

**B. A. \ B.Sc (Mathematics) III semester  
FOR SESSION ( 2015-16,2016-2017, 2017-18)**

**Paper-I: Advanced Calculus**

**Maximum Marks: 50**

**EXT:- 36 / INT: 14**

**Time allowed: 3 Hrs.**

**Teaching hours: 50**

**Minimum Pass Marks: 35%**

**Lectures to be delivered: 5 periods (of 45 minutes duration) per week**

**Instructions for paper-setters**

The question paper will consist of three sections A, B and C. Each of sections A and B will have four questions from the respective sections of the syllabus and Section C will consist of one compulsory question having short answer type questions covering the entire syllabus uniformly. The weightage of section A and B will be 30% and that of section C will be 40%.

**Instructions for the candidates**

Candidates are required to attempt five questions in all selecting two questions from each section A and B and compulsory question of Section C. All questions will carry equal marks.

**SECTION-A**

Limit and Continuity of Functions of several variables. Differentiability of real-valued functions of two variables. Partial differentiation, Jacobians and their properties, Schwarz's & Young's theorems. Euler's theorem on homogenous functions. Taylor's theorem for functions two variables and error estimation. Maxima and Minima, Lagrange's multiplier method.

**SECTION-B**

Double and Triple Integrals, Change of order of integration in double integrals, Change of variables. Applications to evaluation of areas, Volume, Centre of Gravity and Moments of Inertia

**. REFERENCE BOOKS:**

1. Malik and Arora, Mathematical Analysis.
2. Shanti Narayan, Mathematical Analysis.
3. Thomas and Finney ,Calculus and Analytical Geometry.

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**PAPER-II: ANALYSIS-I**

**Maximum Marks: 50**

**EXT:- 36 / INT: 14**

**Time allowed: 3 Hrs.**

**Teaching hours: 55**

**Minimum Pass Marks: 35%**

**Lectures to be delivered: 5 periods (of 45 minutes duration) per week**

**Instructions for paper-setters**

The question paper will consist of three sections A, B and C. Each of sections A and B will have four questions 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. All questions will carry equal marks. The weightage of section A and B will be 30% and that of section C will be 40%.

**Instructions for the candidates**

Candidates are required to attempt five questions in all selecting two questions from each section A and B and compulsory question of Section C. All questions will carry equal marks.

**SECTION-A**

Definition and existence of Riemann integrals. Properties of integrals. Integrability of continuous and monotonic functions. The fundamental theorem of integral calculus. Mean value theorem of integral calculus.

**SECTION-B**

Scalar and vector fields, differentiation of vectors, velocity and acceleration. Vector differential operators: Del, Gradient, Divergence and Curl, their physical interpretations. Formulae involving Del applied to point functions and their products. Line, surface and volume integrals, Greens Theorem in the Plane Parameterized Surface, Stokes Theorem and the Divergence Theorem. Applications of Green's, Stoke's and Divergence theorem.

**REFERENCE BOOKS:**

1. T. M. Apostol, *Mathematical Analysis*, Norosa Publishing House, New Delhi, 1985.

2. S. C. Malik and Savita Arora, , *Mathematical Analysis*, Wiley, 1984.
3. D. Somasundaram and B. Choudhary, *A First Course in Mathematical Analysis*, Narosa Publishing House, New Delhi, 1997.
4. Shanti Narayan. *S Course of Mathematical Analysis*, S.Chand & Co., New Delhi.
5. P. K. Jain and S. K. Kaushikk, *An Introduction to Real Analysis*, S. Chand & Co., New Delhi, 2000.

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**Paper-III: STATICS**

**Maximum Marks: 50**

**EXT:- 36 / INT: 14**

**Time allowed: 3 Hrs.**

**Teaching hours: 50**

**Minimum Pass Marks: 35%**

**Lectures to be delivered: 5 periods (of 45 minutes duration) per week**

**Instructions for paper-setters**

The question paper will consist of three sections A, B and C. Each of sections A and B will have four questions from the respective sections of the syllabus and Section C will consist of one compulsory question having short answer type questions covering the entire syllabus uniformly. All questions will carry equal marks. The weightage of section A and B will be 30% and that of section C will be 40%.

**Instructions for the candidates**

Candidates are required to attempt five questions in all selecting two questions from each section A and B and compulsory question of Section C. All questions will carry equal marks.

**SECTION-A**

**Statics:** Basic notation, Newton Laws of motion, system of two forces, parallelogram law of forces, resultant of two collinear forces, resolution of forces, moment of a force, couple, theorem on moments of a couple, coplaner forces, resultant of three coplanar concurrent forces, theorem of resolved parts, resultant of two forces acting on a rigid body, Varignon's theorem, generalized theorem of moments.

**SECTION-B**

Equilibrium of two concurrent forces, equilibrium condition for any number of coplanar concurrent forces, Lami's theorem.  $\lambda - \mu$  theorem, theorems of moments, resultant of a force and a couple. Equilibrium conditions for coplanar non-concurrent forces.

**Friction:** Definition and nature of friction, laws of friction, Centre of gravity.

**Books recommended:**

- 1) S.L. Loney: The elements of statics and dynamics, 5<sup>th</sup> edition, Cambridge University Press, 1947.
- 2) J. L. Synge and B. A. Griffith : Principles of mechanics, Published by Nabu Press.

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**PAPER-IV: Numerical Methods**

**Maximum Marks: 50**

**EXT:- 36 / INT: 14**

**Time allowed: 3 Hrs.**

**Teaching hours: 50**

**Minimum Pass Marks: 35%**

**Lectures to be delivered: 5 periods (of 45 minutes duration) per week**

**Instructions for paper-setters**

The question paper will consist of three sections A, B and C. Each of sections A and B will have four questions from the respective sections of the syllabus and Section C will consist of one compulsory question having short answer type questions covering the entire syllabus uniformly. All questions will carry equal marks. The weightage of section A and B will be 30% and that of section C will be 40%.

**Instructions for the candidates**

Candidates are required to attempt five questions in all selecting two questions from each section A and B and compulsory question of Section C. All questions will carry equal marks.

**SECTION-A**

Bisection Method, Regula-falsi method, Secant method, Fixed – point iteration and Newton-Raphson method and convergence of Secant, Newton- Raphson method and fixed-point iteration. Pivoting strategies, Partial Pivoting, Gauss-Elimination, Gauss Jordan and Triangularisation method, Jacobi Method, Gauss Seidel Method.

**SECTION-B**

**Interpolation:** Finite differences, Divided differences, Newton Gregory Forward and Backward formula, Lagrange's formula, Newton's formulae, Central Differences, Stirling, Bessel's and Everett's formulae, Error in linear and quadratic interpolation.

**REFERENCES:**

1. M.K.Jain, S.R.K Iyengar and R.K.Jain, Numerical Methods for Scientific and Engineering Computation, New Age Publisher, New Delhi.
2. S.D.Conte and C.D.Boor, *Elementary Numerical Analysis*, 3<sup>rd</sup> Edition, Mc-Graw Hill International Company, Newyork.

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**Paper-V: Analysis-II**

**Maximum Marks: 50**

**EXT:- 36 / INT: 14**

**Time allowed: 3 Hrs.**

**Teaching hours: 50**

**Minimum Pass Marks: 35%**

**Lectures to be delivered: 5 periods (of 45 minutes duration) per week**

**Instructions for paper-setters**

The question paper will consist of three sections A, B and C. Each of sections A and B will have four questions from the respective sections of the syllabus and Section C will consist of one compulsory question having short answer type questions covering the entire syllabus uniformly. All questions will carry equal marks. The weightage of section A and B will be 30% and that of section C will be 40%.

**Instructions for the candidates**

Candidates are required to attempt five questions in all selecting two questions from each section A and B and compulsory question of Section C. All questions will carry equal marks.

**SECTION-A**

Definition of a sequence, Bounded and Monotonic sequences, Convergent sequence, Cauchy sequences, Cauchy's Convergence Criterion, Theorems on limits of sequences. Subsequence , Sequential continuity,.

Definition of a series, test of convergence (Without proofs) Comparison tests. Cauchy's integral Ratio tests. Raabe's, Logarithmic, gauss Test, Cauchy root test, tests, Alternating series. Leibnitz's test. Absolute and conditional convergence.

**SECTION-B**

Concept of Point-wise and Uniform convergence of sequence of functions and series of functions with special reference to power Series. Statement of Weierstrass M-Tests for Uniform convergence of sequence of functions and of series of functions. Simple applications. Determination of Radius of convergence of power series. Term by term integration and Term by term differentiation of power Series.

### **REFERENCE BOOKS:**

1. T. M. Apostol, *Mathematical Analysis*, Norosa Publishing House, New Delhi, 1985.
2. R. R. Goldberg, *Real Analysis*, Oxford & IBH Publishing Co., New Delhi, 1970.
3. Shanti Narayan. S *Course of Mathematical Analysis*, S.Chand & Co., New Delhi.
4. S. C. Malik and Savita Arora, , *Mathematical Analysis*, Wiley, 1984.
- 5..Shanti Narayan, *Theory of Functions of a Complex Variable*, S. Chand & Co., New Delhi

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**Paper-VI: DYNAMICS**

**Maximum Marks: 50**

**EXT:- 36 / INT: 14**

**Time allowed: 3 Hrs.**

**Teaching hours: 50**

**Minimum Pass Marks: 35%**

**Lectures to be delivered: 5 periods (of 45 minutes duration) per week**

**Instructions for paper-setters**

The question paper will consist of three sections A, B and C. Each of sections A and B will have four questions from the respective sections of the syllabus and Section C will consist of one compulsory question having short answer type questions covering the entire syllabus uniformly. All questions will carry equal marks. The weightage of section A and B will be 30% and that of section C will be 40%.

**Instructions for the candidates**

Candidates are required to attempt five questions in all selecting two questions from each section A and B and compulsory question of Section C. All questions will carry equal marks.

**Section - A**

Motion of a particle with constant acceleration , acceleration of falling bodies, motion under gravity, motion of a body projected vertically upward, motion of a two particles connected by a string, motion along a smooth inclined plane, constrained motion along a smooth inclined plane. Variable acceleration, Simple harmonic motion, elastic string, simple pendulum.

**Section - B**

Projectile, Work, Power , conservative fields and potential energy, work done against gravity, potential energy of a gravitational field.

Relative motion, relative displacement, velocity and acceleration, motion relative to a rotating frame of reference. Linear momentum, angular momentum, conservation of angular momentum, impulsive forces, principle of impulse and momentum.

**REFERENCE BOOKS:**

- 1) S.L. Loney: The elements of statics and dynamics, 5<sup>th</sup> edition, Cambridge University Press, 1947.
- 2) J. L. Synge and B. A. Griffith : Principles of mechanics, Published by Nabu Press.