : 100
[Final-80+Internal Assessment-20]
Time: 3hrs.

Note: 1. The question paper will have eight questions. Candidates will attempt five questions.
2. There will be four questions from each part and the students will be required to answer two questions from each part.
3. All questions carry equal marks

PART-I

Divisibility, Greatest common divisor, fundamental theorem of arithmetic, congruences, residue classes and reduced residue classes, Euler-Fermat’s Theorem, Wilson’s Theorem, linear congruences, Chinese Remainder Theorem, polynomial congruences, Arithmetical functions, \( \phi(n) \), \( \tau(n) \), \( \mu(n) \), \( \sigma(n) \) etc. Mobius Inversion Formula.

PART-II

Primitive roots, indices, quadratic residues, Legendre’s symbol, Euler’s Criterion. Gauss’ Lemma, Quadratic reciprocity Law, Jacobi symbol. The Diophantine Equations

\[ x^2 + y^2 = z^2 \]

\[ x^4 + y^4 = z^4 \]

(Scope as in Elementary Number Theory by D.M. Burton, Chapters 1-11). Farey Sequences (Scope as in Chapter 6 (Sections 6.1 and 6.2) of Elementary Number Theory by Niven & Zuckerman)

Suggested Readings

3. Hardy and Wright : Number Theory, 5\textsuperscript{th} edition, Oxford Univ. Press
Note: 1. The question paper will have eight questions. Candidates will attempt five questions.
2. There will be four questions from each part and the students will be required to answer at least two questions from each part.
3. All questions carry equal marks.

PART-I

The real number system, least upper bound property, countable and uncountable sets, topology of real line and $\mathbb{R}^n$, metric spaces, compact sets, connected sets, arcwise connectedness, completion of a metric space, limit superior and limit inferior of a real sequence. Series, review of various tests of convergence, Abel’s test and Dirichlet’s test.

PART-II

Absolute convergence, alternating series. Addition and multiplication of series, rearrangements, limits of functions, continuous functions, continuity and compactness, continuity and connectedness, discontinuity, monotone functions, infinite limits and limits at infinity, the derivative of a real function, mean value theorems, L’Hospital’s rule, Taylor’s theorem.

[Scope as in the book ‘Principles of Mathematical Analysis’ by W.Rudin (3rd edition) Chapter I-V ]

Books recommended

Paper-III: Math 403S: Ordinary Differential Equations

[7 hrs per week (including tutorials)]
Max.Marks : 100
[Final-80+Internal Assessment-20]
Time: 3hrs.

Note: 1. The question paper will have eight questions. Candidates will attempt five questions.
2. There will be four questions from each part and the students will be required to answer atleast two questions from each part.
3. All questions carry equal marks.

PART-I

Ordinary differential equations

Basic definitions: order and degree of differential equation, primitives, solutions of differential equations, Integral curves, isoclines.

First order differential equations: Linear, non-linear differential equations, Variables separable, homogeneous, non-homogeneous exact equations and integration factors, equations reducible to first order, Clairaut’s equation and Geometrical interpretation of first order differential equation, applications.

Successive approximations, Lipschitz condition, Statements of Existence and Uniqueness of solution of first order differential equations.

PART- II


Euler equation, regular singular points, ordinary points, series soultion. Method of Frobenius, Applications, Legendre’s, Hermite’s and Bessel’s equation.

Suggested Reading

Differential Equations
4. E. D. Rainville: Elementary Differential Equations, Bedient Publisher Prentice Hall.
Subsidiary Paper –

Semester-III

CA 203S : Programming with JAVA

[5 hrs/week/ Max.marks : 75(Final-60+15 Int.Assess.)]

(Time : 3 hrs.)

Note: 1. The question paper will have eight questions. Candidates will attempt five questions.
2. There will be four questions from each part and the students will be required to answer at least two questions from each part.
3. All questions carry equal marks.

Part I

Fundamentals of Object-Oriented Programming, data types, operators, expressions, decision making, looping, arrays and strings, classes, objects and methods, constructors, static members,

Part II

Subclass, final variables and methods, abstract methods, interfaces, packages, errors and exceptions, input/output files handling, graphics programming.

SUGGESTED READINGS


CAP 204S : Practical of Programming with JAVA

[3 hrs/week/marks : 25(Practicals-20+5 Int.Assess.)]

Practical

The distribution of marks in practical will be as under:

- Practical Exercises: 12 marks
- Record of practicals: 4 marks
- Viva-voce: 4 marks
- Internal Assessment: 5 marks
Semester-IV

Major Papers-

Paper I : Math 421S : Algebra

[7 hrs per week (including tutorials)]
Max.Marks : 100
[Final-80+Internal Assessment-20]
Time: 3hrs.

Note : 1. The question paper will have eight questions. Candidates will attempt five questions.
2. There will be four questions from each part and the students will be required to answer two questions from each part.
3. All questions carry equal marks

PART-I

Group Theory: Definitions, examples and simple properties of groups, order of an element, cyclic groups, connection with primitive roots, subgroups, cosets. Lagrange’s Theorem, subgroups of a cyclic group, subgroup generated by a subset, conjugacy, normal subgroups, quotient groups, homomorphisms, the isomorphism theorem.

PART II

Cayley’s Theorem, detailed study of S_n , simplicity of A_n, n ≠ 4, Class Equations, Cauchy’s Theorem, Sylow’s Theorems, Direct Products. Elementary properties of finite p-groups, Fundamental Theorem of finite Abelian groups (scope as in Chapter 2 of I.N. Herstein - Topics in Algebra, Second Edition).

Suggested Readings

Paper-II: Math 422S: Analysis –II

[7 hrs per week (including tutorials)]
Max. Marks: 100
[Final-80+Internal Assessment-20]
Time: 3hrs.

Note: 1. The question paper will have eight questions. Candidates will attempt five questions.
2. There will be four questions from each part and the students will be required to answer at least two questions from each part.
3. All questions carry equal marks.

PART-I

Functions of bounded variation, Total variation, Additive property of total variation, functions of bounded variation expressed as the difference of increasing functions, rectifiable curves and arc length.

The Riemann-Stieltjes integrals with emphasis on Riemann Integral, step functions as integrators, additive and linearity properties of upper and lower integrals, Integrators of bounded variation, Mean value theorems for Riemann-Stieltjes integrals, Fundamental theorem of integral calculus, Mean value theorems for Riemann Integrals.

PART-II

Sequences and series of functions, uniform convergence, uniform convergence and continuity, uniform convergence and integration, uniform convergence and differentiation, The Stone-Weierstrass Theorem power series, exponential and logarithmic functions, trigonometric functions.

[Scope as in the book Mathematical Analysis by T.M. Apostol, Chapter VI (upto 6.10), VII (upto 7.22), ‘Principles of Mathematical Analysis’ by W.Rudin (3rd edition) Chapter VII (Sections 7.1 to 7.18, 7.26). Chapter VIII upto Theorem 8.8 ]

Books recommended
Paper-III: Math 423S: Mechanics

[7 hrs per week (including tutorials)]
Max.Marks : 100
[Final-80+Internal Assessment-20]
Time: 3hrs.

Note: 1. The question paper will have eight questions. Candidates will attempt five questions.
2. There will be four questions from each part and the students will be required to answer at least two questions from each part.
3. All questions carry equal marks.

PART-I

Statics
Forces acting on a particle, parallel Forces, Couples, Moments and Coplanar forces acting on a rigid body and their resultant. Equilibrium of concurrent and Non-Concurrent coplanar forces, Friction, Virtual Work, Stable and unstable equilibrium and the Physical situations via problems.

PART-II

Dynamics
Motion in a straight line, Newton’s law of motion, Motion on an inclined plane. Motion under variable acceleration, Simple harmonic motion, Relative Motion, Projectiles, Work, Power, Energy.

Suggested Reading
2. A Text Book of Mechanics for TDC I, TDC II Publication Bureau, Panjab University, Chandigarh.

Subsidiary Papers-

CA 223S -Software Engineering and Minor Project

[5 hrs/week/ Max.marks : 75(Final-60+15 Int.Assess.)]
(Time : 3 hrs.)

Note: 1. The question paper will have eight questions. Candidates will attempt five questions.
2. There will be four questions from each part and the students will be required to answer at least two questions from each part.
3. All questions carry equal marks.
Part I


Part II

Software Engineering: Coding, Testing

Project: Development of mathematical package in C or JAVA (package include atleast 20 functions)

SUGGESTED READINGS:


CA P224S –Practicals of Software Engineering and Minor Project

[3 hrs/week/marks : 25(Practicals-20+5 Int.Assess.)]

Practical

The distribution of marks in practical will be as under:

<table>
<thead>
<tr>
<th>Practical</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical Exercises</td>
<td>12</td>
</tr>
<tr>
<td>Record of practicals</td>
<td>4</td>
</tr>
<tr>
<td>Viva-voce</td>
<td>4</td>
</tr>
<tr>
<td>Internal Assessment</td>
<td>5</td>
</tr>
</tbody>
</table>
Semester-V

Paper I - Math 501S: Algebra

[7 hrs/per week (including Tutorials)]
[Max. Marks: 100]
(Final-80+Internal Assessment-20)
Time: 3hrs.

Note 1. The question paper will have eight questions. Candidates will attempt five questions.

2. There will be four questions from each part and the students will be required to answer at least two questions from each part.

3. All questions carry equal marks.

Groups and Rings

PART-I


PART-II

Polynomial rings, factorization in \( R[X] \) and in integral domains. Divisibility, Euclidean domains, unique factorization domains. Gauss’ lemma and Eisenstein’s criteria of irreducibility [Scope as in Chapters 7, 8, 9 and 10 of the book - Surjeet Singh and Quazi Zameeruddin: Modern Algebra, 7th edition].

Modules, definition and examples. Fundamental theorem of finitely generated modules over Euclidean domains [Scope as in Section 4.5 of the book – I.N. Herstein: Topics in Algebra].

Suggested Readings

3. N.S. Gopalakrishnan: University algebra; Wiley eastern Ltd.
Paper-II Math 502S: Calculus of Several Variables and Improper Integrals

[7 hrs/per week (including Tutorials)]
[Max. Marks: 100]
(Final-80+Internal Assessment-20)
Time : 3hrs.

Note 1. The question paper will have eight questions. Candidates will attempt five questions.

2. There will be four questions from each part and the students will be required to answer at least two questions from each part.

3. All questions carry equal marks.

PART-1

Limit and continuity of functions between Euclidean spaces, Partial derivatives, directional derivatives and the Jacobian matrix, Derivatives and their elementary properties. Chain rule and its matrix form. Mean value theorem for differentiable functions, Sufficient condition for differentiability and sufficient condition for the equality of mixed partial derivatives, higher order derivatives, Taylor Theorem for function of n-variables.

[Scope as in the book ‘Mathematical Analysis’ by T. M. Apostol, Chapter 12(except 12.6) and Chapter 13]

PART-II

The measure of a bounded interval in $\mathbb{R}^n$, the Riemann integral of a bounded function defined on a compact interval in $\mathbb{R}^n$, Sets of measure zero and Lebesgue’s criterion for existence of a multiple Riemann Integral, Evaluation of a multiple integral by iterated integration.
[Scope as in the book ‘Mathematical Analysis’ by T. M. Apostol, Chapter 14 (up to 14.5)]

Improper integrals, Cauchy’s criterion, absolute convergence, tests for convergence and uniform convergence. Elementary notions of functions defined by integrals, continuity, differentiation under the integral sign. Beta and Gamma functions.

Suggested Reading

4. T.J.I’A Bromwich : An introduction to theory of infinite series(Appendix II)
5. Shanti Narayan : A course of Mathematical Analysis (12th Ed.)
Paper III  Math-503S : Some Special Functions and Integral Transforms

[7 hrs/week (including Tutorials)]
[Max. Marks: 100]
(Final-80+Internal Assessment-20)
Time : 3hrs.

Note 1. The question paper will have eight questions. Candidates will attempt five questions.
2. There will be four questions from each part and the students will be required to answer at least two questions from each part.
3. All questions carry equal marks.

PART-I

Legendre Polynomials –Recurrence relations, Rodrigue’s formula, generating function, Orthogonal and Orthonormal functions, Orthogonal property of Legendre polynomials, Fourier-Legendre series.

Chebyshev Differential Equation, Chebyshev polynomials of first and second kind and relation between them, Generating function, orthogonal property, Recurrence formulae, Fourier Chebyshev Series.

Bessel’s functions. Strum-Liouville Problem – Orthogonality of Bessel functions, Recurrence formulae, Generating function, Fourier-Bessel Series.

PART- II

Laplace Transforms, Inverse Laplace transform, Solution of initial value problems using Laplace transforms, Translation theorems, Laplace transform of Dirac-Delta function, Differentiation and Integration of Laplace transform, Convolution theorems, Laplace transform of periodic functions, Laplace transform method to solve some ordinary differential equations.


Books recommended
2. E. D. Rainville : Special Functions
PAPER IV– Math 505S: Discrete Mathematics and Graph Theory

[7 hrs/per week (including Tutorials)]
[Max. Marks: 100]
(Final-80+Internal Assessment-20)
Time : 3hrs.

Note 1. The question paper will have eight questions. Candidates will attempt five questions.
2. There will be four questions from each part and the students will be required to answer at least two questions from each part.
3. All questions carry equal marks.

PART-1

Pigeonhole principle, Basic counting principles, permutations and combinations of sets and multisets, Binomial and multinomial theorems, Combinatorial identities, inclusion and exclusion principle, Recurrence relations, Generating functions solution of recurrence relations using difference equations and generating functions, Catalan numbers, Difference sequences and Sterling numbers. Partitions as associated to distribution identical objects in identical boxes.

PART-II

Elements of Graph Theory, Eulerian and Hamiltonian trails and cycles. Bipartite multigraphs, Trees, Spaning Trees, Algorithms for BFS and DFS trees weighted Graphs, Greedy algorithm and Prim’s Algorithm for generating minimum weight spanning graphs, Digraphs, Planer graphs, Euler formula and Chromatic numbers. (Scope as in Introductory Combinatorics, 3rd edition by Brualdi , Chapters 1-3,5-8,11 (except § 11.6), 12 .1, 13.1,13.2)

Suggested Readings

Paper-VI : CA 506 S: Relational Database Management System and Mathematical Package

[7 hrs/week (including Tutorials)]
[Max. Marks: 100]
(Final-60+Internal Assessment-15+Practical-25)
Time : 3hrs

Note 1. The question paper will have eight questions. Candidates will attempt five questions.

2. There will be four questions from each part and the students will be required to answer at least two questions from each part.

3. All questions carry equal marks.

PART I

Relational Database Management System, First, Second and Third Normal Forms, Database connectivity with Java, Use of standard Mathematical package (Mathematica or Matlab) which include: conditional statements, loops.

PART II

Use of standard Mathematical package (Mathematica or Matlab) which include: inbuilt or library functions, user defined functions, arrays, graphics, file handling and its connectivity with C or Java.

Suggested Readings

1. JAVA Complete Reference, McGraw Hill.

2. Data Base Management System by C.J.Date.

Practical

Practical Exercises: 12 marks
Record of practicals: 4 marks
Viva-voce: 4 marks
Internal assessment: 5 marks
Semester-VI

Paper I - Math 521S: Linear Algebra

[7 hrs/per week (including Tutorials)]
[Max. Marks: 100]
[Final-80+Internal Assessment-20]
Time: 3hrs.

**Note**
1. The question paper will have eight questions. Candidates will attempt five questions.
2. There will be four questions from each part and the students will be required to answer at least two questions from each part.
3. All questions carry equal marks.

**PART-I**


Linear transformations, algebra of linear transformations. Dual spaces, matrices and linear transformations.

**PART-II**


**Suggested Readings**

Paper II Math-522S: Lebesgue Integration, Fourier Series and Calculus of Several Variables

[7 hrs/per week (including Tutorials)
Max. Marks: 100]
(Final-80+Internal Assessment-20)
Time: 3hrs.

Note 1. The question paper will have eight questions. Candidates will attempt five questions.

2. There will be four questions from each part and the students will be required to answer at least two questions from each part.

3. All questions carry equal marks.

PART-I

Lebesgue outer measure, measurable sets and Lebesgue measure, Construction of a non-measurable set, measurable functions, Littlewood three principles.

Lebesgue integral of a bounded function over a set of finite measure, the integral of a non-negative function, the general Lebesgue Integral.
[Scope as in the relevant sections from Chapter 4 of the book ‘Real Analysis’, 3rd Edition, 2000 by H. L. Royden]

PART-II

Differentiation of monotone functions, functions of bounded variation, differentiation of an integral, absolute continuity.
[Scope as in the relevant sections from Chapter 5 of the book ‘Real Analysis’, 3rd Edition, 2000 by H. L. Royden]
The set $L^2[a,b]$ of square integrable real valued functions on $[a,b]$. Orthogonal/orthonormal system of functions, the theorem of best approximation, the Fourier Series of a function relative to an orthonormal set, Bessel’s inequality, the Riemann-Lebesgue lemma, the Dirichlet integrals, Riemann’s Localization theorem, sufficient conditions for convergence of a Fourier Series at a particular point.


Suggested Reading:

1. H.L. Royden : Real Analysis (3rd Ed.), Prentice Hall of India.
Paper III  Math-523S : Partial Differential Equations

7 hrs/per week (including Tutorials)]
[Max. Marks: 100]
(Final-80+Internal Assessment-20)
Time : 3hrs.

Note 1. The question paper will have eight questions. Candidates will attempt five questions.
2. There will be four questions from each part and the students will be required to answer at least two questions from each part.
3. All questions carry equal marks.

Part I

Ordinary differential equations in more than two variables : Simultaneous Differential equations of the first order and the first degree in three variables, Methods of their solution and applications, Pfaffian Differential forms and equations, solutions of Pfaffian Differential equations in three variables.


Part II


[Scope as in the book ‘Differential Equations’ by I. N. Sneddon, Chapter 1, Chapter 2, Chapter 3(4, 5, 9)]

Books recommended

Paper-IV: Math 525S: Numerical Analysis

[7 hrs/per week (including Tutorials)]

[Max. Marks: 100]

(Final-80+Internal Assessment-20)

Time : 3hrs.

Note 1. The question paper will have eight questions. Candidates will attempt five questions.

2. There will be four questions from each part and the students will be required to answer at least two questions from each part.

3. All questions carry equal marks.

PART-1

Error: Sources, Propogation and Analysis. [Ref.2 Chap 1]


Linear System of Equations:

Direct Methods: Gauss elimination method, Gauss-Jordan Elimination methods, Decomposition methods (Doolittle, Crout and Cholskey), Partition method and their error analysis.

Iterative Methods: Jacobi iterative method, Gauss-Seidel iterative method, Successive over relaxation iterative method, iterative method to determine $A^{-1}$, Convergence Analysis matrix.

Eigen Value Problems: Gerschgirun Theorem, Jacobi, Givens methods Householder’s method for Symmetric matrices, Ruthishauser, Power and Inverse Power method. [Ref.1, Chap 3]

PART-II

Interpolation and Approximation of Functions:


Quadrature, Gaussian Integration, Euler-Maclaurin Sum Formula, Numerical Integration of Singular and Fourier Integrals, Numerical Doule Integration, [Ref. 3 Chap 5, Ref.4 Chap 5.8].

**Numerical solutions to first order ordinary differential equations**: Taylor’s Series method, Picard’s Method, Euler’s and modified Euler’s methods, Runge Kutta methods [Ref. 3 Chap 7.1-7.5]

**Suggested Readings**


**Paper-V: CA 526S: Advanced Java**

[7 hrs/per week (including Tutorials)]

[Max. Marks: 100]

(Final-60+Internal Assessment-15
Practical-25)

Time : 3hrs.

**Note** 1. The question paper will have eight questions. Candidates will attempt five questions.

2. There will be four questions from each part and the students will be required to answer at least two questions from each part.

3. All questions carry equal marks.

**PART I**

Review of Java Basic Features, Applets, AWT Controls, Event Handling, Multithreading, I/O files. Swing : Features, components, swing vs AWT, swing containers, controls, using Dialogs, sliders, progress bars, tables, creating user interface using swing.

**PART II**

Java Server Pages: Introduction, JSP Architecture, Java Beans, JSP objects, developing Web Applications.
**Suggested Readings**

2. Web Enabled Commercial Application Development using Java 2.0, Ivan Bayross BPB.
3. The Complete Reference Java 2, Herbert Schildt, TMH.
4. J2EE : The Complete Reference, James Keogh

**Practical**

- Practical Exercises: 12 marks
- Record of practicals: 4 marks
- Viva-voce: 4 marks
- Internal assessment: 5 marks

***************