B.Sc. (Second Year)(Fourth Semester)Mathematics)

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

1. <u>Differences, Operators, Interpolation with equal intervals:</u>
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. <u>Interpolation for unequal intervals of the Arguments:</u>
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. <u>Central Difference Interpolation Formulae:</u>
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. <u>Inverse Interpolation:</u>
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. <u>Numerical Differentiation:</u>
Approximate expressions for the derivative of a function, Unsymmetrical expression for the third derivative

Recommended Text Book:
H. C. Saxena : *<u>Finite Differences and Numerical Analysis</u>* : 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.Sc. (Second Year)(Mathematics)

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

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

2. <u>Non – linear Partial Differential equations of the first Order</u> :
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. <u>Partial Differential equations of the second Order</u> :
Introduction, Classification of linear partial differential equations of second order, Canonical forms.

4. <u>Linear partial Differential equations of Higher Order</u> :

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

N. Ch. S. N. Iyengar: <u>*Differential Equations*</u> : 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

B.Sc. (Second Year)(Fourth Semester)(Mathematics)

Paper No. MAT – 403 : (Mechanics – II)
Marks: (30 + 20)

1. Kinematics and dynamics of a particle in two dimensions:
Introduction, Definitions, Velocity and acceleration in terms of vector derivatives, Tangent and unit vector along the tangent, Rate of change of unit vector moving in a plane, Curvature principal normal, Tangential and normal components of velocity and acceleration, Angular speed and angular velocity, Radial and transverse components of velocity and acceleration, Areal speed and areal velocity.

2. Kinetics of a particle:
Introduction, Newton′s law of motion, Matter, Linear momentum, Angular momentum, An Impulsive force and its impulse, Conservation of linear momentum, Impact of two bodies, Work, Energy, Scalar point function, Vector point function, Field of force, Conservative field of force.

3. Motion of a projectile and motion in a resisting medium:
Rectilinear Motion, Motion under gravity, Projectile, Motion of projectile, Range on an inclined plane, Parabola of Safety, Projectile to pass through a given point, Motion in a resisting medium, Motion of a body moving under gravity and in a medium whose resistance varies as velocity.

4. Centre of Gravity:
Definitions, Areal velocity in central orbit, Differential equation of central orbit, Apses, Law of force, Pedal equation of some curves

Recommended Text Book:
V. Tulsani, T. V. Warhekar and N. N. Saste : *Mechanics and Differential Geometry:*
S. Chand and Co. (Pvt) Ltd, New Delhi (Second Edition) – 1987
Scope: Part (I): Dynamics of a Particle
Ch. (1) : Complete
Ch. (2) : Complete
Ch. (3) : Complete
Ch. (4) : Articles 4.01 to 4.10