Department of Mathematics and Humanities

Ph.D. examination Written Test Syllabus of Mathematics, Management and English

Subject: Mathematics

Calculus: Functions of two or more variables, continuity, directional derivatives, partial derivatives, total derivative, maxima and minima, saddle point, method of Lagrange's multipliers; Double and Triple integrals and their applications to area, volume and surface area; Vector Calculus: gradient, divergence and curl, Line integrals and Surface integrals, Green's theorem, Stokes' theorem, and Gauss divergence theorem.

Linear Algebra: Finite dimensional vector spaces over real or complex fields; Linear transformations and their matrix representations, rank and nullity; systems of linear equations, characteristic polynomial, eigenvalues and eigenvectors, diagonalization, minimal polynomial, Cayley-Hamilton Theorem, Finite dimensional inner product spaces, Gram-Schmidt orthonormalization process, symmetric, skew-symmetric, Hermitian, skew-Hermitian, normal, orthogonal and unitary matrices; diagonalization by a unitary matrix, Jordan canonical form; bilinear and quadratic forms.

Real Analysis: Metric spaces, connectedness, compactness, completeness; Sequences and series of functions, uniform convergence, Ascoli-Arzela theorem; Weierstrass approximation theorem; contraction mapping principle, Power series; Differentiation of functions of several variables, Inverse and Implicit function theorems; Lebesgue measure on the real line, measurable functions; Lebesgue integral, Fatou's lemma, monotone convergence theorem, dominated convergence theorem.

Complex Analysis: Functions of a complex variable: continuity, differentiability, analytic functions, harmonic functions; Complex integration: Cauchy's integral theorem and formula; Liouville's theorem, maximum modulus principle, Morera's theorem; zeros and singularities; Power series, radius of convergence, Taylor's series and Laurent's series; Residue theorem and applications for evaluating real integrals; Rouche's theorem, Argument principle, Schwarz lemma; Conformal mappings, Mobius transformations.

Ordinary Differential equations: First order ordinary differential equations, existence and uniqueness theorems for initial value problems, linear ordinary differential equations of higher order with constant coefficients; Second order linear ordinary differential equations with variable coefficients; Cauchy-Euler equation, method of Laplace transforms for solving ordinary differential equations, series solutions (power series, Frobenius method); Legendre and Bessel functions and their orthogonal properties; Systems of linear first order ordinary differential equations, Sturm's oscillation and separation theorems, Sturm-Liouville eigenvalue problems, Planar autonomous systems of ordinary differential equations: Stability of stationary points for linear systems with constant coefficients, Linearized stability, Lyapunov functions.

Algebra: Groups, subgroups, normal subgroups, quotient groups, homomorphisms, automorphisms; cyclic groups, permutation groups, Group action, Sylow's theorems and their applications; Rings, ideals, prime and maximal ideals, quotient rings, unique factorization domains, Principle ideal domains, Euclidean domains, polynomial rings, Eisenstein's irreducibility criterion; Fields, finite fields, field extensions, algebraic extensions, algebraically closed fields

Functional Analysis: Normed linear spaces, Banach spaces, Hahn-Banach theorem, open mapping and closed graph theorems, principle of uniform boundedness; Inner-product spaces, Hilbert spaces,

orthonormal bases, projection theorem, Riesz representation theorem, spectral theorem for compact self-adjoint operators.

Numerical Analysis: Systems of linear equations: Direct methods (Gaussian elimination, LU decomposition, Cholesky factorization), Iterative methods (Gauss-Seidel and Jacobi) and their convergence for diagonally dominant coefficient matrices; Numerical solutions of nonlinear equations: bisection method, secant method, Newton-Raphson method, fixed point iteration; Interpolation: Lagrange and Newton forms of interpolating polynomial, Error in polynomial interpolation of a function; Numerical differentiation and error, Numerical integration: Trapezoidal and Simpson rules, Newton-Cotes integration formulas, composite rules, mathematical errors involved in numerical integration formulae; Numerical solution of initial value problems for ordinary differential equations: Methods of Euler, Runge-Kutta method of order 2.

Partial Differential Equations: Method of characteristics for first order linear and quasilinear partial differential equations; Second order partial differential equations in two independent variables: classification and canonical forms, method of separation of variables for Laplace equation in Cartesian and polar coordinates, heat and wave equations in one space variable; Wave equation: Cauchy problem and d'Alembert formula, domains of dependence and influence, non-homogeneous wave equation; Heat equation: Cauchy problem; Laplace and Fourier transform methods.

Topology: Basic concepts of topology, bases, subbases, subspace topology, order topology, product topology, quotient topology, metric topology, connectedness, compactness, countability and separation axioms, Urysohn's Lemma.

Linear Programming: Linear programming models, convex sets, extreme points; Basic feasible solution, graphical method, simplex method, two phase methods, revised simplex method ; Infeasible and unbounded linear programming models, alternate optima; Duality theory, weak duality and strong duality; Balanced and unbalanced transportation problems, Initial basic feasible solution of balanced transportation problems (least cost method, north-west corner rule, Vogel's approximation method); Optimal solution, modified distribution method; Solving assignment problems, Hungarian method.

Subject: Management

Unit –I

Management Concept, Process, Theories and Approaches, Management Roles and Skills

Functions–Planning,Organizing,Staffing,CoordinatingandControlling.Communication–Types, Process and Barriers.
Decision Making– Concept, Process, Techniques and Tools

Organisation Structure and Design – Types, Authority, Responsibility, Centralisation, Decentralisation and Span of Control

Managerial Economics –Concept & Importance

Demand analysis – Utility Analysis, Indifference Curve, Elasticity& Forecasting
Market Structures–Market Classification &Price Determination
National Income – Concept, Types and Measurement
Inflation – Concept, Types and Measurement Business
Ethics& CSR Ethical Issues & Dilemma Corporate
Governance Value Based Organisation

Unit–II

Organisational Behaviour –Significance &Theories

Individual Behaviour–Personality,Perception,Values,Attitude,LearningandMotivation

Group Behaviour – Team Building, Leadership, Group Dynamics
Interpersonal Behaviour & Transactional Analysis
Organizational Culture &Climate

Work Force Diversity & Cross Culture Organisational Behaviour
Emotions and Stress Management
Organisational Justice and Whistle Blowing

Human Resource Management Concept, Perspectives, Influences and Recent Trends

Human Resource Planning, Recruitment and Selection, Induction, Training and Development

Job Analysis, Job Evaluation and Compensation Management

Unit–III

Strategic Role of Human Resource Management
Competency Mapping & Balanced Scoreboard Career
Planning and Development
Performance Management and Appraisal

Organization Development, Change &OD Interventions Talent
Management &Skill Development
Employee Engagement & Work Life Balance
IndustrialRelations:Disputes&GrievanceManagement,LabourWelfareandSocialSecurity
Trade Union & Collective Bargaining
InternationalHumanResourceManagement–HRChallengeofInternationalBusiness
Green HRM

Unit–IV

AccountingPrinciplesandStandards,PreparationofFinancialStatements
FinancialStatementAnalysis–RatioAnalysis,FundsFlowandCashFlowAnalysis,DuPont Analysis
Preparation of Cost Sheet, Marginal Costing, Cost Volume Profit Analysis
Standard Costing & Variance Analysis
Financial Management, Concept & Functions
Capital Structure – Theories, Cost of Capital, Sources and Finance Budgeting and Budgetary Control, Types and Process, Zerobase Budgeting
Leverages–Operating,FinancialandCombinedLeverages,EBIT–EPSAnalysis,FinancialBreakeven Point & In difference Level.

Unit–V

Value&Returns–TimePreferenceforMoney,ValuationofBondsandShares,RiskandReturns; CapitalBudgeting–NatureofInvestment,Evaluation,ComparisonofMethods;RiskandUncertainlyAnalysis
Dividend–Theories and Determination
MergersandAcquisition–CorporateRestructuring,ValueCreation,MergerNegotiations,LeveragedBuyouts,Takeover
Portfolio Management–CAPM,APT

Derivatives–Options,OptionPayoffs,OptionPricing,ForwardContracts&Future Contracts
WorkingCapitalManagement–Determinants,Cash,Inventory,ReceivablesandPayables Management, Factoring
International Financial Management, Foreign exchange market

Unit-VI

Strategic Management–Concept, Process, Decision & Types
StrategicAnalysis–
ExternalAnalysis,PEST,Porter'sApproachtoindustryanalysis,InternalAnalysis –Resource Based Approach, Value Chain Analysis

Strategy Formulation – SWOT Analysis, Corporate Strategy – Growth, Stability, Retrenchment, Integration and Diversification, Business Portfolio Analysis - BCG,GE Business Model, Ansoff's Product Market Growth Matrix

StrategyImplementation–ChallengesofChange,DevelopingProgramsMckinsey7s Framework

Marketing–Concept,Orientation,TrendsandTasks,CustomerValueandSatisfaction

Market Segmentation, Positioning and Targeting

Product and Pricing Decision – Product Mix, Product Life Cycle, New Product development, Pricing –Types and Strategies

Place and promotion decision – Marketing channels and value networks, VMS, IMC, Advertising and Sales promotion

Unit–VII

ConsumerandIndustrialBuyingBehaviour:TheoriesandModelsofConsumerBehaviour

BrandManagement–
RoleofBrands,BrandEquity,EquityModels,DevelopingaBrandingStrategy;BrandName Decisions, Brand Extensions and Loyalty

LogisticsandSupplyChainManagement,Drivers,Valuecreation,SupplyChainDesign,Designin gandManaging Sales Force, Personal Selling

ServiceMarketing–ManagingServiceQualityandBrands,MarketingStrategiesofService Firms

Customer Relationship Marketing–Relationship Building, Strategies, Values and Process

Retail Marketing– Recent Trends in India, Types of Retail Outlets.

EmergingTrendsinMarketing–Conceptofe-
Marketing,DirectMarketing,DigitalMarketingandGreen Marketing

International Marketing–Entry Mode Decisions, Planning Marketing Mix for International Markets

Unit–VIII

StatisticsforManagement:Concept,MeasuresOfCentralTendencyandDispersion,ProbabilityD istribution–Binominal,Poison,NormalandExponential

Data Collection & Questionnaire Design
Sampling–Concept, Process and Techniques
Hypothesis Testing – Procedure; T, Z, F, Chi-square tests
Correlation and Regression Analysis
Operations Management–Role and Scope

FacilityLocationandLayout–SiteSelectionandAnalysis,Layout–DesignandProcess

Enterprise Resource Planning – ERP Modules, ERP implementation
Scheduling; Loading, Sequencing and Monitoring
QualityManagementandStatisticalQualityControl,QualityCircles,TotalQualityManagement–KAIZEN,Benchmarking,SixSigma;ISO9000SeriesStandards

Operation Research–Transportation, Queuing Decision Theory, PERT/CPM

Unit–IX

InternationalBusiness–ManagingBusinessinGlobalizationEra;TheoriesofInternationalTrade; Balance of payment

Foreign Direct Investment– Benefits and Costs

Multilateral regulation of Trade and Investment under WTO International
Trade Procedures and Documentation; EXIM
PoliciesRoleofInternationalFinancialInstitutions–IMFandWorldBank
InformationTechnology–UseofComputersinManagementApplications;MIS,DSS

Artificial Intelligence and BigData

Data Warehousing, Data Mining and Knowledge Management – Concepts
Managing Technological Change

Unit –X

EntrepreneurshipDevelopment–
Concept,Types,TheoriesandProcess,DevelopingEntrepreneurial Competencies

Intrapreneurship – Concept and Process

Women Entrepreneurship and Rural Entrepreneurship

InnovationsinBusiness–
TypesofInnovations,CreatingandIdentifyingOpportunities,ScreeningofBusiness Ideas

BusinessPlanandFeasibilityAnalysis–ConceptandProcessofTechnical,Marketand Financial Analysis

Micro and Small Scale Industries in India; Role of Government in Promoting
SSISickness in Small Industries–Reasons and Rehabilitation
InstitutionalFinancetoSmallIndustries–FinancialInstitutions,CommercialBanks,Cooperative Banks, Micro Finance.

Subject: English

Indian writing in English
Postcolonial fiction
Literary theory and criticism