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ಕ್ರ. ಸಂ. ಗುವಿಗು/ವಿಮವಿ/ಬಿಓಎಸ್/2014-15/ 808 ದಿನಾಂಕ: 06-08-14

ಅಧಿಸೂಚನೆ

ವಿಷಯ: ಬಿ.ಎಸ್ಸಿ I ರಿಂದ VIನೇ ಸೆಮೆಸ್ಟರ್‌ನ ಗಣಿತ ವಿಷಯದ ಪಠ್ಯಕ್ರಮ ಪರಿಷ್ಕರಿಸಿ ಜಾರಿಗೊಳಿಸಿದ ಬಗ್ಗೆ.

ಉಲ್ಲೇಖ: 1) ಗಣಿತ ಸ್ನಾತಕ ಅಧ್ಯಯನ ಮಂಡಳಿ ಸಭೆಯ ನಿರ್ಣಯ(2) ದಿನಾಂಕ: 31.01.2014.
2) ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಗೊತ್ತುವಳಿ ಸಂಖ್ಯೆ 02 ದಿನಾಂಕ 24.03.2014.
3) ಕುಲಪತಿಗಳ ಅನುಮೋದನೆ ದಿನಾಂಕ: 03.06.2014.

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ಉಲ್ಲೇಖ (2) ರಲ್ಲಿನ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್‌ನ ಸಭೆಯ ಗೊತ್ತುವಳಿ ಸಂಖ್ಯೆ 02 ನ್ನು ಅನುಷ್ಠಾನಗೊಳಿಸುತ್ತ; ಬಿ.ಎಸ್ಸಿ I ರಿಂದ VIನೇ ಸೆಮೆಸ್ಟರ್‌ನ ಗಣಿತ ವಿಷಯದ ಪಠ್ಯಕ್ರಮವನ್ನು ಪರಿಷ್ಕರಿಸಿ ಗಣಿತ ಸ್ನಾತಕ ಅಧ್ಯಯನ ಮಂಡಳಿಯು ಅನುಮೋದಿಸಿರುವದರಿಂದ, ಈ ಪಠ್ಯಕ್ರಮವನ್ನು 2014-15 ನೇ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ ಜಾರಿಗೊಳಿಸಲಾಗಿದೆ.

ಮೇಲಿನ ಬದಲಾವಣೆಯನ್ನು ಸಂಬಂಧಪಟ್ಟ ಶಿಕ್ಷಕರ ಹಾಗೂ ವಿದ್ಯಾರ್ಥಿಗಳ ಗಮನಕ್ಕೆ ತರಲು ಸೂಚಿಸಲಾಗಿದೆ. ಪಠ್ಯಕ್ರಮದ ವಿವರವನ್ನು ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್‌ಸೈಟ್ www.gulbargauniversity.ac.in ದಿಂದ ಪಡೆಯಬಹುದು.

ಕುಲಸಚಿವರು 06/8/14
ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಗುಲಬರ್ಗಾ

ಗೆ,
1) ಮುಖ್ಯಸ್ಥರು, ಗಣಿತ ಅಧ್ಯಯನ ವಿಭಾಗ, ಗು.ವಿ.ಗುಲಬರ್ಗಾ.
2) ಎಲ್ಲಾ ವಿಜ್ಞಾನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಂಶುಪಾಲರಿಗೆ ಮಾಹಿತಿಗಾಗಿ.

ಪ್ರತಿ:

1) ಡೀನ್‌ರು, ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ನಿಕಾಯ, ಗು.ವಿ.ಗುಲಬರ್ಗಾ
2) ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ), ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಗುಲಬರ್ಗಾ.
3) ಮುಖ್ಯಸ್ಥರು, ವಿಶ್ವವಿದ್ಯಾಲಯ ಗಣಕ ಕೇಂದ್ರ, ಗು.ವಿ.ಗುಲಬರ್ಗಾ ಇವರಿಗೆ ಸದರಿ ಪಠ್ಯಕ್ರಮವನ್ನು ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್ ಸೈಟ್ ನಲ್ಲಿ ಪ್ರಕಟಿಸಲು ತಿಳಿಸಲಾಗಿದೆ.
4) ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿ / ಕುಲಸಚಿವರ ಆಪ್ತ ಸಹಾಯಕರ ಮಾಹಿತಿಗಾಗಿ.

Gulbarga University, Gulbarga

Department of Mathematics

Proposed Syllabus in

Mathematics for SIX Semesters
B.Sc., Degree Courses to be effective
from 2014-15 onwards
alongwith Question Paper Models

(Draft)

GULBARGA UNIVERSITY, GULBARGA

DEPARTMENT OF MATHEMATICS

Proposed syllabus in Mathematics for SIX Semesters B.Sc. Degree Course to be with effective from 2014-15 onwards

		Semesters I, II, III & IV	Semesters V & VI
Number of papers in each semesters		2	3
Teaching Hours per paper per week	a) Teaching	4 Hours	5 Hours
Examination pattern in each paper in each semester	Duration of Examination	3Hours	3 Hours
i) Examination marks	a) Maximum b) Minimum for pass	60 24	80 32
ii) Internal Assessment marks	a) Maximum b) Minimum for pass	15 --	20 --
iii) Total marks	a) Maximum b) Minimum for pass	75 30	100 40

2. Internal assessment marks in each paper shall be awarded by the concerned course teacher based on the two class tests each of one hour duration conducted during the semester.

3. The internal assessment marks awarded shall be carried forward for the repeated examination.

4. The maximum strength of each section for teaching hours be restricted to sixty students.

B.Sc. Degree
Course structure for Mathematics subject
Duration : 6 semesters (3 years)

Semester	Paper No.	Paper Title	Contents
I	BSM 1.1	Algebra & Vectors	Matrices, Theory of equations, and Vectors and Number Theory
	BSM 1.2	Calculus – I	Successive differentiation, continuity & differentiability, functions of two and three variables and applications
II	BSM 2.1	Sequence Series and Boolean Algebra	Sequences, Infinite series, Boolean Algebra
	BSM 2.2	Calculus – II	Polar co-ordinates, theory of plane curves reduction formula on integration and applications
III	BSM 3.1	Abstract Algebra & Multiple Integrals	Groups, Rings, Line and Multiple Integrals
	BSM 3.2	Real Analysis & Ordinary D.E.	Riemann Integration Ordinary differential equations-I
IV	BSM 4.1	Liner Algebra & L.T.	Linear Algebra, Laplace Transformation
	BSM4.2	Vector Analysis & Fourier Transforms	Vector Analysis, Integral Theorems Fourier Series and Transformation
V	BSM 5.1	Complex Analysis	Trigonometry & Complex Analysis
	BSM 5.2	Improper Integral and Differential Equation – II	Improper Integrals, series solutions Total differential, Partial differential equation
	BSM 5.3	Optional-I	Any one of the following optional papers a) Graph Theory – I b) Discrete Mathematics – I c) Mathematical Modeling – I
VI	BSM 6.1	Numerical Analysis	Numerical Analysis
	BSM 6.2	Fluid Mechanics & Statistical Analysis	Fluid Mechanics, Statistical Analysis, Calculus of variation and Topology
	BSM 6.3	Optional – II	Any one of the correspond paper as in V Semester a) Graph Theory -II b) Discrete Mathematics – II c) Mathematical Modeling – II

BSM 1.1 Paper

Algebra and Vectors

Matrices:

Recapitulation of Matrices of symmetric and skew symmetric matrices Hermition, Skew Hermition matrices - Orthogonal and unitary matrices and their properties -Rank of a Matrix Elementary operations and Normal form of a Matrix and by reducing it to echlon form.

System of 'm' linear equations in 'n' unknowns. Consistency Criterion of existence of solutions of homogeneous and non homogeneous systems - Criterion for uniqueness of solutions.

Eigen values and Eigen vectors of a square matrix :

Characteristic equation of a square matrix, Eigen values and Eigen vectors of a real matrices and properties thereon. Reduction of such matrix to diagonal form.

Cayley Hamilton Theorem :

Verification of Cayley Hamilton Theorem and determination of A^{-1} , A^{-2} ,A^2 ,A^3 by using the theorem 3 x 3 matrices (30 hrs)

Vector Algebra :

Recapitulation of vector algebra, vector triple product, product of four vectors, reciprocal vectors, Properties and Examples. (10 hrs)

Theory of Equations:

Transformations of equations, Descartes' rule of signs – Solutions of cubic equations – Cardon method and trigonometric method – Biquadratic equations. (14 hrs)

Number Theory :

Recapitulation of number system, Divisibility, Congruencies, Fundamental Theorem of Arithmetic, Euclidean Algorithm, arithmetical function, Mo bious function, $\mu(n)$, Euler totient function $\Phi(n)$, Liouville's function λ (n) relation connecting Φ and μ problems thereon. (10 hrs)

Reference Books :

1) Shantinarayan (S.Chand and Co.) Matrix Algebra

2) M. Ray and Sharma Higher Algebra

3) Vector Algebra by M.L. Khanna

4) Vector Analysis by Murry R. Spiegal (Schaum Series)

5) Number theory and analysis by Paul and Paul

6) Introduction to Analytical Number Theory by Tom M Apostol

7) Vector Algebra – P.N. Chattarji

8) Vector Algebra - Shantinarayan

B.S.M. 1.2

Calculus – I

Successive Differentiation :

Recapitulation of differentiation, successive differentiation. Standard formula for n^{th} derivative of the functions $(ax+b)^n$, $\log(ax+b)$, e^{ax}, $\sin(ax+b)$, $\cos(ax+b)$, $e^{ax}\sin(bx+c)$ $e^{ax}\cos(bx+c)$ Leibnitz's theorem and applications. (14 hrs)

Continuity and differentiability :

Recapitulation of limits, continuity and bounds of a functions Infinite limit, limit at infinity, types of discontinuity. Algebra of continuous functions (statement only) properties of continuous functions. Differentiability of functions, Rolle's theorem, Lagrange's & Cauchy's Mean value theorem, Taylor's Theorem, Taylor's & Maclaurin's Series, Indeterminate forms and L.Hospital Rule . (25 hrs)

Functions of two and three Independent variables :

Limit and continuity, partial derivative, partial derivative of higher order, homogenous functions, Euler's theorem on homogeneous functions of second order and examples thereon. Total derivative, Total differention, Differentiation of implicit function, Jacobian's : Dependent and Independent functions, properties of Jacobian's & functional relations. Applications of two and three variables for finding errors and approximations using total differentials in area and volume. (25 hrs)

Reference :

1) Differential calculus by Shanthi Narayan (S.Chand & Co.)
2) Advanced Calculus by Murry R Spiegal (Schaum Series)
3) Mathematical Analysis by S.C. Malik (Wiley Eastern)
4) College Mathematics Vol. – I by Dr. N. Rudraiah
5) Modern College Calculus by D.C. Pavate

BSM 2.1

Sequences, Series and Boolean Algebra

Sequences :

Sequences, bounded and unbounded sequences, convergence and divergence of sequences and subsequences, monotonic sequences, algebra of convergent, sequences, supremum and infimum of sequences, algebra of limits sub-sequences, Cauchy sequences, Cauchy's criterion for convergence – limit $n \to \infty (1+1/n)^n = e$ and standard forms sequences and examples.

(20 hrs)

Infinite Series :

Partial sums of a series, convergence and divergence of series, series of non-negative terms, geometric & harmonic series, p- series, comparison test for series of non negative terms – De-Alembert's Ratio test and Raabe's test, Cauchy's root test. Absolute convergence, alternating series, absolute and conditional convergent, Leibnitz's test (without proof) and verification and examples - Summation of binomial, exponential and logarithmic series.

(30 hrs)

Boolean Algebra and Switching functions :

Introduction, operator, definition, principle of Duality, fundamental theorems on Boolean Algebra, relation, Boolean function, Disjunctive normal form, Conjuctive normal form, Conversion

Switching Circuits :

Switching circuits and Boolean function. (14 hrs)

References :

1) S.C. Malik : Mathematical Analysis (Wiley. Eastern)

2) Ray & Sharma : Higher Algebra (S. Chand & Co.)

3) O.E. Stanitics : An Introduction to Sequences, Series

4) Eral d. Rainville : Infinite Series, Mc. Millan Co.

5) M.K. Venkataraman N. Sridharan & N.Chandrashekhar (2003) DSM The National Publishing Company, Chennai

6) M.K. Sen and B.C. Chakraborthy (2002) DSM Books and Allied Pvt Ltd., Kolkata

BSM 2.2

Calculus – II

Polar Co-ordinates :

System of Polar co-ordinates, Angle between the radius vector and the tangent to the curve. Angle of intersection of two curves (polar form). Polar sub tangent and polar subnormal, length of the perpendicular from the pole to the tangent, pedal equation of the curves, whose equation is given in polar and Cartesian form. (14 hrs)

Theory of plane curve :

Derivative of Arc, equation of conic in polar form, curvature, radius of curvature, polar and parametric forms to determine the radius of curvature. Centre of curvature, circle of curvature, evolute of curvature, envelops (only definitions and expressions). Examples.

Increasing and decreasing function, concavity convexity and point of inflexions, Asymptotes, Singular points, multiple points cusp, node, isolated point, tracing of standard curves and examples. (30 hrs)

Integration :

Recapitulation of Integration, standard reduction formula. Application of integration for finding length of arc, surface areas and volume of solid revolution for standard curves whose equations are given in Cartesian, polar forms and parametric forms (20 hrs)

Reference :

1) Differential calculus by Shanti Narayan (S.Chand & Co.)
2) Integral Calculus by Shanti Narayan (S.Chand & Co.)
3) College Mathematics Vol. I by N. Rudraiah (Sapna, Bangalore)
4) Modern College Calculus by D.C. Pavate

BSM – 3.1

Group, Rings, Line and Multiple Integrals

Introduction to Groups :

Binary operation, Group and Sub-Group. The necessary and sufficient condition for a sub group. Properties of groups and examples.

Order of an element of a group. Properties of the order of an element.

Cyclic group - Definition and properties, Cosets definition and properties. Index of a sub group. Lagrange's Theorem. Consequences of Lagrange's Theorem, Euler's phi function and Fermat's Theorem.

Normal sub groups of a group : Equivalent versions of the criterion for a sub group to be normal sub group - Factor groups – problems illustrating the concept and results.

Homomorphism, Isomorphism of groups, Kernal, normality, fundamental theorem of homomorphism.

Permutation groups of degree n, Cayley's theorem – problems illustrating concept and results.

Normality of the Kernal - Fundamental Theorem of homomorphism. Iso morphism theorems – permutation groups of degree 'n' Cayleys Theorem – problems illustrating the concept and results. (30 hrs)

Rings :

Definition of Ring, Subrings definition and properties, integral domain, field and ideals of rings properties and examples (10 hrs)

Line and multiple integral :

Line integral, basic properties and examples.

Double and Triple integrals. Evaluation of double integrals, and triple integrals (1) under given limits (2) in regions bounded by given curves. Change of variables to polar, cylindrical and spherical polar co-ordinates examples thereon. (24 hrs)

References :

1) Modern Algebra : Vashistha

2) A Course in Abstract Algebra : Vijay K. Khanna and S.K. Bhambri, Vikas Publishing House Pvt. Ltd.

3) College Mathematics Vol I and II : Jayaram, Prabhakara, Santhkumar Sastry, Sundareshan, Himalaya Publishing House

4) Real Analysis by Shantinarayan

5) Mathematical Analysis by H.C. Malik

BSM - 3.2

Riemann Integration and Ordinary Differential Equation

Riemann Integrability :

Real valued functions of single real variable – Integral primitive of function – Inequalities, Absolute values, lower and upper bounds – Bounded function (re capitulation) – lower and upper sums – lower and upper Riemann integrals – necessary and sufficient conditions for Remann Intigrability – Reimann integral, Darboux's theorem (statement only) Integrability of a) continuous function b) monotonic function. Properties of integrable functions – Intergrability of sum, difference, Integrability of modules of an integrable function – Fundamental theorem of integral calculus - continuity and derivability of integrable function –First and second mean value theorem of integral calculus. Leibnitz's result to evaluate the examples of differentiation under the integral sign (24 hrs)

Ordinary Differential Equations

Differential equations of first order and higher degree. Equations solvable for p, x, y – Clairault's equations. General and singular solutions Linear Differential Equation of finding complementary function – Nonhomogeneous differential equation – Methods of finding particular integrals- When RHS function is of the form e^{ax}, x^n, sin ax, cos ax, $e^{ax}F$, where F is a function of x – Cauchy Euler Differential Equations of order two Simultaneous differential equations – Linear differential equations of IInd order with variable coefficients – Solutions by the following methods.

a) When a part of CF is given b) Changing the independent variable

c) Changing the dependent variable d) When first integral is given

e) Variation of parameters (40 hrs)

References :

1) Differential Calculus – Shanti Narayan (S.Chand & Co.)

2) Principles of Mathematical Analysis – Shanti Natrayan (S.Chand & Co.)

3) Murrary R. Spiegel : Advanced Calculus (Schaum's Series)

4) Mathematical Analysis : S.C. Malik (Willy Eastern)

5) Introductory Course in Differential Equations ": Daniel Murray (Orient Longman)

6) Real Analysis : Sharma and Vasistha (Krishna Prakashan Mandir,Meeruit)

7) Ordinary Differential and difference equations (Chorlton F (Van Norstand)

8) Differential Equations : G.F. Simmons (TMH)

9) Elementary Differential Equations and BVP (WE Boyce & R.C. Diprima – John Wiky & Sons)

BSM 4.1

Linear Algebra & Lap lace Transform

Linear Algebra:

Introduction and Definition of vector space, properties and examples of vector space, sub space definition properties and examples. Linear combination and Linear span of a set, Linear dependence and Linear independence.

Basis and Dimension :

Linear transformation, properties of linear transformation of matrix, Rank , nullity of linear transformation, Rank nullity theorem and examples.

Change of basis.

Range of Kernel of a linear transformation

Similarity of matrices, reduction of diagonal, quadrate and canonical forms

(32 hrs)

Laplace Transforms :

Introduction and definition -Laplace Transform of some standard functions - Properties of Laplace transforms - Laplace transform of periodic function. Definition, properties and Laplace transforms of unit step (Heaviside) function and Unit impulse function. Inverse Laplace Transformation, properties, computation of inverse Laplace Transformation by completing the square, by partial fractions. Inverse Laplace transformation of Logarithmic, Inverse Trigonometric functions and functions of the form f(s)/s - Convolution theorem - Laplace Transform of derivatives - Applications of Laplace Transform (32 hrs)

Reference Books :

1) Herstein : Topics in Algebra

2) Fraleigh J.B. : A. First course in Abstract Algebra

3) Lipsclitz S. : Linear Algebra (Schaun Series)

4) Murry R. Spiegal L : Laplace Transform (Schaun Series)

BSM 4.2

Vector Analysis & Fourier Transforms

Vector Analysis :

Scalar field gradient of scalar field, geometrical meaning, directional derivatives, vector field, divergences and curl of a vector field, solenoidal and irrotational Laplacian of a scalar field, vector identities, Orthogonal curvilinear co-ordinates, polar, spherical cylindrical co-ordinates, Green's, Gauss, Stoke's theorem, simple examples (30 hrs)

Fourie's Series and Fouries Transform

Fourie's Series : Introduction, period functions, Trigonometric series, Euler's formula (with proof) Fourie's series of period 2Π, 2L and arbitrary period. Fourier series of even and odd functions. Half range Fourie series. Harmonic Analysis of Fourier Series. (16 hrs)

Fourier Transforms :

Introduction - Finite and infinite Fourier transforms - Finite and infinite inverse Fourier transforms – Properties - Fourier cosine and sine transforms - Inverse Fourier cosine and sine transforms - Applications of Fourier transforms to ODE's and PDE's (18 hrs)

Books :

1) Murry R & Spiegal L vector analysis (Schaum Series)
2) Spain B : Vector Analysis
3) N.P. Bali : Vector Algebra
4) Murry R & Spiegal : Fourier Series and Fourier transform (Schaum SEreis)
5) Churchil R. V & Brown J.W : Fourier Series & Boundary Value Problem (McGrew Hill)

BSM 5.1

Complex Analysis

Trigonometry :

Recaptulation of De-Moveire's Theorem – Expansion of sine and cosine of multiple angles and powers of sin cosine functions – Exponential series of complex quantities – Euler's Formula – Hyperbolic functions and results – Logarithms of complex quantities – Separation of expressions into real and imaginary parts . (10 hrs)

Complex Numbers :

Introduction - Complex Numbers - Conjugation and Modulus – Inequalities - Square Root - Geometrical Representation of Complex Numbers - n^{th} Roots of Complex Numbers - Circles and Straight Lines - Regions in the Complex Plane - The Extended Complex Plane. (10 hrs)

Analytic Functions :

Introduction - Functions of a Complex variable – Limits -Theorems on Limit - Continuous Functions – Differentiability- The Cauchy-Riemann Equations - Analytic Functions - Harmonic Functions - Conformal Mapping (10 hrs)

Bilinear Transformations :

Introduction - Elementary Transformations -Bilinear Transformations Cross Ratio - Fixed Point of Bilinear Transformations - Some Special Bilinear Transformation (10 hrs)

Mapping By Elementary Functions :

Introduction - The Mapping $\omega = z^2$ The Mapping $\omega = z^2$ where n is a positive integer - The Mapping $\omega = e^z$ The Mapping $\omega = \sin z$ - The Mapping $\omega = \cos z$ -The Mapping $\omega = \cosh z$ -The Mapping $\omega = \frac{1}{2}(z + 1/z)$

Complex Integration :

Introduction - Definite Integral - Cauchy's Theorem - Cauchy's Integral Formula - Higher Derivatives

Series Expansions :

Introduction - Taylor's Series - Laurent's Series (only statement) - Zero of an Analytic Function – Singularities

Calculus of Residues :

Introduction - Residues - Cauchy's Residue Theorem -Evaluation of Definite Integrals (40 hrs)

References :

1) J.N. Sharma : Complex Analysis
2) Ponnausamy : Foundations of Complex Analysis, Narosa Publishing House
3) S. Arumugam, A. Thangapand Isaac, A. Somasundaram : Complex Analysis, Scitech Publication
4) B.D. Gupta : Topology, Kedarnath Ramnath Pub. Merrut
5) Complex Analysis by B.S. Tyagi
6) Complex Analysis by M.L. Khanna

BSM 5.2

Improper Integrals and Differential Equations

Improper Integrals:

Improper Integrals of the first and second kinds, convergence of Beta and Gamma functions. Connections between two functions applications to evaluate the standard integrals, relations between Beta and Gamma functions, Duplication formulae, Sterling formulae (statements) - (20 hrs)

Series Solution :

Bessel's Differential Equation, Bessel function, $J_n^{(x)}$ as a solution – generating formula – integral formula for $J_n^{(x)}$ Orthogonal property – basic recurrence relation and examples related to the recurrence relations

Legendre Differential Equation :Legendre Polynomials $P_n^{(x)}$ as a solution., Rodrigue's Formula – generating function, Orthogonal property and basic recurrence relation and examples related to the recurrence relations

(25 hrs)

Total Differential Equation :

Necessary condition for the equation Pdx+Qdy+Rdz = 0 to be integral – problems thereon.

Solutions of equations of the type $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ (15 hrs)

Partial Differential equations :

Formation of partial differential equations, Lagrange's equation – Pp+Qq = R, Standard types of first order non linear partial differential equation and equations reducible to standard form. Charpit's method. (20 hrs)

References :

1) Sharma and Vasistha : Real Analysis (Krishna Prakashan Mandir, Merruit)

2) Shantinarayan : Mathematical Analysis (S.Chand & Co.)

3) Charlton : Ordinary Differential Equation (Von-Norstand)

4) Raisinghania M.D. : Ordinary and Partial Differential Equation (S.Chand & Co)

5) Simmons G.F. : Differential Equation (TMH)

6) I.N. Sneddean : Elements of Partial Differential Equations (McGraw Hill)

7) D.A. Murray : Differential Equation

BSM 5.3 (a)

Theory of Graphs - I

Introduction, graphs, finite and null graphs, loops, multi graphs, pseudo graph, simple graph, degree of a vertex, isolated and pendent vertices – connectedness and complete graphs, regular graph, minimum and maximum degree $\sum$ deg(vi) =2q. The number of vertices of odd degree is even Isomorphism, line and total graphs (definitions and examples only)

Sub – graphs, spanning and induced sub-graphs, walk, trial, path cycle, the shortest path problems, bipartite graph. Characterization of bipartite graphs in terms of its cycles. (40 hrs)

Cut Vertex, Bridge, Block, Tree, Spanning Tree, Rooted and Binary Trees, properties of trees and characterizations, forests, centres and centroids.

Matrix representation :

Adjacency, Incidence , and cycle matrices and rank of matri examples thereon. Verification of isomorphism by matrix method. Definitio of a path of a matrix and examples. (40 hrs

Reference :

1) Robin J. Wilson : Introduction to Graph Theory, Longman (London), U.K.

2) Narsing Deo : Graph Theory and Applications (PHI), India.

3) Frank Harrary : Graph Theory, Narosa Publications

4) DSC : Graph Theory and Its Applications

5) Vasudev : Graph Theory and Its Applications

6) V.R. Kulli : Graph Theory, Vishwa International Publications.

7) Balkrishan : Graph Theory and its applications.

BSM 5.3 (b)

Discrete Mathematics - I

Sets and propositions –Cardinality – Mathematical induction. Principle of inclusion and exclusion.

Computability and formal languages – Ordered sets

Languages, Phrase structure grammars. Types of grammars and languages

Permutation, combinations and discrete probability. Relations and Functions: Binary relations. Equivalence relations and partitions. Partial order relations and lattices. Chains and Anti-chains. Functions and the Pigeon Hole Principle. (40 hrs)

Graph and Planar Graphs : Basic terminology. Multi-graphs. Weighted graphs. Paths and Circuits. Hamiltonian Paths and Circuits. Travelling Salesman problem Painar Graph.

Trees: Trees, Routed Trees, Binary Search Trees. Spanning Trees and cut sets

Transport Networks

Finite State Machines : Equivalent machines. Finite State Machines as Language Recognizers. (40 hrs)

Reference :

1) Liu C.L. : Elements of Discrete Mathematics (McGraw Hill)
2) Trambley J.P. and Manohar P. Discrete Mathematical Structures with Application to Computer Scince (TMH)
3) Narsing Deo : Graph Theory with Application to Engineering and Computer Science (PHI)
4) Kolamn B. and busy R.C. : Discrete Mathematical Structures for Computer Science (PHI)

BSM 5.3 (C)

Mathematical Modelling – I

The Technique of Mathematical modeling, characteristics of mathematical models, limitations of mathematical modeling.

Mathematical Modelling through ordinary differential equations :

Linear growth and decay models : Single species population models, population size, spread of scientific and technological innovation, innovation, radioactive decay, diffusion, diffusion of medicine in the blood stream.

(40 hrs)

Higher Order Linear Models :

A model for the detection of diabetes, modeling of dynamics, vibration of a mass on a sprig free and un-damped, damped forced motion, electric circuit problem.

Modelling of Epidemics :

A simple epidemic model, a susceptible – infected – susceptible (SIS) model, simple epidence model with carriers and removal model for arm race, combat model, traffic model. (40 hrs)

Reference :

1) Life Science Models, H.M. Roberts and M. Thompson, Springer Verlag, 1982.

2) Models in Applied Mathematics, Springer Veriag, 1982

3) Mathematical Modelling. J.N. Kapur, Wiley Eastern, 1988

BSM 6.1

Numerical Analysis

Errors :

Classification of errors (absolute, rounding, relative and percentage errors), Relation connecting the errors with illustrations.

Solution of non linear equations, method of successive bisection, method of false position, Newton Raphson's iterative method, the secant method.

Solution of System of Equations :

Gauss elimination method, Jacobi method, Gauss- Seidel method.

(20 hrs)

Finite Differences :

Definition and properties of Δ, ∇, E and relations between them. The n^{th} differences of a polynomial (10 hrs)

Interpolation :

Newton Gregory forwarded and backward interpolation formula, Lagrange's and Newton's interpolation formula for unequal intervals, inverse interpolation.

Numerical differentiation using forwarded and backward difference formulae – computation of first and second derivatives. (20 hrs)

Numerical Integration :

General Quadrature formula - Trapezoidal rule, Simpsons 1/3 rd and $3/8^{th}$ rules, Weddles Rule, problems thereon Solutions of initial value problem for ordinary linear first order differential equations by Picard's Taylor's, Euler's and Euler's modified method and fourth order Runge – Kutta Methods.

(20 hrs)

Difference equations :

Finite difference equations of homogeneous and non homogeneous equations of first order with constant and variable coefficients. Second order difference equation with constant coefficients and RHS is of the form x^m, a^x, $a^x V(x)$ Sin (ax), and Cos(ax). (10 hrs)

Reference :

1) Sastry S.S. : Numerical Analysis (Prentice Hall of India)

2) Shield P. : Numerical Analysis (Schaum Series)

3) P.N. Chaterjee : Numerical Analysis

4) Rajaram V. : Computer Oriented Numerical Methods (Prentice Hall of India)

5) Balaguruswamy E. : Numerical Methods (Tata McGraw Hill)

6) M.K. Jain, S.R.K. Iyangar & R.K. Jain : Numerical Methods (New Age Int)

7) H.C. Sexana : Finite Differences and Numerical Analysis

BSM 6.2

Fluid Mechanics, Statistical Analysis, Calculus of Variation and Topology

Fluid Mechanics :

Concept of Fluids, continuum hypothesis, Density, specific weight and specific volume, pressure, viscosity, surface tension, Equation of state. First law of thermodynamics, clausius inequality, second law of thermodynamics.

Eulerian and Lagrangian methods of description of fluids, Equivalence of Lagrangian and Eulerian Methods. Translation, Rotation and Deformation of fluid elements. (20 hrs)

Statistical Analysis :

Introduction :

Curve fitting (Least square method) – Fitting of straight line $y=ax+b$, second degree para bola $y=ax^2 + bx+c$ and other curves of the form $y= ab^x$, $y=ae^{bx}$, ax^b – Correlation and Regression – Correlation coefficient , regression lines and regression coefficient – probability distributions, discrete and continues probability distribution – Mean and Standard Deviation of Poisson distributions with examples – cumulative distribution function – mean and SD of exponential and normal distribution. – Standard normal distribution and normal probability curve. (30 hrs)

Calculus of variation :

Variation of a function $f=f(x, y, y')$ – variation of the corresponding functional extermal of a functional – variational problem. Euler's equation and its particular forms – Examples, standard problems like geodesics minimal surface of revolution, hanging chine – Brachistochrone problem – Isoperimetric problems. (15 hrs)

Topology :

Definition of topology, topological spaces, examples – Discrete and indiscrete topological spaces – Types of topologies, Co finite topology, countable topology, Weaker and stronger topology – Comparable and non comparable topology, examples – Intersection and union of topologies – Closed and open sets, neighborhoods. (15 hrs)

Reference :

1) Viscous Fluid Dynamics : J.L. Bansal (Oxford IBH Pub. Co Pvt Ltd)
2) Fluid Dynamics : R.K. Rathy
3) Fluid Dynamics : G.K.Batchelor
4) Mathematical Statistics : Gupta and Kapoor
5) Mathematical Statistics : R.K. Gupta
6) Topology : J.N. Sharma and A.R. Vashishta
7) Topology : B.Tayagi
8) Topological Spaces : Munkers
9) Calculus of Variations : G.K. Ranganath
10) Mathematical Physics : B.D. Gupta
11) Mathematical Physics : I.W. Joshi
12) Mathematical Physics : Gupta and Rajput

BSM 6.3 (a)

Theory of Graphs - II

Connectivity :

Vertex and Edge connectivity – Separability, Whitney's Inequality $K(G) \leq \lambda(G) \leq \delta(G)$ – Menger's Theorems Statement only. Line graph and total graphs (definitions and examples)

Eulerian and Hamiltonian Graphs :

Introduction. The Konigsberg Bridge problem and traveling salesman problem.

Characterization of Eulerian Graph and properties of Hamiltonian graphs. Some applications of graphs in electric networks. (40 hrs)

Planar Graphs :

Plane and Planar graphs, Euler's formula, outer planar graphs, Kuratowski's Theorem - Other characterization of planar graphs – Crossing numbers (examples)

Colorability :

Introduction, coloring of a graph, chromatic numbers of some of the familiar graphs, Four color conjecture.

Planar graphs, definition of a planar graphs, Euler's formula and examples. (40 hrs)

Reference :

1) Robin J. Wilson : Introduction to Graph Theory, Longman (London), U.K.

2) Narsing Deo : Graph Theory and Applications (PHI), India.

3) Frank Harrary : Graph Theory, Narosa Publications

4) DSC : Graph Theory and Its Applications

5) C. Vasudev : Graph Theory with Applications, New Age International Publishers

6) V.R. Kulli : Graph Theory, Vishwa International Publications.

7) V.K. Balkrishan : Graph Theory and its applications.

8) B. Sooryanarayana and G.K. Ranganath : A Text Book Graph Theory and Its Applications (S.Chand & Co.)

BSM 6.3 (b)

Discrete Mathematics - II

Analysis of Algorithms :

The complexity of algorithms, shortest path algorithm, complexity of problems. Trackable and intrackable problems. Discrete numeric functions and generating functions. Recurrence relations and recursive algorithms : Linear recurrence relations with constant coefficients. Homogenous solutions. Particular solutions. Total solutions. Solution by the method of generating functions. (40 hrs)

Coding Theory :

Semi-graphs, monoids and groups, codes and group code, codes, coding of binary information and error detection, decoding and error correctin.

Boolean Algebra :

Lattices and Algebraic Structures. Principle of duality. Distribute and complemented lattices. Boolean lattices and Boolean Algebras. Boolean functions and expressions, Propositional calculus. Design and implementation of digital networks. Switching circuits. (40 hrs)

References :

1) Liu C.L. :Elements of Discrete Mathemagics (McGraw Hill)

2) Trambley J.. and Manohar R. : Discrete Mathematical Structures with Application to Computer Science (TMH)

3) Narsingh R\deo, Graph Theory with Application to Engineering and Computer Science (PHI)

4) Kolamn B. and Busy R.C. : Discrete Mathematical Structures for Computer Science (PHI)

BSM 6.3 (c)

Mathematical Modelling - II

Modelling through differential equations. Non leaner model : Non leaner population growth model, multi species models, age structured population model, pray-predator model, competition model, epidemic growth model and of technological innovations and infections, diseases, chemical reaction. (40 hrs)

Modelling in Dynamics :

Simple pendulum, falling body.

Mathematical modeling through difference equations, the need for falling body through difference equations, simple model, population growth model, leaner model, prey-predator model, competition model, epidemic model, non learner population growth model, an age structured model, Hardy-Weinburg Law in Genetics. (40 hrs)

Reference Books :

1) Differential Equations Models : Eds.M.Braun, C.S. Colman, A.Drew Springer Verlag, 1982
2) Discrete and System Models, W.R. Lucas, F.S.Roberts, R.M.Thra, Springer Verlag, 1982
3) Mathematical Modelling :J.N. Kapoor, Willey Eastern, 1988
4) Models in Applied Mathematics : Springer Verlag, 1982

Gulbarga University, Gulbarga
Department of Mathematics
Question Paper Pattern for B.Sc. Mathematics Subject
(Semester Scheme)

Semester – I

Paper BSM 1.1 – **Algebra and Vectors**

Section – A

Marks

Answer Any Ten of the following : 10x2=20

1- 6 Matrices

7 -8 Vector Algebra

9 -10 Number Theory

11-12 Theory of Equations

Section –B

Answer Any Four of the following : 4x5=20

1- 6 Matrices

Section –C

Answer Any Four of the following : 4x5=20

1- 2 Vector Algebra

3 – 4 Number Theory

5 – 6 Theory of Equation

Paper BSM 1.2 – **Calclus - I**

Section – A

Marks

Answer Any Ten of the following : 10x2=20

1- 2 Successive Differention

3 -7 Continuity and Differentiability

8 -12 Functions of Two and Three Variables

Section –B

Answer Any Two of the following : 2x5=10

1- 3 Successive Differention

Section –C

Answer Any Three of the following : 3x5=15

1- 2 Continuity

3 – 5 Differentiability

Section –D

Answer Any Three of the following : 3x5=15

1- 5 Functions of Two and Three Variables

Semester – II

Paper BSM 2.1 – **Algebra - II**

Section – A

Marks

Answer Any Ten of the following : 10x2=20

1- 4 Sequences

5-9 Infinite Series

10-12 Boolean Algebra

Section –B

Answer Any Two of the following : 2x5=10

1- 3 Sequences

Section –C

Answer Any Four of the following : 4x5=20

1- 6 Infinite Series

Section –D

Answer Any Two of the following : 2x5=10

1- 3 Boolean Algebra

Semester – II

Paper BSM 2.2 – **Calculus - II**

Section – A

Marks

Answer Any Ten of the following : 10x2=20

1- 3 Polar Coordinates

4-8 Theory of Plane Curves

9-12 Integrations

Section –B

Answer Any Two of the following : 2x5=10

1- 3 Polar Coordinates

Section –C

Answer Any Four of the following : 4x5=20

1- 6 Theory of Plane Curves

Section –D

Answer Any Two of the following : 2x5=10

1- 3 Integrations

Semester – III

Paper BSM 3.1 – Groups, Rings, Line and Multiple Integrals

Section – A

Marks

Answer Any Ten of the following : 10x2=20

1- 6 Groups

7-8 Rings

9-12 Line and Multiple Integrals

Section –B

Answer Any Five of the following : 5x5=25

1- 6 Groups

7 – 8 Rings

Section –C

Answer Any Three of the following : 3x5=15

1- 5 Line and Multiple Integ

Semester – III

Paper BSM 3.2 – Riemann Integration and Ordinary Differential Equations

Section – A

Marks

Answer Any Ten of the following : 10x2=20

1- 3 Riemann Integration

4-6 Ordinary Differential Equation (up to singular solutions)

7-10 Linear Differential Equations of second order with variable coefficients

11-12 Solutions by the different methods

Section –B

Answer Any Three of the following : 3x5=15

1- 5 Riemann Integration

Section –C

Answer Any Five of the following : 5x5=25

1- 2 Ordinary Differential Equations (upto singular solutions)

3-6 Linear Differential Equations (upto simultaneous differential equations)

7-8 Solutions by the different methods

Semester – IV

Paper BSM 4.1 – **Linear Algebra, Laplace Transformation**

Section – A

Marks

Answer Any Ten of the following : 10x2=20

1- 6 Linear Algebra

7-12 Laplace Transformation

Section –B

Answer Any Four of the following : 4x5=20

1- 3 Linear Algebra up to basis and dimension

4 – 6 Linear Transformation

Section –C

Answer Any Four of the following : 4x5=20

1- 3 Laplace Transformation up to unit impulsive function

4 – 6 Inverse Laplace transformation

Semester – IV

Paper BSM 4.2 – **Vector Analysis, Integrals Theorem, Fourier Series and Transformation**

Section – A

Marks

Answer Any Ten of the following : 10x2=20

1- 5 Vector Analysis

6-9 Fourier Series

10 -12 Fourier Transformation

Section –B

Answer Any Four of the following : 4x5=20

1- 5 Vector Analysis identities, curvilinear coordiantes

5– 6 Gauss, Green and Stokes Theorem & examples

Section –C

Answer Any Four of the following : 4x5=20

1- 3 Fourier Series

4 – 6 Fourier Transformation

Semester – V

Paper BSM 5.1 – **Trigonometry and Complex Analysis**

Section – A

Marks

Answer Any Ten of the following : 10x2=20

1- 3 Trigonometry

4-7 Complex Numbers, Analytical Functions, Bilinear Transformations

8-12 Mapping by Elementary Functions, Complex Integration, Series Expansions, Calculation of Residues

Section –B

Answer Any Five of the following : 5x6=30

1- 2 Trigonometry

3– 4 Complex Numbers

5 -6 Analytical Functions

7 – 8 Bilinear Transformations

Section –C

Answer Any Five of the following : 5x6=30

1- 2 Mapping by Elementary Functions

3 –4 Complex Integration

5 – 6 Series Expansion

7 – 8 Calculus of Residues

Paper BSM 5.2 – **Improper Integrals and Differential Equations**

Section – A

Marks

Answer Any Ten of the following : 10x2=20

1- 3 Improper Integrals

4 -7 Series Solutions

8 – 9 Total Differential Equation

10 –12 Partial Differential Equations

Section –B

Answer Any Five of the following : 5x6=30

1- 4 Improper Integrals

5– 8 Partial Differential Equations

Section –C

Answer Any Five of the following : 5x6=30

1- 5 Series Solutions

6 –8 Total Differential Equations

Paper BSM 5.3 – **Theory of Graphs - I**

Section – A

Marks

Answer Any Ten of the following : 10x2=20

1- 3 Graphs

4 -7 Sub graphs

8 – 10 Trees

11 –12 Cut Vertices, Bridges and Blocks

Section –B

Answer Any Five of the following : 5x6=30

1- 4 Graphs

5– 8 Sub graphs and Walks

Section –C

Answer Any Five of the following : 5x6=30

1- 5 Trees

6 –8 Matrix Represenations

Paper BSM 6.1 – **Numerical Analysis**

Section – A

Marks

Answer Any Ten of the following : 10x2=20

1- 4 Errors, Finite Differences

5 -10 Interpolation, Numerical Integration

1 – 12 Finite Difference Equations

Section –B

Answer Any Five of the following : 5x6=30

1- 3 Errors, Solution of system of equations

4– 6 Interpolation

7 – 8 Finite Differences

Section –C

Answer Any Five of the following : 5x6=30

1- 4 Numerical Integration

5 –8 Finite Difference Equations

Paper BSM 6.2 – **Topology, Mechanics, Calculus of Variations and Statistical Analysis**

Section – A

Marks

Answer Any Ten of the following : 10x2=20

1- 3 Fluid Mechanics

4 -6 Topology

7 – 9 Statistical Analysis

10 –12 Calculus of Variations

Section –B

Answer Any Four of the following : 4x6=24

1- 3 Fluid Mechanics

3– 6 Calculus of Variations

Section –C

Answer Any Six of the following : 6x6=36

1- 3 Topology

4 –9 Statistical Analysis

Paper BSM 6.3 – **Theory of Graphs - II**

Section – A

Marks

Answer Any Ten of the following : 10x2=20

1- 3 Connectivity

4 -7 Eulerian and Hamiltonian Graphs

8 –10 Planar Graphs

11 –12 Colorability

Section –B

Answer Any Five of the following : 5x6=30

1- 3 Connectivity

4– 8 Eulerian and Hamiltonian Graphs

Section –C

Answer Any Five of the following : 5x6=30

1- 4 Planar Graphs

5 –8 Colorability