Chain rule. Higher order partial derivatives. Euler's theorem. Maxima and minima, Lagrange's method of multipliers.

Double and triple integrals; Areas and volumes.

Scalar and vector fields. Differentiation of vector fields. Gradient, divergence and curl. Higher order derivatives; Vector identities and vector equations. Line integral, Surface integral. Green's theorem and Stokes' theorem.

(4) Metric Space & Complex Analysis:

Metric spaces. Open sets and closed sets. Cauchy sequence and convergence. Completeness. Total boundedness. Compactness. Continuity, uniform continuity. Connectedness. Separable metric spaces.

Baire category theorem. Examples: R^n, C^n, Space of real valued continuous functions on [a,b]. ℓp spaces.

Extended complex plane, stereographic projection.

Differentiability of complex functions; Cauchy-Riemann equations, Analytic functions, harmonic functions; relation between analytic and harmonic functions.

(5) Numerical Analysis and Computer programming:

Numerical Analysis: Interpolation. Newton's (forward and backward) interpolation, Lagrange's interpolation.

Solution of algebraic and transcendental equations of one variable by bisection, fixed point iteration; Regula-Falsi and Newton-Raphson methods; solution of system of linear equations by Gaussian elimination and Gauss-Seidel (iterative) methods.

Numerical integration: Trapezoidal rule, Simpson's 1/3rd rule, Gaussian quadrature formula.

Numerical solution of ordinary differential equations: Picard, Euler and Runge- Kutta method (4-th order).

Computer Programming: Positional number system, Binary, Octal, Decimal and Hexadecimal systems; Binary arithmetic, Conversion to and from decimal systems.

Algorithms and flow charts: important features, Ideas about complexities of algorithm, applications in simple problems.

Boolean algebra: Huntington postulates for Boolean algebra, algebra of sets and switching algebra as examples of Boolean algebra, duality principle, disjunctive normal and conjuctive normal forms of Boolean expressions. Design of simple switching circuit.

Programming using C.

(6) Probability & Statistics:

Probability: Classical and frequency definitions of probability. Axioms of Probability. Multiplication rule of probabilities. Conditional probability, Bayes' theorem. Independent events. Bernouli trials and binomial law.

Probability distribution. Distribution function (Discrete and continuous) of one variable: Binomial, Poisson, Gamma, Uniform and Normal. Transformation of random variables. Two dimensional probability distributions (Discrete and continuous): Uniform and normal. Transformation of random variables. Marginal and Conditional distributions. Mathematical expectation: Mean, variance, moments, central moments. skewness and kurtosis. Median, mode, quartiles. Moment-generating function. Characteristic function. Covariance, Correlation coefficient. Conditional expectation. Regression curves, least square regression lines and parabolas. Chi-square and t-distributions and their important properties. Tchebycheff's inequality. Convergence in probability. Statements of: Bernoulli's limit theorem. Law of large numbers. Statement of central limit theorem.

Statistics: Sample characteristic and their computation. Sampling distributions of the sample mean and variance. Estimation of parameters: Method of maximum likelihood. Interval estimation for parameters of normal population.

Bivariate samples. Sample correlation co-efficient. Least square regression lines and parabolas.

Statistical hypothesis. Simple and composite hypothesis. Best critical region of a test. Neyman-Pearson theorem and its application to normal population. Likelihood ratio testing and its application to normal population.

(7) Linear Programming:

Linear programming problems, Graphical method of solutions; hyperspace, convex sets, extreme points. Basic solution, basic feasible solution and optimal solution; Fundamental theorem of LPP; Simplex method; Duality.

Transportation and assignment problems.

MANAGEMENT :	
Paper – I :	**UNIT I** EVOLUTION AND GROWTH OF MANAGEMENT THOUGHT
	Concepts, Theory and Practice, The Evolution of Management Thought -- Scientific
	Management School, The Operational or Management Process approach, Behavioural School,
	Contemporary School, Recent Contributions, Patterns of Management Analysis, Managerial Roles
	approach
	UNIT II PLANNING AND ORGANISING
	Planning –Nature, Importance, Types, Process, Concept of MBO, Objectives, Policies, Procedures,
	Strategies
	Decision-Making-Approaches, Decision-Making under Certainty, Risk and Uncertainty, Group
	Decision Making Guidelines

The Nature of Organising -Types of Organisations, Organisational Levels, Process of Organising, Line/Staff Authority, Decentralisation of Authority and Delegation of Authority

UNIT III DIRECTING, COORDINATING AND CONTROLLING
Direction -- Supervision - Span of Management – Factors determining Span
Motivation -- Elements - Importance – Methods - Morale
Leadership--Theories, Approaches-Power and Authority
Coordination - Definition - Characteristics- Objectives - Principles – Techniques
Controlling --Control Process, Requirements for effective Control, Critical Control Standards and Techniques, Maintenance *vs.* Crisis Management, Overall Control Process

UNIT IV ORGANISATIONAL BEHAVIOUR
Foundations of Individual Behaviour-- Personality, Perception, Learning, Attitudes & values
Foundations of Group Behaviour--Group Process, Group Tasks, Types, Group Development
Conflict Management – Management of Change

UNIT V RECENT DEVELOPMENTS
Global Management, Managerial Functions in International Business, Business Process Reengineering, TQM-Six Sigma, Information Technology in Management, Enterprise Resource Planning (ERP); Supply Chain Management, Management of Innovation

Paper – II :	**MARKETING MANAGEMENT** Marketing Concept; Marketing Environment; Marketing Mix--4Ps *vs* 4Cs; Consumer Behaviour--Buying Process, Segmentation, Targeting, Positioning; Product—Types, Product Life Cycle; Pricing—Methods; Distribution—Channels; Promotion—Integrated Marketing Communications; Retailing—Recent Trends; Service Marketing—Features 7Ps; International Marketing—Cultural Dimension; Modes of Entry; e-marketing **FINANCIAL MANAGEMENT** Objectives; Functions; Sources of Finance; Working Capital Management; Cost of Capital; Operating and Financial Leverage; Dividend Policies; Capital Budgeting; Financial Control **HUMAN RESOURCE MANAGEMENT** Importance; difference between Personnel Management and HRM; Role of a HR Manager Human Resources Planning-Objectives-Importance-Process- Manpower Estimation-Job analysis-Job Description-Job Specification Recruitment-Sources of Recruitment-Selection Process-Placement and Induction Retention of Employees; Training and Development- Objectives and Needs-Training Process-Methods of Training-Tools and Aids-Evaluation of Training Programmes Performance Management System-Definition, Concepts, Different methods of Performance Appraisal Grievance Redressal—Concepts. Mechanisms Productivity Management—Concepts, Employee Involvement, Quality Circles, Kaizen Industrial Relations--Collective Bargaining-Settlement of Disputes **STRATEGIC MANAGEMENT** Concept, SWOT Analysis, PEST Analysis, Porter's 5 Forces Framework, BCG Matrix, GE Model; Values and Ethics; Corporate Governance; e-governance **QUANTITATIVE TECHNIQUES** Assignment; Transportation; Linear Programming (Graphical and Simplex methods); Network Analysis—PERT and CPM

MECHANICAL ENGINEERING :

Paper – I :	**Paper – I**
	Theory of machines :
	       Kinematic and dynamic analysis of planer mechanisms. General description and working principles of Belts, Cams, Gears and Gear trains. Inertia force analysis. Flywheels, Governors, Balancing of rotating masses and in-line engines. Linear vibration analysis of mechanical systems – single degree of freedom. Critical speeds and whirling of shafts.
	
	Mechanics of Solids :
	       Simple stress and strain – plane stress and plane strain, cases, Mohr's circle. Relation of elastic constants. Stress-strain relations due to uniaxial loading. Thermal stress. Bending Moment and Shear Force diagrams of beams. Bending stress and shear stress in Bending. Deflection of beams. Torsion of circular shafts. Combined stresses - thin wall pressure vessels. Struts and columns. Strain Energy concept. Theories of failure.