316 > 2 / 18/11/13 ①   Reference No. MD/1306 16-11-13

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CH. CHARAN SINGH UNIVERSITY, MEERUT

Proceedings of the Board of Studies Meeting

for

B.Sc./B.A. IIIrd year, M.Sc./M.A. and Course Work of Ph.D.(Mathematics) (16.11.2013)

A meeting of Board of Studies to approve the revised syllabi of M.Sc./M.A. Sem. III Numerical Analysis and to approve the modified syllabi (minimum common syllabi of UGC) of B.Sc./B.A. IIIrd year, was held on 16.11.2013 at 11:30 AM in the, Ch. Charan Singh University, Meerut. The following members were present:

1. Prof. Y. Vimla as Dean, Faculty of Science, C.C.S. University, Meerut (for Prof. H.S. Singh)
2. Prof. S. P. Gupta, Rtd. Principal, BSA College, Mathura (Expert)
3. Prof. (Rtd.) V. P. Kaushik, Department of Maths, Kurukshetra University, Kurukshetra (Expert)
4. Prof. R. C. Mittal, Department of Maths, IIT Roorkee (Expert)
5. Prof. R. C. Dimri, Department of Maths, HNB University, Garwal (Expert)
6. Prof. Jaimala, Head, Department of Maths, C.C.S. University, Meerut (Convener)
7. Dr. Raj Pal Singh, Department of Maths, L. R. College, Sahibabad (Convener)
8. Prof. M.K. Gupta, Department of Maths, C.C.S. University, Meerut
9. Dr. Hari Kishan, D.N. College, Meerut

Exmn Committee Cell & put up 19/11/13

- The committee reviewed the minimum unified syllabi for B.Sc./B.A. III year (Mathematics) in detail and proposed and approved the following changes to be effective from the session 2013-14:
  1. The number of papers in B.Sc/B.A-III will be three in place of four.
  2. The details of papers will be as follows

Analysis:	Paper-I	Marks- 33/65	Code- US-326
Linear Programming:	Paper-II	Marks- 33/65	Code- US-327
Numerical Methods and Fundamentals of Computers:	Paper-III	Marks- 34/70	Code- US-328

Syllabi of Above papers is enclosed herewith. ((3)-(4))

Important: The teacher should spend 75% of lectures on theory and 25% of lectures on problems. As the classes of B.Sc./B.A. III year have already been started in the colleges, the course will not suffer with the above proposed and approved changes.

- In view of the changes approved in the papers and syllabi of B.Sc./B.A. III year, the committee reviewed the syllabi for mathematics of M.Sc./M.A. and revised the syllabi of Numerical Analysis. The papers of M.Sc/M.A-IVth Sem are reshuffeled the course of Functional Analysis will be compulsory and Fuzzy Sets and its applications will be optional. The changes will be implemented from the session 2014-2015. Remaining papers and syllabus (enclosed) of M.Sc./M.A. will remain the same as before. ((5))

Continued

[signatures] 16-11-13 16-11-13 16/11/13 16-11-13

(2)

CH. CHARAN SINGH UNIVERSITY, MEERUT

Proceedings of the Board of Studies Meeting

for

B.Sc./B.A. IIIrd year, M.Sc./M.A. and Course Work of Ph.D.(Mathematics) –(16.11.2013)

- The committee also approved the syllabi of the paper of Mathematics for Course Work for Ph. D. There may be objective type question papers evaluation. However, the committee feels that it should be reviewed after each year. ((6))
- The list of experts for Ph.D course work is enclosed herewith ((7))

(Y.Vimla) (S.P. Gupta) 16/11/13 (R.C. Mittal) (V.P. Kaushik) (R.C. Dimri)

(Mridul Kumar Gupta) (Jaimala) 16.11.13 (Raj Pal Singh) (Harikishen)

Submitted for kind approval :

To :

1. The Vice Chancellor, CCS University, Meerut
2. Committee Cell, C.C.S. University, Meerut.

Registrar

Sir May kindly observe the proceedings of the Board of Studies in Maths held on 16/11/2013 in anticipation of the approval of the Acad Council which the Matter be referred to the Acad Council Meeting for approval

Submitted for Orders.

16-11-13

21/11/13

DR (Ac) / Registrar /

Hon'ble VC. Sir

B.Sc./B.A. IIIrd year

Paper code : US- 326 | Paper-I | M.M:- 33/65

ANALYSIS

Unit 1. Axiomatic study of real numbers, Completeness property in R, Archimedean property, Countable and uncountable sets, Neighbourhood, Interior points, Limit points, Open and closed sets, Derived sets, Dense sets, Perfect sets, Bolzano-Weierstrass theorem.

Unit 2. Sequences of real numbers, Subsequences, Bounded and monotonic sequences, Convergent sequences, Cauchy's theorems on limit, Cauchy sequence, Cauchy's general principle of convergence, Sequential continuity, Boundeness and intermediate value properties of continuous functions, Uniform continuity, Meaning of sign of derivative

Unit 3. Riemann integral, Integrability of continuous and monotonic functions, Fundamental theorem of integral calculus, Mean value theorems of integral calculus,
Improper integrals and their convergence, Comparison test, μ -test, Abel's test, Dirichlet's test, Integral as a function of a parameter and its differentiability and integrability.

Unit 4. Functions of a complex variable, Concepts of limit, continuity and differentiability of complex functions, Analytic functions, Cauchy Riemann equations (Cartesian and polar form), Harmonic functions, Orthogonal system, Power series as an analytic function.

Unit 5. Elementary functions, Mapping by elementary functions, Linear and bilinear transformations, Fixed points, Cross ratio, Inverse points and critical points, Conformal transformations.

Paper III(b): LINEAR PROGRAMMING

Paper code : US-327 | **Paper-II** | **M.M:- 33/65**

Unit 1. Linear programming problems, Statement and formation of general linear programming problems, Graphical method, Slack, and surplus variables, Standard and matrix forms of linear programming problem, Basic feasible solution.

Unit 2. Convex sets, Fundamental theorem of linear programming, Simplex method, Artificial variables, Big-M method, Two phase method.

Unit 3. Resolution of degeneracy, Revised simplex method, Sensitivity Analysis.

Unit 4. Duality in linear programming problems, Dual simplex method, Primal-dual method Integer programming.

Unit 5. Transportation problems, Assignment problems.
Goal Programming: Concept of goal programming, formulation and methodology for solution of goal programming.

NUMERICAL METHODS AND COMPUTER FUNDAMENTALS

Paper Code : US-328 | **Paper-III** | **M.M:- 34/70**

Unit 1. Discussion of different type of Errors,Shift operator, Forward difference ,Backward difference and Central difference operators and their relationships, Fundamental theorem of difference calculus, Divided differences,

Unit 2. Interpolation, Newton-Gregory's forward and backward interpolation formulae.
, Newton's divided difference formula, Lagrange's interpolation formula, , Formulae based on central differences : Gauss, Stirling's, Bessel's and Everett's interpolation formulae, Numerical differentiation.

Unit 3. Solution of transcendental and polynomial equations by iterative methods

bisection method, Regular-falsi method and Newton -Raphson method, Successive iteration Method

Unit 4. Basic computer organization, Computer arithmetic and Number systems: Binary, octa and hexadecimal system, Storage devices, Operating system

Unit 5. Computer software, Programming languages, Computer networking: LAN, WAN and Computer network topologies

(Y.Vimla) (S.P. Gupta) (R.C. Mittal) (V.P. Kaushik) (R.C. Dimri)

(Mridul Kumar Gupta) (Jaimala) (Raj Pal Singh) (Harikishen)

(5) To be effective w.e.f. Acad/Sess 2014-15

NUMERICAL ANALYSIS (M. Sc./ M.A.)

Unit I

Errors in computation: Floating point representation of numbers, Significant digits, Rounding and chopping a number and error due to these absolute and relative errors, Computation of errors using differentials, Errors in evaluation of some standard functions, Truncation error.

Linear equations: Gauss elimination method, LU Decomposition method, Gauss–Jordan method, Tridiagonal system, Inversion of matrix, Gauss-Jacobi, Gauss-Seidal iterative methods and their convergence

Unit II

Non-linear equations: Iterative method, Secant method, Rate of convergence of Regula-Falsi method, Newton-Raphson method, Convergence of Newton-Raphson method for simple and multiple roots, Birge-Vieta method, Bairstow's method and Graffe's root squaring method for polynomial equations.

Unit III

Numerical differentiation: Differentiation methods based on Newton's forward and backward formulae, Differentiation by central difference formula.

Numerical integration: Methodology of numerical integration, Rectangular rule, Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rules, Romberg Integration, Gauss-Legendre quadrature formula.

Unit IV

Algebraic Eigen values and Eigen vectors: Power method, Jacobi's method, Given's method, Householder's method, Approximation: Least square polynomial approximation, polynomial approximation using orthogonal polynomials, Approximation with algebraic and trigonometric functions.

Unit V

Ordinary differential equations: Initial and boundary value problems, Solutions of Initial Value Problems, Single and multistep methods, Picard's method, Taylor series method,Euler's and Modified Euler's methods, Runge-Kutta second order and fourth order methods, Milne's method, Adams-Bashforth method.

RECOMMENDED BOOKS

1. **Radhey S. Gupta**,Elements of Numerical Analysis, Macmillan India Ltd. New Delhi.
2. **M.K.Jain, S.R.K.Iyengar, R.K.Jain,** Numerical Methods for Scientific and Engineering Computations, New Age International (P) Ltd. New Delhi .
3. E.V. Krishnamurthy and S.K. Sen, Computer Based Numerical Analysis, PHI.
4. B. Bradie : A Friendly Introduction to Numerical Analysis, PEARSON.

(Y.Vimla) (S.P. Gupta) (R.C. Mittal) (V.P. Kaushik) (R.C. Dimri)

(Mridul Kumar Gupta) (Jaimala) (Raj Pal Singh) (Harikishen)

Mathematics for Course Work of Ph. D.

Unit:I - Extension fields, Algebraic and transcendental extensions, Separable extensions, Normal extensions, Perfect fields, Finite fields, Primitive elements, Algebraically closed fields, Automorphisms of extensions, Galois extensions, Fundamental theorem of Galois theory.

Canonical forms, Diagonal forms, Triangular forms, Jordan forms, Inner product spaces, Orthonormal basis, Quadratic forms, Reduction and classification of quadratic forms.

Unit:II - Sequences and series of functions, Pointwise and uniform convergence, Cauchy criterion for uniform convergence, Weierstrass M-test, Abel's and Dirichlet's tests for uniform convergence, uniform convergence and continuity, Weierstrass approximation theorem.

Complex integration, Cauchy-Goursat theorem, Cauchy's integral formula, Higher order derivatives, Morera's Theorem, Taylor's theorem. Maximum modulus principle, Laurent's series, Isolated singularities, Meromorphic functions. The arguement principle, Rouche's theorem, Residues, Cauchy's residue theorem.

Unit:III - Linear system of ordinary differential equations, Asymptotic stability, Existence and uniqueness theorems, Classification and characteristics of higher order PDe's, Canonical form, Dirichlets theorem, Neumann theorem, Conservation laws and shocks systems in one dimension: Conservation laws, Weak solution, Maximum principles for parabolic equations (i) weak maximum principle, (ii) strong maximum principle

Unit:IV - Fourier integral formula, Fourier transform, Inversion theorem for complex Fourier transform, Fourier Sine and Cosine transforms, Inversion formulae, Convolution theorem for Fourier transforms, Parseval's identity, Finite Fourier sine and Cosine transform. Inversion formulae, Applications to integral equations and boundary value problems, Z- transform, Hypergeometric functions.

Unit:V - Goal programming techniques, Nonlinear programming-one and multi-variable unconstrained optimization, Kuhn-Tucker conditions for constrained optimization, Quadratic Programming, Separable programming, Convex programming.

RECOMMENDED BOOKS

1. J. B. Fraleigh, A First Course in Abstract Algebra, Narosa Publishing House,New Delhi.
2. W. Rudin, Principles of Mathematical Analysis, (3rd edition) McGraw-Hill, Kogakusha, International Student Edition.
3. T. M. Apostol, Mathematical Analysis, Narosa Publishing, New Delhi.
4. L.V. Ahlfors, Complex Analysis, McGraw-Hill.
5. R.V. Churchill, Complex Variable and Applications, McGraw Hill.
6. G. F. Simmons: Differential Equations with Applications and Historical Notes, Second Edition, Tata Mcgraw-Hill Publishing Company Ltd. New Delhi.
7. B. Rai, D.P. Chaudhary and H.I. Freedman: A Course in Ordinary Differential Equations, Narosa Publishing House, New Delhi.
8. I.N. Sneddon: Elements of Partial Differential Equation, McGraw-Hill Book Company.
9. J. W. Brown, R.V. Churchill, Fourier Series and Boundary Value Problems, McGraw Hill Education, New Delhi.
10. F. B. Hildebrand, Method of Applied Mathematics, PHI, India.
11. H.A. Taha: Operation Research- An Introduction, Macmillan Publishing Co. Inc., NY.
12. Kanti Swarup, P.K. Gupta and Man Mohan, Operations Research, S Chand and Sons, New Delhi.
13. S.S. Rao, Optimization Theory and Applications, Wiley Eastern Ltd, New Delhi.

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