विषय का नाम :– गणित

स्नातक परीक्षा 2020–2021

बी. एस–सी. भाग – I			
प्रश्न पत्र	प्रश्न पत्र का नाम	पूर्णांक	उत्तीर्णांक
प्रथम	**ALGEBRA AND TRIGONOMETRY**	50	–
द्वितीय	**CALCULUS**	50	–
तृतीय	**VECTOR ANALYSIS AND GEOMETRY**	50	–
		150	50

बी. एस–सी. भाग – II			
प्रश्न पत्र	प्रश्न पत्र का नाम	पूर्णांक	उत्तीर्णांक
प्रथम	**ADVANCED CALCULUS**	50	–
द्वितीय	**DIFFERENTIAL EQUATIONS**	50	–
तृतीय	**MECHANICS**	50	–
		150	50

बी. एस–सी. भाग – III			
प्रश्न पत्र	प्रश्न पत्र का नाम	पूर्णांक	उत्तीर्णांक
प्रथम	**ANALYSIS**	50	–
द्वितीय	**ABSTRACT ALGEBRA**	50	–
तृतीय	**Discrete Mathematics** **OR** **PROGRAMMING IN "C" AND NUMERICAL ANALYSIS**	50 Theo. 30 Prac. 20	– Theo. 10 Prac. 07
		150	50

24.11.2020 24.11.2020 24/11/2020

शासकीय जे0 योगानन्दम् छत्तीसगढ़ महाविद्यालय,
बैरन बाजार रायपुर 492001 / ☎ 0771–2427126

बी. एस–सी प्रथम वर्ष

सत्र : 2020–2021

विषय का नाम :– **(गणित)**
प्रश्न पत्र क्रमांक :– **प्रथम**
प्रश्न पत्र का नाम :– **ALGEBRA AND TRIGONOMETRY**

पूर्णांक :– ..... **50** .....

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions. All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (50)
A	05	5x3 = 15
B	05	5x7 = 35
Max. Marks		50

पाठ्यक्रम

UNIT I Elementary operations on matrices. Inverse of a matrix. Linear independence of row and column matrices, Row rank, column rank and rank of matrix, Equivalence of column and row ranks. Eigen values, Eigen vectors and the characteristic equations of a matrix. Cayley Hamiltion theorem and its use in finding inverse of a matrix.

UNIT II Applications of Matrices to a system of linear (both homogenous and non-homogenous) equations. Theorems on consistency of a system of Linear equations. Relations between the roots and coefficients of general polynomial equations in one variable, Transformation of equations. Descarte's rule of signs. Solution of cubic equations (Cardon method). Biquadratic equation.

UNIT III Mappings, Equivalence relations and partitions, Congruence modulo n.

Definition of a group with examples and simple properties. Subgroups and generation of groups. Cyclic groups Coset decomposition, Lagrange's theorem and its consequences. Fermat's and Euler's theorems. Normal subgroups. Quotient group. Permutation groups, Even and Odd permutations The alternating groups A_n. Cayley's theorem.

UNIT IV Homomorphism and Isomorphism The fundamental theorem of homomorphism. Introduction, properties and examples of Rings, subrings, integral domain and fields. Characteristic of ring and field.

TRIGONOMETRY

UNIT V De Moivre's theorem and its applications. Direct and inverse circular and hyperbolic functions. Logarithm of a complex quantity. Expansion of trigonometrical functions. Gregory's series. Summation of series.

References :-

1. I. N. Herstein, Topies in Algebra Wiles Eastern Ltd. New Delhi, 1975.
2. K. B. Datta, Matrix and Linear Algebra, Prentice Hall of India Pvt. New Delhi, 2000.
3. S. L. Loney, Plane Trigonometry Part II Macmillan and Company, London.

24.11.2020

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बी. एस–सी प्रथम वर्ष

सत्र : 2020–2021

विषय का नाम :– (गणित)
प्रश्न पत्र क्रमांक :– द्वितीय
प्रश्न पत्र का नाम :– **CALCULUS**

पूर्णांक :– ..... 50 .....

Scheme of Examination

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- Section B will consist of five long answer questions. All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (50)
A	05	5x3 = 15
B	05	5x7 = 35
Max. Marks		50

पाठ्यक्रम

UNIT I ε–δ definition of the limit of a function. Basic properties of limits. Continuous functions and classification of discontinuities. Differentiability. Successive differentiation. Leibnitz theorem. Maclaurin and Taylor series expansions.

UNIT II Asymptotes curvature, Tests for concavity and convexity. Points of inflexion. Multiple points. Tracing of curves in Cartesian and Polar coordinates.

INTEGRAL CALCULUS

UNIT III Integration of transcendental functions. Reduction formulae. Definite integrals. Quadrature. Rectification. Volumes and surfaces of solids of revolution.

ORDINARY DIFFERENTIAL EQUATIONS

UNIT IV Degree and order of a differential equation. equations reducible to the linear form. Exact differential equations. First order higher degree equations solvable for x, y, p. Clairaut's form and singular solutions. Geometrical meaning of differential equation. Orthogonal trajectories. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations.

UNIT V Linear differential equations of second order. Transformation of the equation by changing the dependent variable/the independent variable. Method of variation of parameters. Ordinary simultaneous differential equations.

References :-

1. Gorakh Prasad, Differential Calculus, Pothishala Private Ltd. Allahabad.
2. Gorakh Prasad, Integral Calculus, Pothishala Private Ltd. Allahabad.
3. D. A. Murray Introductory Course in Differential Equations, Orient Longman (India), 1976.

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बी. एस–सी प्रथम वर्ष

सत्र : 2020–2021

विषय का नाम :– (गणित)
प्रश्न पत्र क्रमांक :– तृतीय
प्रश्न पत्र का नाम :– **VECTOR ANALYSIS AND GEOMETRY**

पूर्णांक :– ..... 50 .....

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions. All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (50)
A	05	5x3 = 15
B	05	5x7 = 35
Max. Marks		50

पाठ्यक्रम

UNIT I Scalar and vector product of three vectors. Product of four vectors. Reciprocal vectors. Vector differentiation. Gradient, divergence and Curl.

UNIT II Vector integration. Theorems of Gauss, Green, Stokes and problems based on these.

GEOMETRY

UNIT III General equation of second degree. Tracing of conices. System of conices. Confocal conices. Polar equation of a conic.

UNIT IV Sphere, Cone, Cylinder.

UNIT V Central conicoids. Paraboloids. Plane sections of Conicoids. Generating lines. Confocal conicoids, Reduction of Second degree equations.

References :-

1. N. Saran and S. N. Nigam, Introduction to Vactor Analysis, Pothishala Pvt. Ltd. Allahabad
2. Gorakh Prasad, and H. C. Gupt, Text Book on Coordinate Geometry Pothishala Pvt Ltd. Allahabad
3. R. J. T. Bill, Elementary Treatise on Coordinate Geometry of three dimensions, Machmillan India Ltd. 1994.

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बी. एस–सी द्वितीय वर्ष
सत्र : 2020–2021

विषय का नाम :– **(गणित)**
प्रश्न पत्र क्रमांक :– **प्रथम**
प्रश्न पत्र का नाम :– **ADVANCED CALCULUS**

पूर्णांक :– ..... **50** .....

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions. All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (50)
A	05	5x3 = 15
B	05	5x7 = 35
Max. Marks		50

पाठ्यक्रम

UNIT I Definition of sequence. Theorems of limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion. Series of non-negative terms. Comparison tests. Cauchy's integral test. Ratio tests. Raabe's, Logarithmic, de-Morgan and Bertrands' tests. Alternating series. Leibnitz's theorem. Absolute and conditional convergence.

UNIT II Continuity. Sequential continuity. Properties of continuous functions. Uniform continuity. Chain rule of differentiability. Mean value theorems and their geometrical interpretatiions. Darboux's intermediate value theorem for derivatives. Taylor's theorem with various forms of remainders.

UNIT III Limit and continuity of functions of two variables. Partial differentiation. Change of variables. Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables. Jacobians.

UNIT IV Envelopes. Evolutes. Maxima, minima and saddle points of functions of two variables. Lagrange's multiplier method..

UNIT V Beta and Gamma functions. Double and triple integrals. Dirichlet's integrals. Change of order of integration in double integrals.

References :-

1. P. K. Jain and S. K. Kaushik, An introduction to real Analysis, S. chand & Co. New Delhi 2000.
2. Gorakh Prasad, Differential Calculus, Pothishala Private Ltd. Allahabad.
3. Gorakh Prasad, Integral Calculus, Pothishala Private Ltd. Allahabad.
4. S. C. Malik Mathematical Analysis, Wiley Eastern Ltd. New Delhi.

24.11.2020

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द्वितीय वर्ष

सत्र : 2020–2021

विषय का नाम :– **बी. एस–सी (गणित)**
प्रश्न पत्र क्रमांक :– **द्वितीय**
प्रश्न पत्र का नाम :– **DIFFERENTIAL EQUATIONS**

पूर्णांक :– ..... **50** .....

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions. All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (50)
A	05	5x3 = 15
B	05	5x7 = 35
Max. Marks		50

पाठ्यक्रम

UNIT I Series solutions of differential equations. Power series method. Bessel and Legendre function and their properties, Convergence, recurrence and generating relations. Orthogonality of functions. Sturm - Liouville problem. Orthogonality of eigen-functions. Reality of eigenvalues. Orthogonality of Bessel functions and Legendre polynomials.

UNIT II Laplace transformation - Linearity of the Laplace transformation. Existence theorem for Laplace transforms. Laplace transforms of derivatives and integrals. Shifting theorems. Differentiation and integration of transforms. Convolution theorem. Solution of integral equations and systems of differential equations using the Laplace transformation.

UNIT III Partial differential equations of the first order. Lagrange's solution. Some special types of equations which can be solved easily by methods other than the general method. Charpit's general method of solution.

UNIT IV Partial differential equation of second and higher orders. Classification of linear partial differential equations of second order. Homogeneous and non-homogeneous equations with constant coefficients. Partial differential equations reducible to equations with constant coefficient. Monge's methods.

UNIT V Calculus of Variations - Variational problems with fixed boundaries, Euler's equations for functional containing first order derivatives and one independent variable. Externals. Functional dependent on higher order derivatives. Functionals dependent on more than one dependent variable. Variational problems in parametric form. Invariance of Euler's equation under coordinates transformation.

Variational problems with Moving Boundaries- Functionals dependent on one and two functions. One sides variations.

Sufficient conditions for an extremum Jacobi and Legendre conditions.

Second Variation. Variational principle of least action.

References :-

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, Inc, New York, 1999.
2. A. R. Forsyth, A Treatise on Differential Equations, Macmillan and Co. Ltd., London.
3. Lan N. Sneddon, Elements of Partial Differential Equations, McGraw-Hill Book Company, 1988.

24.11.20

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बी. एस–सी द्वितीय वर्ष

सत्र : 2020–2021

विषय का नाम :– (गणित)
प्रश्न पत्र क्रमांक :– तृतीय
प्रश्न पत्र का नाम :– **MECHANICS**

पूर्णांक :– ..... 50 .....

Scheme of Examination

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- Section B will consist of five long answer questions. All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (50)
A	05	5x3 = 15
B	05	5x7 = 35
Max. Marks		50

पाठ्यक्रम

STATICS

UNIT I Analytical conditions of Equilibrium, Stable and unstable equibrium, Virtual work Catenary.

UNIT II Forces in three dimentions, Poinsot's central axis, Null lines and planes..

DYNAMICS

UNIT III Simple harmonic motion. Elastic strings. Velocities and accelerations along radial and transverse directions. Projectile, Central orbits.

UNIT IV Kepler's law of motion. Velocities and acceleration in tangential and normal direction. Motion on smooth and rough plane curves.

UNIT V Motion in a resisting medium. Motion of particles of varying mass, motion of a particle in three dimensions. Acceleration in terms of different coordinate systems.

References :-

1. S. L. Loney, Statics, Macmillan and Company, London.
2. R. S. Verma, A Text Book on Statics, Pothishala Pvt, Ltd. Allahabad
3. S. L. Loney, An Elementry Treatise on the Dynamics of a particle and of rigid bodies, Cambridge University Press,1956.

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बी. एस–सी तृतीय वर्ष
सत्र : 2020–2021

विषय का नाम :– **(गणित)**
प्रश्न पत्र क्रमांक :– **प्रथम**
प्रश्न पत्र का नाम :– **ANALYSIS**

पूर्णांक :– ..... **50** .....

Scheme of Examination

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- Section B will consist of five long answer questions. All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (50)
A	05	5x3 = 15
B	05	5x7 = 35
Max. Marks		50

पाठ्यक्रम

REAL ANALYSIS :

UNIT I Series of arbitrary terms. Convergence, divergence and oscillation. Abel's and Dirichlet's tests. Multiplication of series. Double series. Partial derivation and Differentiability of real - valued functions of two variables. Schwartz and Young's theorem. Implicit function theorem. Fourier series. Fourier expansion of piece wise monotonic functions.

UNIT II Riemann integral. Integrability of continous and monotonic functions. The fundamental theorem of integral calculus. Mean value theorems of integral calculus. Improper integrals and their convergence. Comparison tests, Abel's and Dirichlet's tests. Frullani's integral. Integral as a function of a parameter. Continuity. Derivability and integrability of an integral of a function of a parameter.

COMPLEX ANALYSIS :

UNIT III Complex numbers as ordered pairs. Geometric representation of Complex numbers. Stereographic projection, continuity and differentiability of complex functions. Analytic functions. Cauchy- Riemann equations. Harmonic functions. Elementary functions. Mapping by elementary functions. Mobius Transforms, Fixed point cross, ratio, Inverse point and critical mapping. Conformal mapping.

UNIT IV Definition and examples of metric spaces. Neighbourhoods. Limit points. Interior points. Open and closed sets. Closure and interior. Boundary points. Sub-space of a metric space. Cauchy sequences. Completeness. Cantor's intersection theorem. Contraction principle. Construction of Real numbers and the completion of the incomplete metric space of rationals. Real numbers as a complete ordered field.

UNIT V Dense subsets. Baire Category theorem. Separable. Second countable and first countable space. Continuous functions. Extension theorem. Uniform continuity, Isometry and homeomorphism. Equivalent metrices. Compactness. Sequential compactness. Totally bounded space. Finite intersection property. Continuous functions and compact sets. Connectedness. Components. Continuous functions and connected sets.

References :-

1. S. Lang, Undergraduate Analysis, Springer-Verlag, New York, 1983.
2. Shanti Narayan, A Course of Mathematical Analysis, S. Chand & Co. New Delhi.

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बी. एस–सी तृतीय वर्ष
सत्र : 2020–2021

विषय का नाम :– (गणित)
प्रश्न पत्र क्रमांक :– द्वितीय
प्रश्न पत्र का नाम :– **ABSTRACT ALGEBRA**

पूर्णांक :– ..... 50 .....

Scheme of Examination

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- Section B will consist of five long answer questions. All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (50)
A	05	5x3 = 15
B	05	5x7 = 35
Max. Marks		50

पाठ्यक्रम

UNIT I Group - Automorphisms, inner automorphism. Automorphism groups and their computations. Conjugacy relation. Normalizer. Counting principle and the class equation of a finite group. Centre for group of prime order. Abelianzing of a group and its universal property. Sylow's theorems. Sylow sub-group. Structure theorem for finite Abelian groups.

UNIT II Ring theory-Ring homomorphism. Ideals and Quotient Rings. Field of Quotients of an Integral Domain. Euclidean Rings. Polynomial Rings. Polynomials over the Rational Field. The Einstein criterion. Polynomial Rings over Commutative Rings. Unique factorization domain R. Unique factorization domain implies so is $R(x_1, x_2 ..... x_n)$ Modules, sub-modules. Quotients modules. Homomorphism and Isomorphism Theorems.

UNIT III Definition and examples of vector spaces. Subspaces. Sum and direct sum of subspaces. Linear span. Linear dependence, independence and their basic properties. Basis. Finite dimensional vector spaces. Existence theorem for bases. Invariance of the number of elements of a basis set. Dimension. Existence of complementary subspace of a subspace of a finite dimensional vector space. Dimension of sums of subspaces. Quotient space and its dimension.

UNIT IV Linear transformations and their representation as matrices. The Algebra of linear transformations. The rank nullity theorem. Change of basis. Dual space. Bidual space and natural isomorphism. Adjoint of a linear transformation. Eigenvalues and eigenvectors of a linear transformation. Diagonalisation. Annihilator of a sub space. Bilinear, Quadratic and Hermitian forms.

UNIT V Inner Product Spaces. Cauchy Schwarz inequality. Orthogonal complements. Orthogonal sets and bases. Bessel's inequality for finite dimensional spaces. Gram-Schmidt Orthogonalization process.

References :-

1. I. N. Herstein, Topics in Algebra, Wiley Eastern Ltd. New Delhi, 1975.
2. Shanti Narayan, A Text Book of Modern Abstract Algebra, S, Chand & Co. New Delhi
3. P. B. Bhattacharya, S. K. Jain and S. R. Nagpal, Basic Abstract Algebra (2nd Edition) Cambridge University Press, Indian Edition, 1997.

24.11.20

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बी. एस–सी तृतीय वर्ष

सत्र : 2020–2021

विषय का नाम :– **(गणित)**

प्रश्न पत्र क्रमांक :– **तृतीय (वैकल्पिक– A)**

प्रश्न पत्र का नाम :– **Discrete Mathematics**

पूर्णांक :– ..... **50** .....

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
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- Section B will consist of five long answer questions. All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (50)
A	05	5x3 = 15
B	05	5x7 = 35
Max. Marks		50

पाठ्यक्रम

UNIT I Sets and Propositions - Cardinality. Mathemetical Induction. Principle of Inclusion and exclusion.

Computability and Formal Languages - Ordered sets. Languages. Phrase Structure Grammers. Types of Grammars and Languages. Permutations. Combinations and Discrete Probability.

UNIT II Relations and Functions - Binary Relations, and partitions. Partial Order Relations and Lattices. Chains and Antichains. PigeonHole principle.

Graphs and Planner Graphs - Basic Terminology. Multigraphs. Weighted Graphs. Paths and Circuits. Shortest Paths. Eulerian Paths and Circuits. Travelling Salesman Problem Planner Graphs. Trees.

UNIT III Finite State Machines - Equivalent Machines. Finite State Machines as Language Recognizers. Analysis of Algorithms - Time Complexity. Complexity of Problems. Discrete Numeric Functions and Generating Functions.

UNIT IV Recurrence Relations and Recursive Algorithms - Linear Recurrence Relations with Constant Cofficients. Homogenous Solutions. Particular Solution. Total Solution by the Method of Generating Functions. Brief Review of Groups and Rings.

UNIT V Boolean Algebras - Lattices and Algebraic Structures. Duality. Distributive and Complemented Lattices. Boolean Lattices and Boolean Algebras. Boolean Functions and Expressions. Prepositional Calculus. Design and Implementation of Digital Networks. Switching Circuits.

References :-

C. L. Liu, Elements of Discrete Mathematics, (2nd Edition), McGraw Hill International Edition, Computer Science Series, 1986.

24.11.20

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बी. एस–सी तृतीय वर्ष

सत्र : 2020–2021

विषय का नाम :– (गणित)

प्रश्न पत्र क्रमांक :– तृतीय (वैकल्पिक– B)

प्रश्न पत्र का नाम :– **PROGRAMMING IN "C" AND NUMERICAL ANALYSIS**

पूर्णांक :– ..... 30 .....

पाठ्यक्रम

Programming in C

UNIT I Programming's model of computer. Algorthims. Flow Charts. Data Type . Aritmetic and input output instructions. Decisions control Structures. Decision statements , Logical and conditional operators. Loop. Case control structures. Functions. Recursions. Preprocessors Arrays.Puppetting of strings. Structures. Pointers. File Formatting.

Numerical Analysis

UNIT II Solution of Equations: Bisection, Scant , Regula Falsi, Newton's Method, Roots of second degree polynomials.

Interpolation: Lagrange and Harmite Interpolation divided differences, Interpolation Formula using differences. Numerical. Differentiation.

Numerical Quardrature : Newton – Cote's Formulas, Gauss Quadrature Formulas. Chebychev's formulas.

UNIT III Linear Equations. Direct method for solving systems of linear equations (Gauss Elimination, LU Decomposition Cholesky Decomposition) , Iterative Methods (Jaccobi, Gauss – Seidel, Relaxation Methods)

The Algebric Eigen value problem : Jacobi's Method, Givens Method, Householder's Method, Power Method, QR Method, Lanczos Method.

UNIT IV Ordinary Differential Equations ; Euler method, singal – step methods, Runge – Kutta's method, multistep methods, Milne – Simpson Method, Methods based on Numerical Integration, Methods Based on Numerical differentiation, Boundary Value problems, Eigen value problem.**Approximation :** Different Types of Approximation, Least square polynomial approximation, polynomial approximation using orthogonal polynomial Approximation with Trigonometric Functions. Exponenetial functions Chobychev polynomials, Rational Functions.

Monte Carlo Methods

UNIT V Random number generation, Congruential generators, Statistical tests of Pseodo – random numbers. Random variate generation, inverse transform method, composition method, acceptance – rejection method, generation of exponentional, normal variates binomial and Possion variates. Monte Carlo Integration, Hil or miss Monte carlo integration, Monte carlo itegration for improper integrals, error analysis for Monte carlo integration.

References :-

1. V. Rajaraman, Programming in C, Prentices Hall of India 1994.
2. M. K. Jain, S. R. K. Lyengar, R. K. Jain Numerical Methods Problems and Solutions, New Age International (P) Ltd. 1996.

24.11.20

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बी. एस–सी तृतीय वर्ष

सत्र : 2020–2021

विषय का नाम :– (गणित)
प्रश्न पत्र क्रमांक :– .....
प्रश्न पत्र का नाम :– **PRACTICAL**

पूर्णांक :– ..... 20 .....

पाठ्यक्रम

Program for Arithmetic Operation.

Program for finding greatest of three number

Program for find roots of quadratics equation

Program for find the factorial of given number by recursion

Program for print sum of n digits of a given numbers

Program to obtain the largest and smallest numbers (Bubble Sort)

Decimal to Binary conversion

Binary to Decimal conversion

Bisection method

Newton Raphson Method

Program to print a given number in reverse

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शासकीय जे0 योगानन्दम् छत्तीसगढ़ महाविद्यालय,
बैरन बाजार रायपुर 492001 / ☎ 0771–2427126

पाठ्यक्रम रूपरेखा
एम. एस–सी (गणित)
सेमेस्टर परीक्षा
2020–2021

प्रथम सेमेस्टर						
					उत्तीर्णांक	
प्रश्न पत्र	प्रश्न पत्र का नाम	बाह्य परीक्षा के अंक	आंतरिक परीक्षा के अंक	कुल	बाह्य परीक्षा	आंतरिक परीक्षा
1	**Advanced Abstract Algebra(I)**	**80**	**20**	**100**	**16**	**04**
2	**Real Analysis (I)**	**80**	**20**	**100**	**16**	**04**
3	**Topology (I)**	**80**	**20**	**100**	**16**	**04**
4	**Complex Analysis(I)**	**80**	**20**	**100**	**16**	**04**
5	**Advanced Discrete Mathematics(I)**	**80**	**20**	**100**	**16**	**04**
6	**Aggregate**			**500**	**180**	

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शासकीय जे0 योगानन्दम् छत्तीसगढ़ महाविद्यालय,

बैरन बाजार रायपुर 492001 / ☎ 0771–2427126

एम. एस–सी. प्रथम सेमेस्टर

सत्र : 2020–2021

विषय का नाम :– **(गणित)**

प्रश्न पत्र क्रमांक :– **प्रथम**

प्रश्न पत्र का नाम :– **Advanced Abstract Algebra - I**

पूर्णांक :– **80** उत्तीर्णांक :– **16**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

UNIT-1 Groups –Normal Subnormal series. Composition series. Jordan holder Theorem, Solvable groups, Nilpotent groups

UNIT-2 Field theory, Extension fields. Algebraic and transcendental Extensions. Separable and inseparable extensions. Normal Extensions.

UNIT-3 Perfect fields .Finite fields. Primititive elements. Algbraically closed fields.

UNIT-4 Automorphisms of extensions. Galois extensions. Fundamental theorem of Galois theory.

UNIT-5 Solution of polynomial equations by radicals. Insolvability of the general equation of degree five by radicals.

Books recommended:

1. P.B.Bhattacharya,S.K.Jain, S.R. Nagpaul : Basic Abstract Algebra, Cambridge University Press
2. I.N. Herstein: Topics in Algebra, Wiley Eastern Ltd.
3. Quazi Zameeruddin and Surjeet Singh: Modern Algebra

References

1. M. Artin, Algebra, Prentice- Hall of India, 1991
2. 2 N. Jacobson,Basic Algebra, Vol. 1 , W.H . Freeman, 1980 (also published by Hindustan Publishing Company)
3. 3.P.M. Cohn, Algebra, Vols 1 , 2and 3, John Wiely and sons,1982, 1989, 1991.
4. S.Lang, Algebra, 3rd edition, Addison –wesley, 1993.
5. I. S. Luther , and I.B. S . Passi, Algebra, Vol. I-Groups, vol. II –Rings, Narosa Publishing House (vol- I 1996, Vol-II 1999)
6. D.S.Malik, J.N.Mordeson and M.K.Sen , Fundamentals of abstract Algebra, Mcgraw –Hill ,International Edition, 1997.
7. Vivek Sahai and Vikas Bist , algebra , Narosa Publishing house, 1999.
8. I.Stewart, Galois Theory, 2nd Edition, Chapman and Hall, 1989.

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एम. एस–सी. प्रथम सेमेस्टर
सत्र : 2020–2021

विषय का नाम :– **(गणित)**
प्रश्न पत्र क्रमांक :– **द्वितीय**
प्रश्न पत्र का नाम :– **Real Analysis - I**

पूर्णांक :– **80** उत्तीर्णांक :– **16**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

UNIT-1 Sequences and series of functions, pointwise and uniform convergence,Cauchy's criterion for Uniform convergence. Weierstrass M – Test Abel's and Dirichlet's tests for uniform convergence,uniform convergence and continuity, uniform convergence and Riemann- Stieltjes integration, uniform convergence and differentiation , Weierstrass approximation theorem.

UNIT-2 Power series, uniqueness theorem for Power series, Abel's and Tauber's theorem. Rearrangements of terms of a series, Riemann's theorem.

UNIT-3 Functions of several variables, linear transformations, Derivatives in an open subset of R^n, Chain rule, Partial derivatives,interchange of the order of differentiation,Derivatives of higher orders, Taylor's theorem ,Inverse function theorem ,Implicit function theorem.

UNIT-4 Jacobians, extremum problems with constraints, Lagrange's multiplier method, Differentiation of integrals.

UNIT-5 Partitions of unity, Differential forms, Stoke's theorem

Recommended books:

1. Principle of Mathematical Analysis By W. Rudin(3rd edition)McGraw-HillKogakusha,1976, International student edition
2. Real Analysis by H. L. Roydon

References:

1. T. M. Apostol, mathematical Analysis, Narosa Publishing House, New delhi,1985.
2. Gabriel klambauer, mathematical Analysis, marcel Dekkar, Inc. New York, 1975.
3. A.J White, Real Analysis , Real Analysis; an introduction,Addison-Wesley Publishing Co. Inc., 1968.
4. G.De. Barra,Measure Theory and Integration, Wiley Eastern Limited, 1981.

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शासकीय जे0 योगानन्दम् छत्तीसगढ़ महाविद्यालय,
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एम. एस–सी. प्रथम सेमेस्टर
सत्र : 2020–2021

विषय का नाम :– **(गणित)**
प्रश्न पत्र क्रमांक :– **तृतीय**
प्रश्न पत्र का नाम :– **Topology - I**

पूर्णांक :– **80** उत्तीर्णांक :– **16**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

UNIT-1 Countable and uncountable sets. Infinite sets and the Axiom of Choice. Cardinal numbers and its arithmetic. Schroeder-Bernstein theorem. Cantor's theorem and the continuum hypothesis. Zorn's lemma, well-ordering theorem.

UNIT-2 Definition and examples of topological spaces. Closed sets. Closure, dense subsets. Neighbourhoods. Interior, exterior and boundary. Accumulation points and derived sets. Bases and sub- bases. Subspaces and relative Topology. Alternate methods of defining a topology in terms of Kurtowski closure operator and Neighbourhood systems. Continous functions and homeomorphism.

UNIT-3 First and Second countable spaces. Lindelof's theorems. Separable spaces. Second countablity and Separability. Separation axioms; their characterizations and basic properties. Urysohn's lemma, Tietze extension theorem.

UNIT-4 Compactness, Continuous functions and compact sets. Basic properties of Compactness. Compactness and finite intersection property. Sequentially and countably compact sets . Local compactness and one point compactification. Stone-Cech compactification.

UNIT-5 Compactness in metric spaces. Equivalence of compactness, countable compactness and sequential compactness in metric space. Connected spaces. Connectedness on the real line . Components. Locally connected spaces.

Recommended Books:

1. James R . Munkers ,Topology, A first course , Prentice Hall of India Pvt. Ltd ., New Delhi,2000
2. K. D. Joshi.,Introduction to General Topology,Wiley Eastern Ltd,1983. Prentice Hall of India Pvt. Ltd,1983.

References:

1. J.Dugundji., Topology, Allyn and Bacon, 1966(reprinted in India by Prentice Hall of India Pvt. Ltd ., New Prentice Hall of India Pvt. Ltd ., New Delhi)
2. George F. Simmons, Introduction to Topology and Modern Analysis, Mcgraw-Hill Book Company, 1963.

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शासकीय जे0 योगानन्दम् छत्तीसगढ़ महाविद्यालय,
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एम. एस–सी. प्रथम सेमेस्टर
सत्र : 2020–2021

विषय का नाम :– **(गणित)**
प्रश्न पत्र क्रमांक :– **चतुर्थ**
प्रश्न पत्र का नाम :– **Complex Analysis - I**

पूर्णांक :– **80** उत्तीर्णांक :– **16**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

UNIT-1 Complex integration, Cauchy- Goursat Theorem.Cauchy's integral formula. Higher Order derivatives. Morera Theorem. Cauchy's inequality and Liouville's theorem. The fundamental theorem of algebra.

UNIT-2 Taylor's Theorem . Laurent's series . Isolated singularities. Meromorphic functions. Maximum modules principle. Schwarz lemma . The Argument principle. Rouche's .Inverse function theorem.

UNIT-3 Residues. Cauchy's Residue theorem .Evaluation of integrals.Branches of many valued functions with special reference to arg z, log z and z^a.

UNIT-4 Bilinear transformations , their properties and classifications. Definitions and examples of conformal mappings .

UNIT-5 Spaces of analytic functions. Hurwitz's Theorem, Montel's theorem, Riemann mapping theorem.

Recommended Books:

1. Ahlfors L.V. , Complex Analysis, Addison Wesley,1977.
2. D. Sarason, Complex Function Theory Hindustan Book Agency, Delhi, 1994.

References:

1. S. Lang, Complex Analysis ,Addison Wesley, 1977.
2. H.A. Priestly, Introduction to Complex Analysis, Clarendon Press, Oxford 1990.
3. J.B. Conway, Functions of one complex variable, Springer- Verlag , International student edition, Narosa Publishing house, 1980.
4. Liang-shin Hahn & Bernard Epstein, classical complex analysis, Jones & Berlatt Publishers. International , London, 1996.
5. Mark J. Ablowitz and A.S. Fokas, Complex Variables:Introduction and applications, Cambridge University Press, South AsianEdition, 1998.

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शासकीय जे0 योगानन्दम् छत्तीसगढ़ महाविद्यालय,

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एम. एस–सी. प्रथम सेमेस्टर

सत्र : 2020–2021

विषय का नाम :– **(गणित)**

प्रश्न पत्र क्रमांक :– **पंचम**

प्रश्न पत्र का नाम :– **Advanced Discrete Mathematics – I**

पूर्णांक :– **80** उत्तीर्णांक :– **16**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

UNIT-1 Formal logic-statements. Symbolic Representation and Tautologies. Quantifiers, Predicates and Validity. Propositional Logic.Semigroups & Monoids – Definitions and Examples of semigroups and monoids (including those pertaining to concatenation Operation).

UNIT-2 Homomorphism of semigroups and monoids. Congruence relation and quotient semigroups. Subsemigroup and submonoids. Direct products. Basic homorphism theorem.

UNIT-3 Lattices-Lattices as a partially ordered sets. Their properties . Lattices as algebraic systems. Sublattices , Direct products and Homorphisms.Some special Lattices e.g. , Complete, complimented and distributive lattices . Boolean Algebras- Boolian Algebra as Lattices. Various Boolean Identities. The switching Algebra example. Subalgebras.

UNIT-4 Direct Products and Homomorphisms. Join- Irreducible elements, Atoms and Minterms . Boolean Forms and their equivalence . Minterm Boolean Forms , Sum of products canonical Forms . Minimization of Boolean functions . Applications of Boolean Algebra to switching Theory (using AND, OR & NOT gates).The Karnaugh Map method.

UNIT-5 Grammars and Languages - Phrase- Structure Grammars. Rewriting Rules. Derivations. Sentential Forms. Language generated By a grammar. Regular, Context –free,and context sensitive Grammars and Languages. Regular sets, Regular Expressions and the Pumping lemma. Kleen's theorem. Notion of Syntax Analysis , Polish Notations. Conversion of Infix expressions to Polish Notations. The Reverse Polish Notation.

Recommended Books:

1. J.P. Tremblay & R Manohar, Discrete Mathematical Structures with Applications to Computer Science, Mc-Graw-Hill Book Co., 1997.
2. C.L.Liu , Elements of Discrete Mathematics

References:

1. J. L.Gersting, Mathematical Structures for Computer Science, (3rd , edition), Computer Science Press, New York

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शासकीय जे0 योगानन्दम् छत्तीसगढ़ महाविद्यालय,
बैरन बाजार रायपुर 492001 / ☎ 0771–2427126

पाठ्यक्रम रूपरेखा
एम. एस–सी (गणित)
सेमेस्टर परीक्षा
2020–2021

द्वितीय सेमेस्टर						
					उत्तीर्णांक	
प्रश्न पत्र	प्रश्न पत्र का नाम	बाह्य परीक्षा के अंक	आंतरिक परीक्षा के अंक	कुल	बाह्य परीक्षा	आंतरिक परीक्षा
1	**Advanced Abstract Algebra - II**	80	20	100	16	04
2	**Real Analysis - II**	80	20	100	16	04
3	**General And Algebraic Topology - II**	80	20	100	16	04
4	**Advanced Complex Analysis - II**	80	20	100	16	04
5	**Advanced Discrete Mathematics - II**	80	20	100	16	04
6	**Aggregate**			500	180	

24.11.2020

शासकीय जे0 योगानन्दम् छत्तीसगढ़ महाविद्यालय
बैरन बाजार रायपुर 492001 / ☎ 0771–2427126

एम. एस–सी. द्वितीय सेमेस्टर

सत्र : 2020–21

विषय का नाम :– **(गणित)**

प्रश्न पत्र क्रमांक :– **प्रथम**

प्रश्न पत्र का नाम :– **Advanced Abstract Algebra - II**

पूर्णांक :– **80** उत्तीर्णांक :– **16**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

UNIT-I Modules- cyclic modules, Simple modules, Semi-simple modules. Schuler's Lemma .Free modules. Noetherian and artinian modules and rings Hillbert basis Theorem.Wedderburn Artin theorem. Uniform modules, primary modules Noether-Laskar theorem.

UNIT-2 Linear Transformations- Algebra of linear transformation, characteristic roots, matrices and linear transformations.

UNIT-3 Canonical Forms –Similarity of linear transformations. Invariant subspaces. Reduction to triangular forms. Nilpotent transformations. Index of nilpotency. Invriants of nilpotent transformation. The primary decomposition theorem. Jordon blocks and Jordan forms.

UNIT-4 Smith Normal form over a principal ideal domain and rank .Fundamental structure theorem for finitely generated modules over a principle ideal domain and its applications to finitely generated abelian groups.

UNIT-5 Rational canonical form. Generalised Jorden form over any field.

Books recommended:

1. P.B.Bhattacharya,S.K.Jain, S.R. Nagpaul : Basic Abstract Algebra, Cambridge University Press
2. I.N. Herstein: Topics in Algebra, Wiley Eastern Ltd.
3. Quazi Zameeruddin and Surjeet Singh: Modern Algebra

References

1 M. Artin, Algebra, Prentice- Hall of India, 1991
2 N. Jacobson,Basic Algebra, Vol. 1 , W.H . Freeman, 1980 (also published by Hindustan Publishing Company)
3 P.M. Cohn, Algebra, Vols 1 , 2and 3, John Wiely and sons,1982, 1989, 1991.
4. S.Lang, Algebra, 3rd edition, Addison –wesley, 1993.
5. I. S. Luther , and I.B. S . Passi, Algebra, Vol. I-Groups, vol. II –Rings, Narosa Publishing House (vol- I 1996, Vol-II 1999)
6. D.S.Malik, J.N.Mordeson and M.K.Sen , Fundamentals of abstract Algebra, Mcgraw –Hill , International Edition, 1997.
7. Vivek Sahai and Vikas Bist , algebra , Narosa Publishing house, 1999.
8. I.Stewart, Galois Theory, 2nd Edition, Chapman and Hall, 1989.

शासकीय जे0 योगानन्दम् छत्तीसगढ़ महाविद्यालय
बैरन बाजार रायपुर 492001 / ☎ 0771–2427126

एम. एस–सी. द्वितीय सेमेस्टर

सत्र : 2020–21

विषय का नाम :– **(गणित)**
प्रश्न पत्र क्रमांक :– **द्वितीय**
प्रश्न पत्र का नाम :– **Real Analysis - II**

पूर्णांक :– **80** उत्तीर्णांक :– **16**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

UNIT-1 Definition and existence of Riemann- Stieltjes integral, Properties of the integral, integration and differentiation, the fundamental theorem of calculus integration of vector valued functions, Rectifiable curves.

UNIT-2 Lebesgue outer measures, Measurable sets. Regularity. Measurable functions. Borel and Lebesgue Measurability. Non- Measurable sets. Integration of non negative functions. The general integral. Integration of Series.

UNIT-3 Measure and outer measures, Extension of a measure. Uniqueness of Extension. Completion of a measure .Measure spaces. Integration with respect to a measure. Reimann and Lebesgue integrals.

UNIT-4 The four derivatives. Lebesgue Differentiation Theorem. Differetiation and integration.

UNIT-5 Functions of bounded variation. The L^p -spaces. Convex functions. Jensen's Inequality . Holder and Minkovaski Inequalities.Completeness of L^p, Convergence in measure,Almost uniform convergence .

Recommended books:

1. Principle of Mathematical Analysis By W. Rudin (3rd edition)McGraw-HillKogakusha,1976, International student edition
2. Real Analysis by H. L. Roydon

References:

1. T. M. Apostol, mathematical Analysis, Narosa Publishing House, New delhi,1985.
2. Gabriel klambauer, mathematical Analysis, marcel Dekkar, Inc. New York, 1975.
3. A.J White, Real Analysis , Real Analysis; an introduction,Addison-Wesley Publishing Co. Inc. , 1968.
4. G.De. Barra,Measure Theory and Integration, Wiley Eastern Limited, 1981.
5. P.K. Jain and V.P. Gupta, Lebesgue Measure and Integration, New age International(P) Ltd, New Delhi,1986 .

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शासकीय जे0 योगानन्दम् छत्तीसगढ़ महाविद्यालय
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एम. एस–सी. द्वितीय सेमेस्टर

सत्र : 2020–21

विषय का नाम :– (गणित)
प्रश्न पत्र क्रमांक :– तृतीय
प्रश्न पत्र का नाम :– **General And Algebraic Topology - II**
पूर्णांक :– 80 उत्तीर्णांक :– 16

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

UNIT-1 Tychonoff product topology in terms of standard sub base and its characterizations. Projection maps. Separation axioms, and product space.

UNIT-2 Product spaces.Connectedness and Product spaces. Compactness and Product spaces (Tychonoff's theorem). Countability and product spaces.

UNIT-3 Embedding and Metrization. Embedding lemma and Tychonoff embedding. The Urysohn metrization therem. Metrization theorems and Paracompactness- Local finiteness. The Nagata –Smirnov metrization. Paracompactness. The Smirnov metrization theorem.

UNIT-4 Nets and Filter. Topology and convergence of nets .Housdorffness and nets. Compactness and nets . Filters and their concergence. Canonical way of converting nets to filters and vice versa. Ultra –filters and Compactness.

UNIT-5 The fundamental group and covering spaces- Homotopy of paths. The fundamental group. Covering spaces. The fundamental group of the circle and fundamental theorem of algebra.

Recommended Books:

1. James R . Munkers ,Topology, A first course , Prentice Hall of India Pvt. Ltd ., New Delhi,2000
2 K. D. Joshi, Introduction to General Topology,Wiley Eastern Ltd,1983. Prentice Hall of India Pvt. Ltd,1983.

References:

1. J.Dugundji., Topology, Allyn and Bacon, 1966(reprinted in India by Prentice Hall of India Pvt. Ltd ., New Prentice Hall of India Pvt. Ltd ., New Delhi)
2. George F. Simmons, Introduction to Topology and Modern Analysis, Mcgraw-Hill Book Company, 1963.
3. J.L.Kelley, general Topology, Van Nostrand, Reinhold Co., New York, 1995.

24.11.2020

शासकीय जे0 योगानन्दम् छत्तीसगढ़ महाविद्यालय
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एम. एस–सी. द्वितीय सेमेस्टर

सत्र : 2020–21

विषय का नाम :– **(गणित)**
प्रश्न पत्र क्रमांक :– **चतुर्थ**
प्रश्न पत्र का नाम :– **Advanced Complex Analysis - II**
पूर्णांक :– **80** उत्तीर्णांक :– **16**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

UNIT-1 Weirestrass' s Factorization Theorem. Gamma function and its properties. Riemann Zeta function. Riemann functional equation. Runge's theorem. Mittag- Leffler's theorem.

UNIT-2 Analytic Continuation. Uniqueness of direct analytic continuation.Uniqueness of analytic continuation along a curve . Power series Method of analytic continuation Schwarz Reflection Principle. Monodromy theorem and its consequences.

UNIT-3 Harmonic functions on a disk. Harnack's inequality and theorem . Dirichlet Problem. Green's function.

UNIT-4 Canonical products. Jensen's formula . Poisson- Jensen's formula. Hadamard's three circles theorem, order of an entire function. Exponent of convergence. Borel's theorem. Hadamard's factorization theorem.

UNIT-5 The range of an analytic function. Bloch's theorem . The Little Picard Theorem.Schottky's theorem.Montel Carathedory and the Great Picard Theorem Univalent functions . Bieberbach's conjecture (statement only) and the " ¼ - theorem".

Recommended Books:

1. Ahlfors L.V. , Complex Analysis, Addison Wesley,1977.
2. D. Sarason, Complex Function Theory Hindustan Book Agency, Delhi, 1994.

References:

1. S. Lang, Complex Analysis ,Addison Wesley, 1977.
2. H.A. Priestly, Introduction to Complex Analysis, Clarendon Press, Oxford 1990.
3. J.B . Conway, Functions of one complex variable, Springer- Verlag , International student edition, Narosa Publishing house, 1980.
4. Liang-shin Hahn & Bernard Epstein, classical complex analysis, Jones & Berlatt Publishers. International , London, 1996.
5. Mark J. Ablowitz and A.S. Fokas, Complex Variables:Introduction and applications, Cambridge University Press, South AsianEdition, 1998.

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एम. एस–सी. द्वितीय सेमेस्टर

सत्र : 2020–21

विषय का नाम :– **(गणित)**

प्रश्न पत्र क्रमांक :– **पंचम**

प्रश्न पत्र का नाम :– **Advanced Discrete Mathematics - II**

पूर्णांक :– **80** उत्तीर्णांक :– **16**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

UNIT-1 Graph Theory- Definiton of (undirected) Graphs, Paths , circuits, cycles & subgraphs.Induced Subgraphs.Degree of vertex Connectivity. Planar Graphs and their properties.Trees , Euler's formula for connected planar graphs. Complete & complete Bipartite Graphs. Kuratowski's theorem(statement only) and its use.

UNIT-2 Spanning trees,cut sets,Fundamental cut –sets, and cycle. Minimal Spanning Trees and Kruskal's Algorithm. Matrix representation of graphs.Euler'sTheorem on the existence of Eulerian paths and Circuits.

UNIT-3 Directed Graphs. Indegree and outdegree of a vertex . Weighted undirected Graphs. Dijkstra's Algorithm.strong connectivity & Warshall's Algorithm. Directed Trees. Search Trees. Tree Traversals.

UNIT-4 Introductory Comutability Theory- Finite state machines and their transition table diagrams. Equivalence of finite state machines. Reduced machines . Homomorphism.

UNIT-5 Finite Automata. Acceptors. Non-deterministic Finite Automata and equivalence of its power to that of Deterministic Finite Automata .Moore and Mealy machines.Turing machine and PartialRecursive Functions.

Recommended Books:

1. J.P. Tremblay & R Manohar, Discrete Mathematical Structures with Applications to Computer Science, Mc-Graw-Hill Book Co., 1997.
2. C.L.Liu , Elements of Discrete Mathematics

References:

1. J. L.Gersting, Mathematical Structures for Computer Science, (3rd , edition), Computer Science Press, New York

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* शासकीय जे0 योगानन्दम् छत्तीसगढ़ महाविद्यालय,
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पाठ्यक्रम रूपरेखा
एम. एस–सी (गणित)
सेमेस्टर परीक्षा
2020–2021

तृतीय सेमेस्टर						
					उत्तीर्णांक	
प्रश्न पत्र	प्रश्न पत्र का नाम	बाह्य परीक्षा के अंक	आंतरिक परीक्षा के अंक	कुल	बाह्य परीक्षा	आंतरिक परीक्षा
1	INTEGRATION THEORY AND FUNCTIONAL ANALYSIS-I	80	20	100	16	04
2	PARTIAL DIFFERENTIAL EQUATION & MECHANICS - I	80	20	100	16	04
3-A	PROGRAMMING IN C (WITH ANSI FEATURES) - I	Theo 70 Pra. 30	NA	100	Theo 14 Pra. 06	NA
	OR					
3-B	THEORY OF ORDINARY DIFFERENTIAL EQUATIONS- I	80	20	100	16	04
4-A	OPERATION RESEARCH- I	80	20	100	16	04
	OR					
4-B	DIFFERENCE EQUATIONS- I	80	20	100	16	04
5-A	FUZZY SETS AND IT'S APPLICATIONS - I	80	20	100	16	04
	OR					
5-B	FLUID MECHANICS-I	50	50	100	16	4
6	Aggregate			500	180	

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एम. एस–सी तृतीय सेमेस्टर
सत्र : 2020–21

विषय का नाम :– (गणित)
प्रश्न पत्र क्रमांक :– 1

प्रश्न पत्र का नाम :– INTEGRATION THEORY AND FUNCTIONAL ANALYSIS-I
पूर्णांक :– 80 उत्तीर्णांक :– 16

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

Unit-1 Signed measure. Hahn Decomposition theorem, mutually singular measures. Radon-Nikodym theorem. Lebesgue decomposition. Riesz representation theorem. Extension theorem (caratheodory).

Unit -2 Lebesgue- Stieltjes integral, product measures, Fubini' theorem. Differentiation and Integration.Decoposition into absolutely continous and singular parts.

Unit-3 Baire set, Baire measure continous function with compact support. Regularity of measures on locally compact spaces. Integration of continous functions with compact support , Riesz-Marcoff theorem.

Functional Analysis

Unit 4 Normed linear space. Banach spaces and examples. Quotient space of normed linear spaces and its completeness, equivalent norms. Riesz Lemma, basic properties of finite dimensional normed linear spaces and compactness.

Unit-5 Weak convergence and bounded linear transformations, normed linear spaces of bounded linear transformations, dual spaces with examples.

References:

1. H.L.Royden Real Analysis, Macmillan Publishing Co. Inc. Newyork, 4th Edition. 1993.
2. P. K. Jain, O. P. Ahuja & Khalil Ahmed, : Functional Analysis, New Age International (P) Lmt. Pub. New Delhi, 1997.
3. G.D. Barra, Measure theory and Integration, Chelsea Publishing Company, New York,1981.

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एम. एस–सी तृतीय सेमेस्टर

सत्र : 2020–21

विषय का नाम :– (गणित)

प्रश्न पत्र क्रमांक :– 2

प्रश्न पत्र का नाम :– PARTIAL DIFFERENTIAL EQUATION & MECHANICS - I

पूर्णांक :– 80 उत्तीर्णांक :– 16

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

Unit-I Examples of PDE. Classification. Transport Equation-Initial value Problem. Non-homogeneous Equation. Laplace's Equation Fundamental Solution, Mean Value Formulas, Properties of Harmonic Functions, Green's Function, Energy Methods.

Unit-II **Heat Equation**- Fundamental Solution, Mean Value Formula, Properties of Solutions, Energy Methods. Wave Equation- Solution by Spherical Means, Non-homogeneous Equations, Energy Methods.

Unit-III Nonlinear First Order PDE – Complete Integrals, Envelopes, Characteristics, Hamilton Jacobi Equations (Calculus of Variations, Hamilton's ODE, Legendre Transform, Hopf-Lax Formula, Weak Solutions, Uniqueness), Conservation Laws (Shocks, Entropy Condition, Laxoleinik formula, weak solutions, Uniqueness, Reimann's Problem, Long Time Behaviour)

Mechanics

Unit-IV Motivating Problems of Calculus of Variations- Shortest Distance, Minimum surface of revolution. Brachistochrone problem, Isoperimetric Problem, Geodesic, Fundamental Lemma of Calculus of Variations, Euler's equation for one dependent function and its generalization to (i) n dependent funcations, (ii) higher order derivatives. Conditional extremum under geometric constraints and under integral constraints.

Unit-V Attraction and potential of rod, disc, spherical shells and sphere. Surface integral of normal attraction (application & Gauss' theorem). Laplace and Poisson equations. Work done by selfattracting systems. Distributions for a given potential. Equipotential surfaces. Surface and solid harmonics. Surface density in terms of surface harmonics.

Books Recommended :

1. L.C. Evans, Partial Differential Equations, Graduate Studies in Mathematics, Volume 19, AMS, 1998.
2. Partial Differential Equations by I. N. Sneddon, F. John, P. Prasad and R. Raindran, Amarnath etc.
3. Lectures in Analytical Mechanics by F. Gantmacher Mir Publishers Moscow, 1975.
4. An Elementary treatise on Statistics by S. L. Loney, A. I. T. B. S. Publishers & Distributors, 2000.

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एम. एस–सी तृतीय सेमेस्टर
सत्र : 2020–21

विषय का नाम :– (गणित)
प्रश्न पत्र क्रमांक :– 3- (A)
प्रश्न पत्र का नाम :– PROGRAMMING IN C (WITH ANSI FEATURES) - I

पूर्णांक :– 70 उत्तीर्णांक :– 14

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (70)
A	05	5x4 = 20
B	05	5x10 = 50
Max. Marks		70

पाठ्यक्रम

Unit-1 An overview of programming. Programming language. Classification. C Essential - Program Development, Function. Anatomy of a C Function. Variable and Constants. Expression. Assignment Statements. Formatting source file. Continuation Character. The pre processor.

Unit-2 Scalar Data Types - Declarations. Different Types of Integers. Different kinds of Integer Constants Floating - Point Types. Initialization . Mixing Types. Explicit Coversions-Casts. Enumeration Types. The Void Data Type. Typedefs. Finding the Address of an object. Pointers.

Unit-3 Control Flow - Conditional Branching. The Switch Statements. Looping. Nested Loops. The break and continue Statements. The goto Statement. Infinite Loops.

Unit-4 Operators and Expressions - Precedence and Associativity. Unary Plus and Minus operator. Binary Arithmatic Operator. Arithmatic Assignment Operators. Increment and Decrement Operator. Comma Operator. Relational Operators. Logical Operators. Bit-Manipulation Operator. Bitwise Assignment Operator. Size of Operator. Conditional Operators. Memory Operators.

Unit-5 **Arrays** -- Declaring an Array. Array and Memory. Initializing Arrays. Encryption and Decryption

References :

1. Peter A. Darnell and Phillip Margolis - C:A Software Engineering Approach.
2. Narosa Publishing House (Springer International Student Edition) 1993.
3. Programming in ANSI C by Balagurusamy

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एम. एस–सी तृतीय सेमेस्टर
सत्र : 2020–21

विषय का नाम :– (गणित)
प्रश्न पत्र क्रमांक :– 3-(वैकल्पिक B)
प्रश्न पत्र का नाम :– Theory of ordinary Differential Equations-(I)

पूर्णांक :– 80 उत्तीर्णांक :– 16

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

UNIT I Existence theorems for differential equations-Introduction. Auxiliary result. Existence theorems of Cauchy-Peano type. Extreme solutions of real Scalar Differential Equations. Uniqueness theorems. Existence theorems by the method of iterations.

UNIT II Applications of the contraction mapping theorem to existence theorems. Differential equations of higher order. Linear vector differential equations. Differentiability of solutions of real differential systems. Differential equations in the complex plane.

UNIT III Linear differential systems-Introduction. Adjoint vector differential equations. Adjoint n-th order differential equations. Homogeneous differential systems involving two- point boundary conditions.

UNIT IV Nonhomogeneous differential systems involving two-point boundary conditions. Adjoint differential systems. Green's matrix. Differential system involving a single n-th order linear differential equations.

UNIT V Differential systems involving an n-th order linear vector differential equation. Generalized Green's matrix. Equivalent Differential systems.

References :

1. W.T. Reid, Ordinary Differential Equations, John Wiley & Sons, NY (1971).
2. Philip Hartman, Ordinary Differential Equations, John Wiley & Sons, NY (1964).
3. E.A. Coddington and N. Levinsion, Theory Of Ordinary Differential Equations, McGraw- Hill , NY (1955).

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एम. एस–सी तृतीय सेमेस्टर
सत्र : 2020–21

विषय का नाम :– (गणित)
प्रश्न पत्र क्रमांक :– 4 (A)
प्रश्न पत्र का नाम :– **OPERATION RESEARCH- I**
पूर्णांक :– 80 उत्तीर्णांक :– 16

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

Unit-I Operations Research and its Scope. Necessity of Operations Research in Industry. Linear Programming-Simplex Method. Theory of the Simplex Method.

Unit-II Duality and Sensitivity Analysis. Other Algorithms for Linear Programming-Dual Simplex Method.

Unit-III Parametric Linear Programming. Upper Bound Technique. Interior Point Algorithm. Linear Goal Programming.

Unit-IV Transportation and Assignment Problems.

Unit-V Network Analysis-Shortest Path Problem. Minimum Spanning Tree Probiem. Maximum Flow I Problem. Minimum Cost Flow Problem. Network Simplex Method. Project Planning and Control with PERT-CPM

. Books Recommended :

1. F.S. Hillier and G.J. Ueberman. Introduction to Operations ResBareft (Sixth Edition), McGraw Hill International Edition, Industrial Engineering Series, 1995. (This book comes with a CD containing tutorial software).
2. H.A.Taha, Operations Research -An introduction, Macmillan Publishing Co., Inc., New York.
3. Kanti Swarup, P.K. Gupta and Man Mohan, Operations Research, Sultan Chand & Sons, New Delhi .
4. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, Linear Programming and Network flows, John Wiley & Sons, New York, 1990.

References

1. S.S. Rao, Optimization Theory and Applications, Wiley Eastern Ltd., New Delhi.
2. Prem Kumar Gupla and D.S. Hira, Operations Research-An Introduction. S. Cliand & Company Ltd., New Delhi.
3. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-West Press Pvt. Ltd., New Delhi,Madras
4. G. Hadley, Linear Programming, Narosa Publishing House, 1995.
5. G. Hadley, Nonlinear and Dynamic Programming, Addison-Wesley, Reading Mass.

24.11.2020

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एम. एस–सी तृतीय सेमेस्टर
सत्र : 2020–21

विषय का नाम :– **(गणित)**
प्रश्न पत्र क्रमांक :– **4 (B)**
प्रश्न पत्र का नाम :– **DIFFERENCE EQUATIONS- I**

पूर्णांक :– **80** उत्तीर्णांक :– **16**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

UNIT I Introduction, Difference Calculus-The Difference Operator, Summation, Generating functions and approximate summation.

UNIT II Linear Differential Equations-First order equations. General results for linear equations. Equation with constant coefficients.

UNIT III Applications. Equations with variable coefficients. Nonlinear equations that can be linearized. The z-transform. Stability Theory - Initial value problems for linear systems. Stability of linear systems, Stability of nonlinear systems, Chaotic behaviour.

UNIT IV Asymptotic methods-Introduction. Asymptotic analysis of sums. Linear equations. Nonlinear equations.

UNIT V The self-adjoint second order linear equation. Introduction. Sturmian Theory. Green's functions, Disconjugacy. The Ricatti Equations. Oscillation.

References :

1. Walter G. Kelley and Allan C. Peterson-Difference Equations. An Introduction with Applications. Academic Press Inc., Harcourt Brace Joranovich Publishers, 1991.

2. Calvin Ahibrandt and Allan C. Peterson. Discrete Hamiltonian Systems, Difference Equations, Continued Fractions and Riccati Equations. Kluwer,Boston,1996.

24.11.2020

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एम. एस–सी तृतीय सेमेस्टर

सत्र : 2020–21

विषय का नाम :– (गणित)

प्रश्न पत्र क्रमांक :– 5(A)

प्रश्न पत्र का नाम :– FUZZY SETS AND IT'S APPLICATIONS - I

पूर्णांक :– 80 उत्तीर्णांक :– 16

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

Unit-1 Fuzzy Set-Basic Definition, α-level sets, Convex fuzzy sets, Basic Operations on fuzzy sets. Types of fuzzy sets. Cartesian products, algebraic products. Bounded sum and difference, T-norms and T- conorms.

Unit-2 The extension principle – the Zadeh's Extension principle, image and inverse image of fuzzy sets, fuzzy numbers, elements of fuzzy arithmetic.

Unit-3 Fuzzy Relations- Fuzzy Relations on fuzzy sets, composition of fuzzy relations, Min-Max Composition and its properties.

Unit-4 Fuzzy Equivalence Relations, Fuzzy Compatibility Relations, Fuzzy Relation Equations, Fuzzy Graphs, Similarity Relations.

Unit-5 Possibility Theory, Fuzzy measures, Evidence theory, Necessity measure, Possibility Measure. Posibility Distribution, Possibility Theory and Fuzzy Sets, Possibility theory vs. Probability Theory.

Reference :

1. G.J. Klir and B. Yuan - Fuzzy Sets and Fuzzy logic, Prentice Hall of India New Delhi.
2. H.J. Zimmermann - Fuzzy Sets and Fuzzy logic, Prentice Hall of India New Delhi

24.11.2020

शासकीय जे0 योगानन्दम् छत्तीसगढ़ महाविद्यालय,
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एम. एस–सी तृतीय सेमेस्टर

सत्र : 2020–21

विषय का नाम :– (गणित)
प्रश्न पत्र क्रमांक :– 5(B)
प्रश्न पत्र का नाम :– FLUID MECHANICS-I

पूर्णांक :– 80 उत्तीर्णांक :– 16

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

UNIT I Kinematics-Lagrangian and Eulerian methods. Equation of continuity. Boundary surfaces. Stream lines. Path lines and streak lines. Velocity potential. Irrotational and rotational motions. Vortex lines.

UNIT II Equations of Motion -Langrange's and Euler's equations of motion. Bernoulli's theorem. Equation of motion by fiux method. Equations referred to moving axes. Impulsive actions. Stream function.

UNIT III Irrotational motion in two-dimensions. Complex velocity potential. Sources, sinks, doublets and their images. Conformal mapping Milne-Thomson circle theorem.

UNIT IV Two-dimentional irrotational motion produced by motion of circular, co-axial and elliptic cylinders in an infinite mass of liquid. Kinetic energy of liquid . Theorem of Blasius. Motion of a sphere through a liquid at rest at infinity. Liquid streaming past a fixed sphere. Equation of motion of a sphere. Stoke's stream function.

UNIT V Vortex motion and its elementary properties. Kelvin's proof of performance. Motions due to circular and rectilinear vortices. Wave motion in a gas. Speed of Sound. Equation of motion of a gas. Subsonic, sonic and supersonic flows of a gas. Isentropic gas flows. Flow through a nozzle. Normal and oblique shocks.

References :

1. W.H. Besaint and A.S. Ramsay, A Treatise on hydromechanics. Part II , CBS Publishers, Delhi, 1988.
2. G.K. Batchelor, An Introducyion to Fluid Mechanics, Foundation Books, New Delhi, 1994.
3. F. Chorlton, Textbook of Fiuid Dyanamics, C.B.S. Publishers, Delhi, 1985.

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शासकीय जे0 योगानन्दम् छत्तीसगढ़ महाविद्यालय,

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एम. एस–सी तृतीय सेमेस्टर

सत्र : 2020–21

विषय का नाम :– **(गणित)**

प्रश्न पत्र का नाम :– **Practical Examination (C-Programming Language)**

पूर्णांक :– **30** उत्तीर्णांक :– **06**

पाठ्यक्रम

1. WAP which reads temperature in Celsius and convert it into Fahrenheit and Fahrenheit into Celsius.
2. WAP to find largest among three numbers.
3. WAP to add two matrices.
4. WAP to find roots of quadratic equation $ax^2 + bx + c = 0$.
5. WAP to multiply two matrices.
6. WAP to read 5 digit integer and print the sum of its digits.
7. WAP to find transpose of matrix of order $m \times n$.
8. WAP to print all prime numbers which fall under 101.
9. WAP to print address of an integer, float and character.
10. WAP to print multiplication table of 1 to 10 using loop.
11. WAP to find sum of first n odd numbers.
12. WAP to illustrate use of switch statement.
13. WAP to illustrate use of goto statement.
14. WAP to illustrate use of continue and break statement.
15. WAP to illustrate use of do..while statement.
16. WAP to illustrate use of while statement.
17. WAP using pointers to compute the sum of all elements stored in an array.
18. WAP to determine and print the sum of the following harmonic series for a given value of n

$$1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\cdots+\frac{1}{n}$$

19. WAP to demonstrate sizeof operator.
20. WAP to print Fibonacci series.
21. WAP to demonstrate Bitwise operator.
22. WAP to demonstrate Bit manipulation operator.
23. WAP to print reverse of given numbers.
24. WAP to demonstrate nested loops.
25. WAP to print following pattern

```
*   *   *   *   *
*   *   *   *
*   *   *
*   *
```

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पाठ्यक्रम रूपरेखा
एम. एस–सी (गणित)
सेमेस्टर परीक्षा
2020–2021

चतुर्थ सेमेस्टर						
					उत्तीर्णांक	
प्रश्न पत्र	प्रश्न पत्र का नाम	बाह्य परीक्षा के अंक	आंतरिक परीक्षा के अंक	कुल	बाह्य परीक्षा	आंतरिक परीक्षा
1	INTEGRATION THEORY AND FUNCTIONAL ANALYSIS-II	80	20	100	16	04
2	PARTIAL DIFFERENTIAL EQUATION & MECHANICS - II	80	20	100	16	04
3-A	PROGRAMMING IN C (WITH ANSI FEATURES) - II	Theo 70 Pra. 30	NA	100	Theo 14 Pra. 06	NA
	OR					
3-B	THEORY OF ORDINARY DIFFERENTIAL EQUATIONS- II	80	20	100	16	04
4-A	OPERATION RESEARCH- II	80	20	100	16	04
	OR					
4-B	DIFFERENCE EQUATIONS- II	80	20	100	16	04
5-A	FUZZY SETS AND IT'S APPLICATIONS - II	80	20	100	16	04
	OR					
5-B	FLUID MECHANICS-II	80	20	100	16	04
6	Aggregate			500	180	

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एम. एस–सी. चतुर्थ सेमेस्टर

सत्र : 2020–21

विषय का नाम :– **(गणित)**

प्रश्न पत्र क्रमांक :– **1**

प्रश्न पत्र का नाम :– **INTEGRATION THEORY AND FUNCTIONAL ANALYSIS- II**

पूर्णांक :– **80** उत्तीर्णांक :– **16**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

Unit -1 Uniform boundedness theorem and some of its Consequences. Open mapping and closed graph theorems.

Unit-2 Hahn –Banach theorem for real linear spaces, complex linear spaces and normed linear spaces. Reflexive spaces. Weak Sequential Compactness, compact operators. solvability of Linear equations in Banach spaces,The Closed Range Theorem.

Unit-3 Inner product spaces. Hilbert spaces. Orthonormal sets. Bessel's inequality. Complete orthonormal set and Parseval's identity.

Unit-4 Structure of Hilbert spaces. Projection theorem. Riesz representation theorem. Adjoint of an operator on a Hilbert spaces. Reflexivity of Hilbert spaces.

Unit-5 Self-adjoint operators, positive, projection, normal and unitary operators. Abstract variational boundary- value problems. The generalized Lax-Miligram theorem.

References :

1. Walter Rudin, Real & Complex Analysis, Tata McGraw-Hill Publishing.
2. Edwin Hewitt and Kori Stromberg, Real and Abstract Analysis, Springer-Verlag, New York.
3. P. K. Jain, O. P. Ahuja & Khalil Ahmed, : Functional Analysis, New Age International (P) Lmt. Pub. New Delhi, 1997.
4. E. Kreyszig ; Introductary Functional Analysis with Application's , John wiley & Sons, New York 1989.
5. Edwin Hewitt and Kenneth A.Ross, Abstract Harmonic Analysis,Vol.1,Springer-Verlag,1993.

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सत्र : 2020–21

विषय का नाम :– **(गणित)**

प्रश्न पत्र क्रमांक :– **2**

प्रश्न पत्र का नाम :– **PARTIAL DIFFERENTIAL EQUATION & MECHANICS - II**

पूर्णांक :– **80** उत्तीर्णांक :– **16**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

PARTIAL DIFFERENTIAL EQUATION

Unit-I **Representation of Solutions -** Separation of Variables, Similarity Solutions (Plane and Travelling Waves, Solitons, Similarity under Scaling), Fourier and Laplace Transform, Cole-Hopf Transform, Hodograph and Legendre Transforms, Potential Functions.

Unit-II **Asymptotics-** Singular Pertubations, Laplace's Method, Geometric Optics, Stationary Phase, Homogenization. Power Series- Non-characteristric surfaces, Real Analytic Functions, Cauchy- Kovalevskaya Theorem.

Mechanics

Unit-III Generalized coordinates. Holonomic and Non-holonomic systems. Scleronomic and Rheonomic sytems. Generalized potential. Lagrange's equations of first kind. Lagrange's equations of second kind. Uniqueness of solution. Energy equation for conservative fields. Hamilton's variables. Donkin's theorem. Hamilton canonical equations.

Unit-IV Cyclic Coordinates. Routh's equations. Poisson's Bracket. Poisson's Identity. Jacobi-Poisson Theorem. Hamilton's Principle. Principle of least action. Poincare Cartan Integral invariant. Whitaker's equations. Jacobi's equations. Statement of Lee Hwa Chung's theorem.

Unit-V Hamilton-Jacobi equation. Jacobi theorem. Method of separation of variables. Lagrange Brackets and Poisson brackets, invariance of Lagrange brackets and Poisson brackets under canonical transformations.

Books Recommended :

1. L.C. Evans, Partial Differential Equations, Graduate Studies in Mathematics, Volume 19, AMS, 1998.
2. Partial Differential Equations by I. N. Sneddon, F. John, P. Prasad and R. Raindran, Amarnath etc.
3. Lectures in Analytical Mechanics by F. Gantmacher Mir Publishers Moscow, 1975.

24.11.2020

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एम. एस–सी. चतुर्थ सेमेस्टर

सत्र : 2020–21

विषय का नाम :– **(गणित)**
प्रश्न पत्र क्रमांक :– **3-(A)**
प्रश्न पत्र का नाम :– **PROGRAMMING IN C (WITH ANSI FEATURES) - II**
पूर्णांक :– **70** उत्तीर्णांक :– **14**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (70)
A	05	5x4 = 20
B	05	5x10 = 50
Max. Marks		70

पाठ्यक्रम

Unit-1 **Storage -** Classes-Fixed vs Automatic Duration. Scope Global variables. The register Specifier. ANCI rules for the syntax and Semantics of the storage-class keywords.

Unit-2 Pointer Arithmatic. Passing pointer as function arguments. Accessing Array, Elements through Pointers. Passing Arrays as Function Arguments. Sorting Algorithm Strings. Multidimensional Array. Arrays of Pointers. Pointers to Pointers.

Unit-3 Functions-Passing Arguments. Declarations and Calls. Pointers to Functions. Recursion. The main Function. Complex Declarations.The C Preprocessor-Macro Substitution. Conditional Compilation. Include Facility. Line Control

Unit-4 Structures and Unions-Structures. Dynamic Memory Allocation. Linked Lists. Unions, enum Declarations.

Unit-5 Input and Output-Streams, Buffering. The Header File. Error Handling. Opening and Closing a File. Reading and Writing Data. Selecting an I/O Method. Unbuffered I/O Random Access. The standard library for Input/Output.

Recommended Books :

1. Peter A. Darnell and Philip E. Margolis, C: A Software Engineering Approach, Narosa Publishing House (Springer International Student Edition) 1993.
2. Samuel P. Harkison and Gly L. Steele Jr., C : A Reference Manual, 2nd Edition, Prentice Hall, 1984.
3. Brian W. Kernighan & Dennis M. Ritchie, The C Programme Language, 2nd Edition (ANSI Features), Prentice Hall 1989.

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सत्र : 2020–21

विषय का नाम :– **(गणित)**
प्रश्न पत्र क्रमांक :– **3-(B)**
प्रश्न पत्र का नाम :– **THEORY OF ORDINARY DIFFERENTIAL EQUATIONS- II**
पूर्णांक :– **80** उत्तीर्णांक :– **16**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

UNIT I Differential system involving linearity a parameter-Formulation of the problem. Elementary properties of boundary value problems. Properties of the Green's matrix.

UNIT II Boundary problem involving an n-th order linear vector differential equation. Self-adjoint boundary problems. Definite boundary problems.

UNIT III Second order linear differential equations-Introduction, preliminary properties of solutions. An associated functional. The associated Riccati differential equation. Oscillation criteria. Comparison theorems.

UNIT IV Differential systems involving a real parameter. Fundamental quadratic forms for conjugate and focal points.

UNIT V Self-adjoint boundary problem associated with second order linear differential equations-Canonical forms for self-adjoint boundary problems. Extremum properties for self-adjoint system. Existence of proper values. Comparison theorems. Expansion theorems.

References :

1. W.T. Reid, Ordinary Differential Equations, John Wiley & Sons, NY (1971).
2. Philip Hartman, Ordinary Differential Equations, John Wiley & Sons, NY (1964).
3. E.A. Coddington and N. Levinsion, Theory Of Ordinary Differential Equations, McGraw- Hill , NY (1955).

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सत्र : 2020–21

विषय का नाम :– **(गणित)**

प्रश्न पत्र क्रमांक :– **4 - (A)**

प्रश्न पत्र का नाम :– **OPERATION RESEARCH – II**

पूर्णांक :– **80** उत्तीर्णांक :– **16**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

Unit-I Dynamic Programming-Deterministic and Probabilistic Dynamic programming.

Unit-II Game Theory-Two-Person, Zero-Sum Games. Games with Mixed Strategies. Graphical . Solution. Solution by Linear Programming.

Unit-III Integer Programming-Pure and Mixed Integer Programming Problem. Gomory's All IPP Method, Construction of Gomory's Constraints. Fractional cut Method- All Integer LPP. Fractional cut Method- Mixed Integer LPP. Branch and Bound Technique.

Unit-IV Queuing system: Deterministic Queuing system, probability distribution in Queuing, classification of Queuing models, Poisson Queuing System.

Unit-V Nonlinear Programming-One/and Multi-Variable Unconstrained Optimization. Kuhn-Tucker Conditions for Constrained Optimization. Quadratic Programming. Separable Programming. I Convex Programming. Non-convex Programming.

Books Recommended:

1. F.S. Hillier and G.J. Ueberman. Introduction to Operations ResBareft (Sixth Edition), McGraw Hill International Edition, Industrial Engineering Series, 1995. (This book comes with a CD containing tutorial software).
2. H.A. Taha, Operations Research -An introduction, Macmillan Publishing Co., Inc., New Yark.
3. Kanti Swarup, P.K. Gupta and Man Mohan, Operations Research, Sultan Chand & Sons, New Delhi
4. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, Linear Programming and Network flows, John Wiley & Sons, New York, 1990. References
5. S.S. Rao, Optimization Theory and Applications, Wiley Eastern Ltd., New Delhi.
6. Prem Kumar Gupla and D.S. Hira, Operations Research-An Introduction. S. Cliand & Company Ltd., New Delhi.

References

1. G. Hadley, Linear Programming, Narosa Publishing House, 1995.
2. G. Hadly, Nonlinear and Dynamic Programming, Addison-Wesley, Reading Mass.

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सत्र : 2020–21

विषय का नाम :– **(गणित)**

प्रश्न पत्र क्रमांक :– **4 - (B)**

प्रश्न पत्र का नाम :– **DIFFERENCE EQUATIONS- II**

पूर्णांक :– **80** उत्तीर्णांक :– **16**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

UNIT I The Sturm-Liouville problem-Introduction, Finite Fourier Analysis. A nonhomogeneous problem.

UNIT II Discrete Calculus of variation-Introduction. Necessary conditions. Sufficient Conditions and Disconjugacy.

UNIT III Boundary Value Problems for nonlinear equations-Introduction. The Lipschitz case.Existence of solutions. Boundary Value Problems for Differential Equations.

UNIT IV Partial Differential Equations.

UNIT V Discrelization of Partial Differential Equations. Solution of Partial Differential Equations.

References :

1. Walter G. Kelley and Allan C. Peterson-Difference Equations. An Introduction with Applications. Academic Press Inc., Harcourt Brace Joranovich Publishers, 1991.

2. Calvin Ahibrandt and Allan C. Peterson. Discrete Hamiltonian Systems, Difference Equations, Continued Fractions and Riccati Equations. Kluwer,Boston,1996.

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सत्र : 2020–21

विषय का नाम :– **(गणित)**

प्रश्न पत्र क्रमांक :– **5 - (A)**

प्रश्न पत्र का नाम :– **FUZZY SETS AND THEIR APPLICATIONS - II**

पूर्णांक :– **80** उत्तीर्णांक :– **16**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

Unit-1 Fuzzy Logic – An overview of classical logic, multivalued logics, fuzzy propositions, Fuzzy quantifiers, linguistic variables and hedges, inference from conditional fuzzy propositions- the compositional rule of inference.

Unit-2 Approximate Reasoning – An overview of fuzzy expert system, Fuzzy implications and their selection, Multiplication approximate reasoning. The role of fuzzy relation eqation.

Unit-3 An introduction to Fuzzy Control- Fuzzy Controller, Fuzzy Rule Base, Fuzzy Inference Engine, Fuzzification.

Unit-4 Defuzzification and the various defuzzification methods (The centre of area, the centre of maxima and the mean of maxima methods) , fuzzy linear programming.

Unit-5 Decision- making in fuzzy Environment – Individual decision making, multi person Decision making, multi criteria decision making, multi stage decision making, fuzzy ranking methods.

Reference :

1. G.J. Klir and B. Yuan - Fuzzy Sets and Fuzzy logic, Prentice Hall of India New Delhi.
2. H.J. Zimmermann - Fuzzy Sets and Fuzzy logic, Prentice Hall of India New Delhi

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एम. एस–सी. चतुर्थ सेमेस्टर

सत्र : 2020–21

विषय का नाम :– **(गणित)**
प्रश्न पत्र क्रमांक :– **5 - (B)**
प्रश्न पत्र का नाम :– **FLUID MECHANICS-II**

पूर्णांक :– **80** उत्तीर्णांक :– **16**

Scheme of Examination

- The Question Paper will consist of two sections, Section A and Section B.
- Section A will consist of five short answer types question (One question from each unit) from question 1 to 5 and each question will carry equal marks. Word limit 50/75 words.
- Section B will consist of five long answer questions (One question from each unit). All questions will have internal option and each question carry equal marks. Word limit 250/300 words.

Section	No. of Question	Marks (80)
A	05	5x4 = 20
B	05	5x12 = 60
Max. Marks		80

पाठ्यक्रम

UNIT I Stress components in a real fluid. Relations between rectangular components of stress. Connection between stresses and gradients of velocity.

UNIT II Navier-stock's equations of motion. Plane Poiseuille and Couette flows between two parallel plates.

UNIT III Theory of Lubrication. Flow through tubes of uniform cross section in form of circle, annulus, ellipse and equilateral triangle under constant pressure gradient. Unsteady flow over a flat plate.

UNIT IV Dynamical similarity. Buckingham p-theorem. Reynolds number. Prandts boundary layer equations in two-dimensions.

UNIT V Blasius solution. Boundary layer thickness. Displacement thickness. Karman integral conditions. Separation of boundary layer flow.

References :

1. W.H. Besaint and A.S. Ramsay, A Treatise on hydromechanics. Part II, CBS Publishers, Delhi, 1988.
2. G.K. Batchelor, An Introducyion to Fluid Mechanics, Foundation Books, New Delhi, 1994.
3. F. Chorlton, Textbook of Fiuid Dyanamics, C.B.S. Publishers, Delhi, 1985.

24.11.2020

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सत्र : 2020–21

विषय का नाम :– **(गणित)**

प्रश्न पत्र का नाम :– **Practical Examination**

पूर्णांक :– **30** उत्तीर्णांक :– **06**

पाठ्यक्रम

1. WAP using function with argument and return value to find sum, product, division and remainder.
2. WAP to illustrate use of function for return multiple values.
3. WAP that computes x raised to the power y for integers x and y by using power function.
4. WAP to using function to find maximum of n given values.
5. WAP to find factorial of positive integer n using recursive function.
6. WAP to find gcd of two positive integers.
7. WAP to illustrate use of pointer in arithmetic operations.
8. WAP using pointer to determine length of string.
9. WAP to illustrate use of pointer of pointer.
10. WAP to illustrate use of pointer in array.
11. WAP to find determinant of 3x3 order matrix.
12. WAP to find Adjoint of 3x3 order matrix.
13. WAP to demonstrate structure.
14. WAP to demonstrate structure within structure.
15. WAP to illustrate the method of sending an entire structure as a parameter to function.
16. WAP to allocate memory using malloc() function.
17. WAP to allocate memory using calloc() function.
18. WAP to illustrate use of macro with argument.
19. WAP to enter two strings and compare them.
20. WAP to short in ascending and descending order of n numbers.

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