COURSES OF STUDIES

PRIVATE EXAMINATION

Sambalpur University

MA/MSc. PART-I

2012

Mathematics

B) Partial Differential Equation   50 marks

Unit-I   Single first order partial differential equations: Meaning of Partial differential equation, Semi-linear and Quasi-linear equation in two independent variables, First order Non- linear equations in two Independent variables.

Unit-II   Linear Second Order Partial Differential Equations : Classification of Second order partial Differential equations, Diffusion Theory, Potential theory and Elliptic differential equations, The wave equations.

Unit-III   Hyperbolic Partial Differential Equations : First order Hyperbolic system, Hyperbolic system of two first order quasi-linear equations.

Books for Reference :

(1) Phoolan Prasad and Renuka Ravindra : Partial differential Equations, Viley Eastern Ltd. (2) F. John : Partial Differential Equations, Springer- Verlag, New York (3) Tyn-Myint-U : Partial Differential Equations, North Holland Publication, New York.

ELECTIVES

MSM 616   Analytic Number Theory   100 marks

The fundamental theorem of arithmetic, Arithmetical functions and Dirichlet multiplication. Averages of arithmetical functions, Some elementary theorems on the distribution of prime numbers, Wellys theorems on uniform distribution, Congrauences finite abelia groups and their characters, Dirichlet's theorems on primes

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MATHEMATICS

Paper-VI	A) Complex Analysis-II (MSM 601)	50 marks
	B) Functional Analysis (MSM 601)	50 marks
Paper-VII	A) Linear Programming (MSM 602)	50 marks
	B) Partial Differential Equation (MSM 602)	50 marks
Paper-VIII	Elective	100 marks
Paper-IX	Elective	100 marks
Paper-X	Elective	100 marks

List of Electives

MSM 616	Analytic Number Theory	100 marks
MSM 619	Linear Operator	100 marks
MSM 625	Numerical Analysis same as Applied Mathematics	100 marks
MSM 626	Stochastics Process	100 marks
MSM 627	Operation Research	100 marks
MSM 645	Graph Theory	100 marks
MSM 661	Combinatorics	100 marks

PAPER-VI

A) Complex Analysis - II

Unit-I   Harmonic functions (Definition and basic properties), The mean value property, Poisoon's formula, Functions with the mean value property, Harnack's Principle, Sub-harmonic functions.

Unit-II   Weirstrass theorem, Partial fraction and factorization, The Riemann- Beta function, The Gamma function, Entire functions (Jensen's formula, Hadamard's theorem).

Unit-III   Normal families, The Riemann-maping theorm, Elliptic functions, Picard's theorem.

Books for Reference :

(1) Lars, V. Ablfors -: Complex Analysis, McGraw Hill, (2) Conway, J.B. : Functions of one complex variable, Narosa.

B) Functional Analysis - II

Unit-I   Review of Matric spaces, L^p spaces, Inequalities in L^{p-} spaces, Completeness of L^p. Normed linear space. Inner product spaces, examples, properties of Normed linear spaces and Inner product spaces, Continuity of linear maps.

Unit-II   Hilbert spaces, Examples, Orthonormal sets, Gram-Schmidt orthonormalizations, Orthonormal polynomials, Bessel's inequality, Riesz-Fisher Theorem, Orthonormal basis, Fourier Expansion, Parseval's Formula, Projection Theorem, Riesz Representation Theorem.

Unit-III   Banach Spaces, "Hahn Banach Theroem", Baire's Category Theorem, Open mapping Theorem, Closed Graph Theorem, Uniform Bondedness Principle, Duals and transpose, dual of $L^p(a,b)$ and c(a,b), Reflexivity.

Unit-IV   Bounded Linear Operators of Banach spaces, Banach algebra, defn. Examples, spectrum of a bounded operator, Resolvant, set, Compact operators on Banach Spaces, Spectrum of a Compact Operator, Elementary ideas on integral equations, Unbounded operators and fixed point Theorems.

Books for Reference :

(1) Kreyszig : Functional Analysis, John Wiley (2) Limaye, B.V. : Functional Analysis, Narosa (3) Goffman & Pedric : A first course in Functional Analysis, Wiley Eastern (4) Bachman & Narici : Functional Analysis, Academic Press.

PAPER-VII

A)   Linear Programming   50 marks

Unit-I   Mathematical formulations of the problem, Graphical solutions, Standard form, Simplex algorithm and Revised Simplex method.

Unit-II   Duality : Primal and Dual Problems, Dual Simplex Algorithm. Post Optimal Analysis : Solvign the changed problem, changes in the cost vector, changes in the resource vector b. addition and deletion of a variable and a constraint, parametric analysis.

Unit-III   Properties of Transportation matrix, North West Corner Rule an Vogel's Approximation method, Transportation Algorithm, Assignment Problem, Travelling Salesman Problem.

Unit-IV   Network Models : Graphical Preliminaries, Minimum cost flow problem, Shortest path problem, Bellman Ford Method, Digkstra Algorithm.

Books for Reference :

(1) S. K. Gupta : Linear Programming and Network Models , 2) S. I. Gass : Linear Programming and its applications., 3) G. Hardley : Linear Programming., 4) Kanti Swarup et all : Operatios Research.

Books for Reference

(1) G. Hadely : Non·Linear and Dyanmic Programming,
(2) S.I. Gass : Linear Programming.

MSM 645   **Graph Theory**   **100 marks**

Introduction paths and circuits, Trees and fundamentals, circuits, cut, sets and out-varieties planner and dual graphs, Vector spaces of a graph. Matrix representation of graphs colouring, Covering and partitioning. Directed graphs.

The Course is covered by :

N. Deo : Graph Theory with applications to Engineering and Computer Science, Prentice Hall of India Pvt Ltd., Chapter 1 to 9.

Books for Reference :

(1) Bondy and Murty : Graph Theory and applications, McMillian (2) Boldbas : Graph Theory, Springer Verlag (3) A first course in Graph Theory - S.A. Choudhury.

MSM 661   **Combinatorics**   **100 marks**

Introductory Examples, Permutation and Combinations, The Inclusion and Exclusion Principle, Linear equations with unit coefficient, Recurrence Relation, Generating functions, Colouring problems, Probability Ramification of Binomial Theorem.

The Course is covered by :

K.D. Frayer - Introduction to Combinatorics (Chapter-1, 2, 3, 4, 5, 6, 10, 12, 13).

arithmetic progressions, periodic arithmetical functions, The Gaussame Quadriatic residues and the quadriatic reciprocity law. Primitive roots Dirichlet series and Euler products, The functions S(s) L(sx) Analytic proof of the prime number theorem portions.

The Course is covered by :

T.M. Apostol : Introduction to Analysis Number Theory, Springer, Introductional student edition, Narosa Publishing House.

Books for Reference :

(1) K. Chandrasekharam : Introduction to Analytic number Theory, Springer Verlag (2) Hardy & Wright: An Introduction to the theory of numbers 4th Ed., Oxford, Calendar Press (3) K. Chandrasekharam : Arithmatical function, Spring Varleg, (4) H. Rademacher : Topic in analytic Number theory, Springer Varlage.

MSM 619   **Linear Operato-I**   **100 marks**

Bounded Linear operators on Bilbert space, Spectral theory of compact self adjoint operators, Spectral theory of integral operators, Oscillation of Elastic strings, Operational calculus in applications, Linear operators on a Banach space, Compact operators on a Banach space.

The Course is covered by :

Basic Operatory Theory : Israll Ohberg and Seymore Goldberg, Birkhauser (Chapters- II, III, IV, V, VI, X, XI)

Books for Reference :

(1) Akhieser & Glaxman : Linear Operators in Hilbert Space, Vol.I & II, Pitman (2) Stone : Linear Transformation in Hilbert Space, American Mathematical Society (3) Dunford & Schwartz : Linear Operator, vol- I, II, III, Intern Science.

MSM 625   Numerical Analysis   100 marks

The source and propagation of errors, Root finding for nonlinear equaliars, interpolation theory, approximation of functions, Numerical integration, Numerical methods for differential equations, Linear algebra, Numerical solutions of system of linear equations.

The Course is covered by :

An Introduction to Numerical Analysis : Kendall E. Atkinsan (Chapter I-VIII) (John Willey and Sons), Numerical Methods by S. Balachandra Rao.

MSM 626   Stochastic Process   100 marks

Definitions and example of Stochastic Processes, Classification of Stochastic Processes, Markov chains: Definitions, Examples, Transition Matrix, Classifications of stattes, Recurrent Markove chains, The basic limit theorem of Markov chains, General pure Birth Processes and Poisson processes, Birth and death proesses with absorbing states, Renewal processes, Renewal equations and the elementary renewal theorem, Brownian motion, continuity of paths and the maximum variables, Discrete time branching processes, Two type branching processes, Multi type

branching processes, Stationary processes, Definitions and examples, Mean square distance, Mean square predictions, Applications of Ergodiz theory, spectral analysis of convariante stationary processes. Queing systems, General concepts, The quewing model M/M/I, Transient Behaviour of M/M/I model. The queing models M/G/I and G/M/I.

The Course is covered by :

(1) A first course in Stochastic processes : S. Karlin and H.M. Taylor (Chapter, 1,2,3, 9 excluding 3.5, 3.6), 4 (excluding4.3, 4.8). 5 (5.1, 5.2, 5.3, 5.4 only), 7 (7.1, 7.2, & 7.3 only), 8 (8.1, to 8.6 only) 9 (9.1 to 9.3, 9.6, 9.7), (2) Stochastic Processes : J. Medhi (chapters 10(10.1,10.2, 10.3 & 10.6).

MSM 627   Operation Research   100 marks

Revised simplex method, Decomposition principle, Upper bounding technique, Gomory's algorithm for Pure Integer Linear Programs, Gomory's Mixed Integer Continuous variable algorithm, Kuhntucker Optimality conditions, Convex programms and Duality, Quadratic Program, Wolfe's programms and Duality, Quadratic program, Wolfe's algorithm, Proto type primal and Dual Geometric Programms, Dynamic Programming, Game Theory.

Book Prescribed :

(1) N.S. Kambo : Mathematical Programming (Chapter6 (6.1 to 6.5). 7,8, 10 (10.1, 10.2), 12 (12.1 only), 15 (15.1 to 15.6), 16.