

**APPROVED SYLLABUS FOR DIRECT RECRUITMENT TO THE POST OF**  
**INSPECTOR OF STATISTICS UNDER PLANNING & PROGRAMME**  
**IMPLEMENTATION DEPARTMENT**

PAPER	SUBJECT	MARKS ALLOTTED
Paper – I (Conventional type question)	General English including Essay & Precis writing	150
Paper-II	Group A – General Mathematics	50
	Group B – General Knowledge	50
Paper- III	Elective (Degree Level) Commerce /Economics/Mathematics/Statistics	100

**Detailed syllabus for Paper-III**

**COMMERCE**

**Unit I: Financial Accounting – 10 marks**

Depreciation: Meaning, factors affecting depreciation; Methods of providing depreciation - Straight line method - Diminishing balance method; (Theory & Numericals).

Final Accounts of Sole Proprietary Firm: Concept, need, advantages, Preparation of Trading, Profit & Loss A/c and Balance Sheet (Theory & Numericals).

Cash Flow Statement and Funds Flow Statement: Meaning, Cash Flow vs Fund Flow, preparation of Cash Flow Statement and Fund Flow Statement (Theory & Numericals).

**Unit II: Corporate Accounting – 10 marks**

Shares : Issue, Forfeiture and Reissue of Equity Shares including pro - rata allotment (Theory & Numericals).

Valuation of Goodwill: Meaning; Factors affecting value of Goodwill; Need for valuation of Goodwill; Methods: Average Profit Method, Super Profits Method, Capitalization Method. (Theory & Numericals).

Preparation of Financial Statements of Companies: Preparation of Financial Statements of Corporate Entities (excluding computation of managerial remuneration, corporate dividend tax) (Theory & Numericals)

**Unit III: Business Economics – 10 marks**

The Law of Demand; Exceptions to the Law of Demand; Demand Forecasting: Methods; Indifference Curve: Meaning, properties.

Law of diminishing marginal utility: Basic Concept.

Cost concepts: Accounting costs and economic costs, opportunity cost, Relationship between AC and MC.

Market: Different market structures and their characteristics; Perfect competition; Monopolistic and Monopoly.



#### **Unit IV: Business Statistics – 10 marks**

Introduction: Meaning, Scope and Limitations; its relationship with other sciences; Statistics as a subject; Descriptive Statistics - compared to Inferential Statistics. (Theory), Presentation of Univariate Data: Construction of a frequency distribution; Concept of central tendency and dispersion and their measures. (Theory)

Probability: Theory, Concepts; Simple application of addition and multiplication theorem. (Theory), Correlation and Simple Linear regression. (Theory)

Index Number: Meaning, types and uses; Methods of constructing price and quantity indices (simple and aggregate). Analysis of Time Series: Causes of variations in time series data; Components of a time series. (Theory)

#### **Unit V: Banking & Insurance – 10 marks**

Origin and evolution of Banking in India, Meaning and definition of Banking, Types of Banks, Modern Banking Services, Functions of Banks, Deposits, Types of deposits, Deployment of Advances.

Central Banking: Meaning, functions and role, RBI monetary and credit control policy, Commercial

Banks: Meaning, Functions & Role, Co-operative Banks: Meaning & Role, Banking Documents: Concept of Cheque, Passbook, Demand Draft.

Introduction to Insurance, Meaning, Evolution & importance; Understanding Risk, Principles of Insurance, Insurance contracts; ULIP, Underwriting. Life Insurance: Fundamental & Classification, General Insurance.

#### **Unit VI: Income Tax – 10 marks**

Introduction: The Income Tax Act 1961, Basic concepts: Agricultural income, Assessee, Assessment year, Previous year, Income, Person, Gross total income, Total Income, Charge of Income Tax.

Heads of income (theory); Computation of Income under the head salary (Theory & Numericals).

Computation of Income from house property (Theory & Numericals).

#### **Unit VII : Auditing And Corporate Governance – 10 marks**

Auditing: Meaning, objectives, basic principles and techniques: Classification of Audit, Audit Planning, Internal control – Internal check and Internal Audit.

Audit of Limited Companies: Company Auditor – Qualifications and disqualifications, Appointment, Rights and Duties, Contents and Types of Auditor's Report

Corporate Social Responsibility (CSR): Meaning, Environmental Aspects of CSR, CSR provision under the Companies Act 2013.

#### **Unit VIII : Management Accounting – 10 marks**

Meaning and objectives of management accounting; Difference between financial accounting, cost accounting and management accounting;

Marginal Costing - Meaning & importance of Marginal Costing; Cost-Volume-Profit analysis, Break even analysis (including problems).

Ratio Analysis: Meaning, classification of ratios - liquidity ratios, turnover ratios, solvency ratios, debt-equity ratios; (including problems).

#### **Unit IX : Indian Financial System – 10 marks**

An overview of Indian Financial System: Structure of Indian Financial system and its impact on economic development.





Money market: Meaning and characteristics of money market. Money market instruments- (a) Call money market, (b) Treasury bills market, (c) Commercial bills market, (d) Commercial Papers Market, (e) Mutual Fund.

Capital market: Nature, Security market- (a) new issue market: Instruments- Debentures, Bonds, Preference shares, Equity shares. Secondary market-(b) Meaning functions and role of stock exchange, concept of depository system, Investors and types of speculators.

#### **Unit X: Functional Areas Of Business – 10 marks**

Financial Management: Meaning, objectives, Sources of short and long term finance; Debt vs Equity; Finance function: Capital Budgeting, Capital structure, Dividend policy, Working Capital Management (Theory)

Human Resource Management: Meaning,; HRM functions: Human Resource Planning, Selection, Training & Development, Compensation; Employer-Employee Relation, Grievances handling and redressal of industrial disputes.

Marketing Management: Meaning, scope and importance; Marketing Mix : Product, Pricing, Promotion Decisions.

### **ECONOMICS**

#### **Unit – I: Micro Economics – 10 marks**

Definition, nature and scope of economics; Demand and supply-concept and determinants; Laws of demand and supply; Role of price mechanism.

Consumer behavior: Utility- Cardinal and Ordinal approaches; Concept of consumer's equilibrium. Concept and measurement of Elasticity of Demand-Price. Indifference Curves and Budget line; Giffen's Paradox. Engel's curve. Consumer's surplus.

Theory of Production and Costs: Concept of production function; Isoquants, Isocost Line - Producer's Equilibrium; Law of variable proportion and Law of returns to scale. Concept of Expansion path.

Market structure: Meaning, features and equilibrium (short run and long run) under Perfect competition and monopoly; Price-discrimination. Meaning and features of Duopoly; Monopsony. Oligopoly and monopolistic competition.

#### **Unit – II: Macro Economics – 10 marks**

National Income and Social Accounts: Concepts and measurement of National Income; Circular flow of income with closed and open economy.

Output and Employment: Say's law of markets and the Classical theory of employment; Keynes' objection to the classical theory;

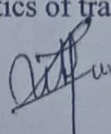
Consumption Function: Meaning of Consumption function; Average and Marginal propensity to consume; The relationship between consumption and income, the income multiplier.

Investment and Saving: Concept of Marginal Efficiency of Capital (MEC), Marginal Efficiency of Investment (MEI).

#### **Unit – III: Money & Banking – 10 marks**

Banking: Meaning, types and functions of Commercial Banks; Instruments of credit control by Central Bank.: RBI - Power and Functions.

Trade Cycles: Meaning, nature and characteristics of trade cycle.





Inflation: Meaning of Inflation, Deflation, Reflation and Stagflation; Demand-pull inflation and Cost-push inflation; Causes and effects of inflation; Measures to control inflation; Philip's curve.

#### **Unit – IV: Indian Economy – 10 marks**

Indian economy Structure of the Indian Economy: Basic features; Characteristics of under-development; Role of the state; Issues of sustainable development; Natural resources - Land, water and forest resources.

Population and Development: Broad Demographic features - Population size and growth rates, sex composition; rural urban migration, occupational distribution; Problem of over-population; Population policy.

Agriculture: Trends in agricultural production and productivity; Factors determining productivity; Land reforms; New agricultural strategy and Green Revolution; Rural credit; Agricultural marketing. Minimum Support price

#### **Unit – V: Public Finance – 10 marks**

Nature and Scope of Public Finance: Taxation - Sources of public revenue; Taxation - Meaning, Canons and classification of taxes; Impact and incidence of taxes; Taxable capacity; characteristics of a good tax system; Major trends in tax revenue of the central and state governments in India, GS

Budget and Public Debt: Sources of public borrowing; methods of debt redemption; Growth of India's Public debt.

Public Budget and Financial Administration: The public budget - Kinds of budget, Zero-based Budgeting; Role of Finance Commission in India.

#### **Unit – VI: Economic Development & Planning – 10 marks**

Basic Concept of Economic Development: Economic Growth and economic development; indicators of economic growth and development – GNP per capita, PQLI and HDI.

Planning in India: Objectives; strategies; Composition and role of National Institution for Transforming India (NITI) Aayog.

Development Planning in India: Concept of Economic Planning; Types of Planning – Centralised and Decentralised planning, Financial and Physical Planning, Perspective and Annual planning.

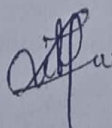
#### **Unit – VII: Environmental Economics – 10 marks**

Introduction to Environmental Economics: Economy and environment inter-linkages; Economic Efficiency and Market Failures: Market solutions and efficiency; Problem of externalities; Public Goods – Environment as a public good; Public goods and public bads.

Sustainable Development and Valuation of Environment: Meaning, Objectives and Indicator of Sustainable Development. Environmental Impact Assessment. Global Environment Issues: Climate Change – implications and mitigations.

#### **Unit – VIII: Financial Institutions And Markets – 10 marks**

Financial Markets: Meaning and structure of Financial Markets – money market and capital market; Concept and functions of stock market and market for gilt-edged securities; Types of regulated and unregulated credit markets.





Foreign Exchange Markets: Foreign exchange; Foreign exchange market; Foreign exchange rate-concept of spot exchange rates and forward exchange rates; Determination of exchange rates under fixed and flexible exchange rate regimes.

#### **Unit – IX: International Trade – 10 marks**

Balance of Trade and Balance of Payments: Concepts and components of balance of trade and balance of payments; Equilibrium and disequilibrium in balance of payments; Various measures to correct deficit in the balance of payment.

Foreign Trade in India: Recent changes in the composition and direction of foreign trade; Causes and effects of persistent deficit in the balance of payments.

#### **Unit – X: Quantitative Technique – 10 marks**

Meaning, uses and importance of statistics; Concept of descriptive and inferential statistics; Methods of data collection- Sampling vrs Census; Data classification-primary data and secondary data; Data presentation-Diagrammatic and graphical presentations

Central Tendency and Dispersion Measures of central tendency: mean, median, mode. Measures of dispersion: range, mean deviation, standard deviation.

Correlation: Concept of Karl Pearson and Rank Correlation, concept of coefficient of determination.

Time series and Index Number: Time series analysis-Concept and components, determination of trend, seasonal and cyclical indices.

### **MATHEMATICS**

#### **Unit – I: Calculus – 10 marks**

Functions and graphs; limit and continuity, indeterminate form, Derivatives of real valued functions: Successive differentiation; Rolle's Theorem, Mean Value Theorems; Taylor's and Maclaurin's theorem with Cauchy's form of remainders; Integration: Indefinite and definite integral; Reduction formulae. Real-valued functions of two and three variables: partial derivatives; Euler's theorem. Convergent sequence, Monotonic sequence, Cauchy sequence; Cauchy's general principle of convergence; Infinite series, Test of convergent series.

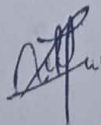
#### **Unit – II: Algebra – 10 marks**

Groups - Abelian groups, Cyclic groups, Groups of prime order, Permutation group, Lagrange's theorem, Normal subgroups, homomorphism of groups, isomorphism theorems, Automorphisms; Inner automorphisms; Cayley theorem. Rings and sub-rings; Ideals - Principal ideals; Prime ideals, Maximal ideals in a commutative ring with unity, Fields and Integral Domains. Ring homomorphisms; Kernels; Isomorphism. Prime and irreducible elements, Euclidean domain, Principal ideal domain, Unique factorisation domains.

#### **Unit – III: Ordinary Differential Equation – 10 marks**

Formation of differential equations; equations of first order and first degree; Bernoulli's equation; exact equations; Linear equations of second and third order with constant coefficients - Complementary functions and Particular integrals; Differential equations of first order but higher degrees; Clairut's equation and singular solution; orthogonal trajectories.

Linear differential equations of Second order with variable coefficients; Homogeneous equations; Exact equations; Method of variation of parameters; Simultaneous equations; Total differential equation .





#### **Unit – IV : Vector and Solid Geometry – 10 marks**

Partial Derivatives of Vectors, Gradient of a Scalar Function, Directional Derivative, Divergence of a vector function, Curl of a Vector, Solenoidal and Irrotational. Line Integral, Surface Integral and Volume integral. Stoke's Theorem, Gauss Divergence Theorem and Green's Theorem.

Pairs of straight lines; General equation of second degree; Polar equation of conics. Perpendicular distance of a point from a plane; Bisectors of two planes; Equations of straight lines in space; Coplanarity of two straight lines; Perpendicular distance of a point from a straight line; Shortest distance between two straight lines in space.

#### **Unit – V: Linear Programming Problem – 10 marks**

Linear programming problems, basic solution, basic feasible solution and optimal solution, graphical method and Simplex method of solutions. Duality. Transportation and assignment problems. Travelling salesman problems. Theory of games, two person zero - sum games, the maximin - minimax principle, saddle point, pure and mixed strategies.

#### **Unit – VI: Linear Algebra – 10 marks**

Vector spaces, subspaces, homomorphisms, isomorphisms, direct sum, linear dependence and independence, basis, dimension, linear span.

Matrix of a linear transformation, rank and nullity of a linear transformation, characteristic roots, characteristic polynomial and characteristic vector of a linear transformation matrix, eigen values and eigen vectors, Cayley-Hamilton theorem, diagonalisation theorem.

#### **Unit – VII: Real Analysis – 10 marks**

Properties of Euclidean distance function in  $R^n$ ; neighbourhoods, open sets, closed sets, limit points, interior points; Bolzano-Weierstrass theorem; Cantor intersection theorem.

Real valued function of several variables, continuity, uniform continuity, compact sets, intermediate value theorem. Derivability; partial derivatives of a real valued function, directional derivatives, Mean value theorem, Schwarz's theorem, Young's theorem, Taylor's theorem, extreme values of a function.


#### **Unit – VIII: Complex Analysis – 10 marks**

Complex numbers; triangle inequality, parallelogram law, De Moivre's theorem, roots of unity, analytic function, analyticity of power series, continuity and differentiability, Cauchy-Riemann equations. Power series, absolute convergence, uniform convergence, complex integration, Cauchy's integral formula, zeroes of an analytic function, singularities.

#### **Unit – IX: Numerical Analysis – 10 marks**

Difference operators, Differences of normal and factorial polynomials, Solution of Algebraic and Transcendental equations - Iteration method, Regula falsi method, Newton-Raphson method. Interpolation - Newton's forward and backward, Divided differences. Solution of system of linear equations - Gauss elimination method, Gauss-Jordan method, Gauss-Siedel method.

Numerical integration: Simpson's one-third rule, trapezoidal rule. Numerical solution of differential equations - Taylor series method, Picard's method, Euler's method, Runge-Kutta methods.



### **Unit – X: Partial Differential Equation – 10 marks**

Formation of Partial differential equations (PDE), linear and non-linear PDE, solution of PDE - Lagrange's method, Special type of equations, Charpit's general method. Compatible system of the first order, Integral surface passing through given curve, surfaces orthogonal to given family of surfaces.

Linear PDE of second order, Homogeneous and non-homogeneous equations with constant coefficients, variable coefficients, Reduction to canonical or normal form

## **STATISTICS**

### **Unit I: Descriptive Statistics – 10 marks**

Statistical Methods: Definition and scope of Statistics, concepts of statistical population and sample.

Data: Primary data, Secondary data, quantitative and qualitative data, variables, scales of measurement- nominal, ordinal, interval and ratio.

Tabular and graphical (Bar chart, histogram, pie) representation of data, Measures of Central Tendency: mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation.

Bivariate data: Scatter diagram, product moment correlation coefficient and its properties, coefficient of determination, rank correlation. Correlation, Regression, principle of least square, fitting of regression line.

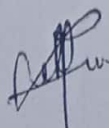
### **Unit II: Survey Sampling & Indian Official Statistics – 10 marks**

Basic concepts in sampling: concept of population and sample, need for sampling, complete enumeration versus sampling, sampling and non-sampling errors. Acquaintance with the working (questionnaires, sampling design, methods followed in field investigation etc.).

Probability sampling, simple random sampling with and without replacement (SRSWR and SRSWOR) and properties. Estimation of population mean and their standard errors.

Introduction to: Stratified sampling, Systematic sampling and Cluster sampling.

Present official statistical system in India, Methods of collection of official statistics, their reliability and limitations. Role of Ministry of Statistics & Program Implementation (MoSPI), Central Statistical Office (CSO), National Sample Survey Office (NSSO), and National Statistical Commission.





### **Unit III: Statistical Inference- I – 10 marks**

Definitions of random sample, parameter and statistic, sampling distribution of a statistic. Concepts of estimation, unbiasedness, sufficiency, consistency and efficiency. Factorization theorem. Complete statistic, Minimum variance unbiased estimator (MVUE).

Rao-Blackwell and Lehmann-Scheffe theorems and their applications. Cramer-Rao inequality and MVB estimators(statement and applications).

Methods of Estimation, Method of moments, method of maximum likelihood estimation, method of least square.

Interval Estimation: Concepts of confidence interval and confidence coefficient, confidence intervals for the parameters of univariate normal distribution.

### **Unit IV: Statistical Inference- II – 10 marks**

Principles of test of significance: Null and alternative hypotheses (simple and composite), Type-I and Type-II errors, critical region, level of significance, size and power, best critical region, most powerful test, uniformly most powerful test with examples.

Neyman Pearson Lemma (statement and applications to construct most powerful test). Likelihood ratio test, properties of likelihood ratio test (without proof).

Non-parametric test: Need of non-parametric test. Sign test, Run test, Median test, Spearman's rank correlation test, Wilcoxon-Mann Whitney test.

### **Unit V: Probability & Probability Distributions – 10 marks**

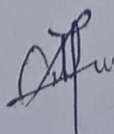
Probability: Introduction, random experiments, sample space, events and algebra of events. Definitions of Probability – classical, statistical, and axiomatic with examples. Conditional Probability, laws of addition and multiplication, independent events, theorem of total probability, Bayes' theorem and its applications.

Random variables: discrete and continuous random variables, p.m.f., p.d.f. and c.d.f., illustrations and properties of random variables, univariate transformations with illustrations.

Two dimensional random variables: discrete and continuous type, joint, marginal and conditional p.m.f, p.d.f., and c.d.f., independence of variables.

Mathematical Expectation and Generating Functions: Expectation of single and bivariate random variables and its properties. moment generating function and characteristic function.

Standard probability distributions (discrete case): Binomial, Poisson, Geometric.





#### **Unit VI: Sampling Distribution – 10 marks**

Definitions of random sample, parameter and statistic, sampling distribution of a statistic, sampling distribution of sample mean, standard errors of sample mean, sample variance. Large sample test, use of Central Limit Theorem for testing single proportion, difference of two proportions, single mean, difference of two means.

Exact sampling distribution: Definition and derivation of p.d.f. of Chi square with  $n$  degrees of freedom (d.f.) using m.g.f., nature of p.d.f. curve for different degrees of freedom, mean, variance, m.g.f., mode, additive property and limiting form of Chi square distribution and its uses.

Exact sampling distributions: Student's and Fishers t-distribution, Derivation of its p.d.f., nature of probability curve with different degrees of freedom, mean, variance, and limiting form of t distribution. Snedecore's F-distribution: Derivation of p.d.f., nature of p.d.f. curve with different degrees of freedom, mean, variance and mode. Test based on t and F distribution. Fisher's Z transformation and its uses. Pearson's Chi-square test for goodness of fit.

#### **Unit VII: Linear Model & Experimental Designs – 10 marks**

Experimental designs: Role, historical perspective, terminology, basic principles. Basic designs: Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD) – layout, model and statistical analysis.

Factorial experiments: advantages, notations and concepts,  $2^2$  factorial experiments, design and analysis.

Gauss-Markov set-up: Theory of linear estimation, Estimation of linear parametric functions, Method of least squares, Gauss-Markov theorem, Estimation of error variance.

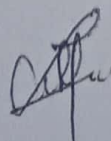
Analysis of variance: Definitions of fixed, random effect models, analysis of variance and covariance in one-way classified data for fixed effect models, analysis of variance in two-way classified data with one observation per cell for fixed effect models.

#### **Unit - VIII: Numerical Methods – 10 marks**

Finite differences of different orders,  $\Delta$ , E and D operators, factorial representation of a polynomial, separation of symbols, sub-division of intervals, differences of zero.

Concept of interpolation and extrapolation: Newton Gregory's forward and backward interpolation formulae for equal intervals, divided differences and their properties, Newton's formula for divided difference, Lagranges formula for unequal intervals.

Numerical differentiation. Numerical Quadrature: Trapezoidal rule, Simpson's one third and three-eight rules.



### **UNIT – IX: Operations Research – 10 marks**

Definitions and scope of operation research, different types of models in operations research - their construction and general method of solution. Elements of linear programming problem. (LPP): Canonical and standard forms, formulation of LPP, graphical method to solve two variable LPP, solution of LPP using simple procedure.

Transportation problem, different methods of finding initial feasible solution of a T.P., UV, MODI method.

Assignment Mode, definition its mathematical representation. Solution of the assignment model, Hungarian method for solution of the assignment problems, formulation and solution of the assignment models.

Game Theory, Rectangular game, minimax-maximin principle, solution to rectangular game using graphical method, dominance property to reduce the game matrix and solution to rectangular game.

### **UNIT – X: Applied Statistics – 10 marks**

Demographic Methods: Sources of demographic data, census, registration, ad-hoc surveys, hospital records, demo profiles of the Indian census.

Measurement of Mortality and Life Table: Crude death rate, Standardized death rates, Age specific death rate. Complete life table and its main features. Infant mortality rate. Uses of life table and its main features. Abridge life table and its construction.

Measurement of Fertility, Crude birth rate, general fertility rate, age specific birth rate, total fertility rate. Gross reproduction rate and net reproduction rate.

Index Number, Price relatives and quantity or volume relatives, Laspeyre, Paasche, Marshal Edgeworth and Fisher index number; chain base index number.

