

**DETAILED SYLLABUS FOR THE POST OF RESEARCH OFFICER IN  
ECONOMICS AND STATISTICS DEPARTMENT  
CATEGORY NO.414/2025**

**TOTAL 100 MARKS**

**Economics (25 Marks)**

**Module I: Micro Economic Theory (4 marks)**

Indifference Curve and Revealed Preference Approach to Consumer Behaviour- Consumer's Surplus- Production Function- Cobb-Douglas and CES Production Functions- Traditional and Modern Cost Theories- Price and Output determination in perfect and imperfect market models- Basic Concepts in Welfare Economics and Parato Optimality Conditions.

**Module II: Macro Economic Principles and Practices (4 marks)**

Basic Concepts in National Income Accounting- Methods of Measuring National Income- Indian Statistical System of National Income Accounting- Inflation and Deflation- Inflation Targeting- Monetary and Fiscal Policies. Balance of Payments and exchange rates

**Module III: Economic Growth and Development (4 marks)**

Concepts of Economic Growth and Development- Alternative measures of Development: PQLI, HDI, HPI - Measures of Poverty: Absolute and Relative, Head-Count Ratio, Poverty Gap Indices, MPI, Sen's Capability theorem- Harrod- Domar and Mahalanobis model of Growth – The Big Push Theory-Balanced and Unbalanced Growth strategies.

**Module IV: Fiscal Federalism and Budgeting in India (4 marks)**

Vertical and horizontal imbalances in India's federal finance- Central, State and Local finance in India- Central and State Finance Commissions- Challenges and recommendations of fifteenth Central Finance Commission

Budgetary procedure in India – Public Account- Consolidated and Contingency Fund of India- Form of GST introduced in India- Fiscal Responsibility and Budget Management Act

**Module V: Development Issues of India (3 marks)**

Trends in the sectoral composition of national income- Role of planning in India's development- Structural Adjustment Reforms- Planning Commission and NITI Aayog- Demographic features of India- Major interventions in the Agricultural, Industrial and Service Sectors of the national economy.

**Module VI: A profile of the Economy of Kerala (3 marks)**

Development experience of Kerala and the trends in its sectoral composition of Gross State Domestic Product- The remittance economy of Kerala- Decentralized Planning in the state- Role and Relevance of KIIFB- MSME sector of Kerala- Issues of Kerala's growing Care Economy

### **Module: VII: Basic Econometrics (3 marks)**

Significance of the random variable in an econometric model- Population and Sample Regression Functions- Goodness of Fit- Basic assumptions of the Classical Linear Regression Model and the violations of such assumptions- Gauss Markov's Theorem- Uses of Dummy Variable Regression Model in Econometrics.

### **MATHEMATICS (25 Marks)**

#### **Unit 1 : Linear Algebra (5 Marks)**

System of linear equations, Rank of a matrix. Eigen values and eigenvectors, characteristic equation, Vector space- Examples and properties, subspaces, linear independence, Spanning set, basis, dimensions, linear transformations, Non-singular transformation, Rank-Nullity Theorem, Representation of linear transformations, Diagonalisation

#### **Unit II : Functional Analysis (2 Marks)**

Normed Linear spaces, Bounded Linear Operators, Banach Spaces, Inner Product Spaces, Hilbert Spaces, Orthogonal Basis, Adjoint of an Operator, Normal, Self Adjoint, Unitary operators.

#### **Unit III Abstract Algebra (3 Marks)**

Groups, subgroups, Abelian Groups, cyclic groups, permutation groups, Normal subgroups, Factor Groups, Lagrange's Theorem, homomorphism, isomorphism, isomorphism theorems, Sylow theorems, Rings, Integral Domain, fields

#### **Unit IV: Real Analysis (5 Marks)**

Limit, sequence, monotone sequences, subsequences, Convergence of a sequence, Series, Convergence of a series, Convergence tests, continuous functions, Uniform continuous functions, sequence of functions, uniform convergence and pointwise convergence, Riemann integral, Properties of Riemann Integral

#### **Unit V : Topology (2 Marks)**

Metric Spaces, Topological spaces, Complete Metric spaces, Open sets, Closed sets, Closure, Interior, Limit points, Continuity, Uniform Continuity, Homeomorphism, Subspace Topology, Base, Connectedness, Path connectedness, Compactness

#### **Unit VI: Complex Analysis (5 Marks)**

Analytic Functions, Cauchy Riemann equations, Harmonic functions, Entire

function, Liouville's Theorem, Mobius transforms, Bilinear transformation, Cross Ratio, power series representations of analytic functions, Laurentz series, Singularities, poles, essential singularity, removable singularities, Residue, Cauchy's Theorem, Cauchy's Integral formula, Residue Theorem, Contour Integration

### **Unit VII: Differential Equation (3 Marks)**

Orthogonal trajectories, exact equations, Simultaneous differential equations. Linear differential equations of first order, Picard's theorem -Power series solution of differential equation. Construction of first order partial differential equations, solution of first order partial differential equations, solution using Charpit's method, solution using Cauchy's characteristics, solution by separation of variables.

## **STATISTICS (25 marks)**

### **MODULE 1: SAMPLING (6 marks)**

Methods of sampling: Random Sampling methods (concepts)

Simple random sampling with and without replacement- Estimation of population mean, population total, population proportion, and the variance of these estimators. Estimation of their standard errors. Confidence limits for population mean and for proportion. Estimation of sample size.

Stratified sampling- estimation of population mean and variance of the estimator, choice of the sample size in different strata (optimum allocation, Neyman allocation and proportional allocation), variance of the estimator of population mean under these allocations, comparison of these variances.

Ratio estimator of population mean and population total, regression estimator of population mean.

### **MODULE 2: PROBABILITY AND RANDOM VARIABLES (3 marks)**

Probability measure, probability space, monotone and continuity properties of probability measure. Independence of events, conditional probability and Bayes theorem.

Univariate Discrete and Continuous random variables, Properties of Cumulative Distribution function, Probability density function, Probability generating function, moment generating function, cumulant generating function and characteristic function.

Sequences of random variables, convergence in probability and convergence in distribution.

### **MODULE 3: STANDARD DISTRIBUTIONS (2 marks)**

Applications of standard discrete distributions- Uniform, Bernoulli, Binomial, Poisson, Geometric, Negative Binomial, Hypergeometric distributions.

Standard continuous distributions: Uniform, Exponential, Weibull, Gamma and normal distributions.

**MODULE 4: SAMPLING DISTRIBUTIONS (2 marks)**

Sampling distributions- distribution of the mean and variance of a random sample from normal population, Chi-square, t, and F distributions (both central and non-central), their properties and applications.

**MODULE 5: ESTIMATION (3 marks)**

Point estimation- properties of estimators, Minimal Sufficient Statistic, Completeness, complete sufficient statistics for exponential family of distributions.

UMVU estimators and properties, Rao-Blackwell theorem, Lehman-Scheffe theorem and its applications, Fisher's information measure, Cramer- Rao inequality.

Methods of estimation- maximum likelihood, method of moments, method of minimum Chi-square.

**MODULE 6: TESTING OF HYPOTHESIS (3 marks)**

Fundamental concepts of hypothesis testing, tests based on Normal, t, chi-square and F distributions, Kolmogorov-Smirnov test, Wald Wolfowitz run test, Mann-Whitney Wilcoxon test, Kruskal-Wallis test, Friedman test.

**MODULE 7: LINEAR REGRESSION (2 marks)**

Inference on simple linear regression models. Properties of least square estimators. Significance test and confidence intervals, prediction problems. Coefficient of determination.

Multiple linear regression models, least square estimation, Properties of least square estimators, Problem of multicollinearity.

Simple, partial and multiple correlation.

**MODULE 8: TIME SERIES (2 marks)**

Time series Analysis: Components of Time series, analysis of trend and seasonal fluctuations, ACF and PACF, Moving Average (MA) and Auto Regressive (AR), ARMA and ARIMA time series models (concepts only)

**MODULE 9: INDEX NUMBERS (1 mark)**

Laspeyre's, Paache's and Fisher's index numbers, Criteria of a good index number. Consumer price index number. Base shifting, splicing and deflating index numbers.

**MODULE 10: VITAL STATISTICS (1 mark)**

Measurement of Fertility: Crude birth rate, General fertility rate, Age specific birth rate, Total fertility rate, Gross reproduction rate, Net reproduction rate.

Measurement of Mortality: Crude death rate, Standardized death rates, Age-specific death rates.

## **COMMERCE (25 MARKS)**

Module 1: Financial Accounting – Sole Trading Concern –Accounting Conceptual framework, accounting principles and conventions-Accounting cycle and preparation of final accounts-Depreciation (SLM, WDV, change in method)- Rectification of errors and suspense account-Preparation of Trading, P&L Account and Balance Sheet

**(3 Marks)**

Module 2: Financial Accounting – Partnership Accounts -Fundamentals: partnership deed, profit-sharing ratio, interest on capital/drawings- Capital accounts: fixed vs fluctuating-Admission of a Partner-Revaluation of assets and liabilities- Treatment of goodwill (premium, hidden goodwill)-Change in profit-sharing ratio and sacrificing ratio-Adjustment of reserves and accumulated profits/losses-Retirement/Death- Gaining ratio and goodwill adjustment- Settlement of dues-Dissolution-: Realisation account, settlement of liabilities (Garner vs Murray rule)

**(3 Marks)**

Module 3: Financial Accounting – Joint Stock Company -Issue, forfeiture and reissue of shares-Debentures: issue and redemption methods-Final accounts as per Schedule III-Managerial remuneration-Profit prior to incorporation

**(3 Marks)**

Module 4: Advanced Financial Accounting & Emerging Areas -Accounting Standards (AS & Ind AS): overview and application-Amalgamation, absorption and reconstruction- Accounting for mergers and acquisitions- Human Resource Accounting- Inflation Accounting (CPP & CCA methods)-Social Responsibility Accounting

**(3 Marks)**

Module 5: Cost Accounting – Costing Methods -Cost concepts and classification- Cost sheet preparation-Job, batch and contract costing-Process costing (normal loss, abnormal loss/gain, WIP valuation)

**(2 Marks)**

Module 6: Cost Accounting – Costing Techniques & Modern Practices - Marginal costing and decision-making- Break-even analysis and margin of safety- Standard costing and variance analysis- Budgetary control-Activity-Based Costing (ABC) -Modern Costing & Production Approaches--Lean Manufacturing-: concept, waste elimination (Muda), Just-in-Time (JIT)-Modern Costing Techniques--Target costing-Life-cycle costing- Kaizen costing-Throughput accounting

**(2 Marks)**

Module 7: Direct Taxation -Basic concepts: assessee, income, previous year, assessment year-Residential status and tax incidence-Heads of income and computation- Deductions under Chapter VI-A-Set-off and carry forward of losses- Assessment procedures, TDS, advance tax-MAT (Minimum Alternate Tax) – concept and applicability-AMT (Alternate Minimum Tax)-MMR (Maximum Marginal Rate) – meaning and application- Faceless assessment and appeals- E-filing, AIS (Annual Information Statement)- Use of data analytics and AI in tax administration

**(2 Marks)**

Module 8: Goods and Services Tax (GST) - Concept, objectives and GST framework (CGST, SGST, IGST) Supply: meaning, composite and mixed supply- Levy and collection of GST- Input Tax Credit (ITC)-Procedural & Compliance Aspects-Registration under GST-(mandatory & voluntary)-Composition Scheme (Composition Dealer)-Filing of returns-Offences & Penalties under GST-Types of offences (evasion, wrongful ITC claims, etc.)- Penalties and prosecution provisions

**(2 Marks)**

Module 9: Managerial Economics --Nature and scope-Demand analysis and elasticity-Production and cost analysis-Pricing decisions- Market structures (perfect competition, monopoly, oligopoly)

**(2 Marks)**

Module 10: Legal Framework of Business --Indian Contract Act, 1872- Essentials of valid contract- Offer, acceptance, consideration- Breach and remedies- Special Types of Contracts- Contract of indemnity and guarantee-Bailment and pledge-Agency-Other Business Laws-Sale of Goods Act, 1930- Companies Act, 2013 (basic provisions)-Consumer Protection Act, 2019 - Rights of consumers- Consumer dispute redressal commissions- Product liability-E-commerce regulations-Negotiable Instruments Act-Cheque, dishonour, liabilities-Bill of exchange- Promissory Note- Hundies

**(3 Marks)**

**NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper.**