Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

B.A. (Second Year)(III & IV Semester)(Mathematics)

With effect from June-2010

B.A. (Second Year)(Third Semester)(Mathematics)

With effect from June-2010

Paper No. MAT – 301: (Number Theory)
Marks: (30 + 20)

1. <u>Divisibility Theory in the integers:</u>
The Division Algorithm, The greatest common divisor, The Euclidean algorithm, The Diophantine equation $ax + by = c$.

2. <u>Primes and their Distribution:</u>
The Fundamental Theorem of Arithmetic

3. <u>The theory of Congruences:</u>
Basic Properties of congruences, Linear congruences

4. <u>Fermat′s Theorem:</u>
Fermat′s Factorization Theorem, The little Theorem, Wilson′s Theorem.

5. <u>Number-Theoretic Functions:</u>
The functions τ and σ, The Mobius inversion formula

6. <u>Euler′s Generalization of Fermat′s Theorem:</u>
Euler′s Phi-function, Euler′s Theorem, Some properties of the Phi-function

Recommended Text Book:
David M. Burton: <u>*Elementary Number Theory:*</u> (Second Edition) – 1987
Scope: Ch. (2) : Complete
Ch. (3) : Article 3.1
Ch. (4) : Articles 4.2, 4.4
Ch. (5) : Articles 5.2, 5.3, 5.4
Ch. (6) : Articles 6.1, 6.2
Ch. (7) : Articles 7.2, 7.3, 7.4

B.A. (Second Year)(Third Semester)(Mathematics)

Paper No. MAT – 302: (Advanced Differential Equations - I)
Marks: (30 + 20)

1. <u>Special Functions</u>:

Special functions, Power series solution of differential equations, Ordinary point, Solution about Singular points, Frobenious method, Bessel′s equation, Solution of Bessel′s equation, Bessel′s functions $J_n(x)$, Recurrence Formulae, Equations reducible to Bessel′s equations, Orthogonality of Bessel′s Functions, A generating function for $J_n(x)$, Legendre′s equation, Legendre′s polynomial $P_n(x)$, Legendre′s function of second kind $Q_n(x)$, General solution of Legendre′s equation, Rodrigue′s formula, Legendre′s polynomials, A generating function of Legendre′s polynomial, Orthogonality of Legendre Polynomials, Recurrence formulae for $P_n(x)$.

2. <u>Laplace Transform</u>:

Introduction, Laplace Transform, Important formulae, Laplace transform of the derivative of $f(t)$, Laplace transform of the derivative of order n, Laplace transform of $t \cdot f(t)$, transform of $f(t)/t$, Unit step function, Second shifting theorem, Periodic functions, convolution theorem, Evaluation of integrals, Inverse Laplace transform, Multiplication by s, Division by s, First Shifting Property, Second Shifting Property, Inverse Laplace transform of Derivatives, Inverse Laplace Transform of Integrals, Partial fraction Method, Inverse Laplace transform by convolution, Solution of differential equations by Laplace Transforms, Solution of simultaneous differential equations by Laplace Transforms

Recommended Text Book:

H. K. Dass : *<u>Advanced Engineering Mathematics</u>* : S. Chand and Co. (Pvt) LTd, New Delhi – 2004

Scope: Ch. (8) : 8.1 – 8.12, 8.17, 8.17.1, 8.18 – 8.24

Ch. (13) : 13.1 – 13.12, 13.14 – 13.15, 13.17 – 13.31

B.A. (Second Year)(Fourth Semester)Mathematics)
With effect from June-2010

Paper No. MAT – 401: (Numerical Analysis)
Marks: (30 + 20)

1. Differences, Operators, Interpolation with equal intervals:

Differences, Factorial notation, The operator E, Properties of the two operators Δ and E, The operator D, Relations between the operators Δ, E and D, Interpolation with equal intervals, Newton-Gregory Formula for Forward interpolation, Newton-Gregory Formula for Backward interpolation, Equidistant terms with one or more missing terms

2. Interpolation for unequal intervals of the Arguments:

Divided differences with unequal arguments, Divided differences when two or more arguments are same or coincident, Properties of divided difference, Newton formula for unequal intervals, Lagrange′s interpolation formula for unequal intervals, Lagrange′s interpolation formula for equal intervals

3. Central Difference Interpolation Formulae:

Central difference, Notation, Operators δ, ∇, σ and μ, Gauss′s interpolation formula, Stirling′s interpolation formula, Bessel′s interpolation formula, Laplace-Everett interpolation formula

4. Inverse Interpolation:

Method of solving the problem of inverse interpolation by making use of Lagrange′s interpolation formula, Method of solving the problem of inverse interpolation by using the technique of Successive approximations or Iteration, To find the roots of an algebraic equation by inverse interpolation

5. Numerical Differentiation:

Approximate expressions for the derivative of a function, Unsymmetrical expression for the third derivative

Recommended Text Book:

H. C. Saxena : *Finite Differences and Numerical Analysis* : S. Chand and Co. (Pvt) Ltd, New Delhi

Scope: Ch. (1) : Articles 1.2, 1.3, 1.5.1, 1.5.2, 1.5.3, 1.6, 1.6.1, 1.6.2, 1.8, 1.8.1, 1.8.2, 1.8.3,
Ch. (2) : Complete
Ch. (3) : Complete
Ch. (4) : Articles 4.2, 4.2.1, 4.2.2, 4.2.3
Ch. (5) : Complete

B.A. (Second Year)(Mathematics)

Paper No. MAT – 402: (Advanced Differential Equations – II)
Marks: (30 + 20)

1. Linear Partial Differential equations of the first Order:
Solution of partial differential equations, Lagrange′s linear equation, Method of grouping, Method of multipliers

2. Non – linear Partial Differential equations of the first Order :
Introduction, Equation of the type $f(p, q) = 0$, Equations of the type $z = px + qy + f(p, q)$ Equations of the type $f(z, p, q) = 0$, Equation of the type $f(x, p) = g(y, q)$, Equations reducible to standard forms, General method of solution, Charpit′s method, Jacobi′s Method.

3. Partial Differential equations of the second Order :
Introduction, Classification of linear partial differential equations of second order, Canonical forms.

4. Linear partial Differential equations of Higher Order :

Introduction, Homogeneous linear partial differential equation with constant coefficients, Solution of partial differential equations, Complementary function, Particular integral, Exceptional case when $f(a, b) = 0$, Short method for particular integral, General method of finding particular integral, Non – homogeneous linear partial differential equations, Particular integrals, Equations reducible to the linear form when $f(D, D')$ does not have linear factors.

7. Non – linear Differential equations of the second order :
Introduction, Monge′s Method of solving $Rr + Ss + Tt = V$.

N. Ch. S. N. Iyengar: *Differential Equations* : Anmol Publications Pvt. Ltd, New Delhi (First Edition) – 2000.
Scope: Ch. (14) : 14.7, 14.8, 14.9, 14.9.1, 14.10, 14.11
Ch. (15) : 15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 15.7, 15.8, 15.9, 15.9.1
Ch. (16) : 16.1, 16.2, 16.3
Ch. (17) : 17.1, 17.2, 17.3, 17.4, 17.5, 17.6, 17.6.1, 17.7, 17.7.1, 17.8, 17.9, 17.10, 17.11, 17.12
Ch. (18) : 18.1, 18.2