

DETAILED SYLLABUS FOR THE POST OF RESEARCH ASSISTANT

I ECONOMICS - 10 Marks

1) National income and balance of payments (2 Marks)

Concepts and measurement of national income – changing contribution of various sectors in national income-structure of the balance of payment accounts exchange rate determination – performance of foreign trade of India.

2) Poverty, inequality and unemployment (2 Marks)

Role of planning in India's development – concepts, measurement and magnitude of poverty – inequality in income distribution – regional disparity in income – definition and measurement of unemployment – employment creation and poverty eradication programme of Centre and Kerala.

Technological advancements, Innovation and the Fourth Industrial Revolution - Importance of good governance for economic development.

3) Resource Allocation and Game Theory(1 Mark)

Application of elasticity of demand and supply-Consumer surplus and producers' surplus-Opportunity cost-Production Possibility Frontier-Marginal analysis-Consumer choice-Introduction to Game theory-Theory of rational choice-Interacting decision-makers.

4) Government and Forms of Intervention (2 Marks)

Role of government in a market economy- allocation, distribution and stabilization- first-best versus second best solutions- Market failure- Source of market failure: incomplete markets, information failure, externalities, public goods- addressing externalities – price based instruments vs non-price based instruments -Concepts of social and merit goods.

Cannons of taxation – tax structure in India – Direct and Indirect Tax reforms in India – Goods and Service Tax(GST).

5) Fiscal Federalism and Budget(1 Mark)

Concept of federal finance-Transfer of resources from Union and States to local bodies - Role of NITI Aayog and fiscal federalism-Budgetary process - Revenue and Capital budget - Budget estimates and Revised estimates - Budget documents - Annual Financial Statement-Finance bill-Demand for Grants- Expenditure and Receipt Budget. – Budgetary Process and Control in India – Fiscal Responsibility Budgetary Management(FRBM) policy in India.

6) Sustainable Development(2 Marks)

Concept of Natural capital - The services of Nature – Ecosystem Services – Link between ecosystem services and human wellbeing-Sustainable development- Challenges and Measurement of Sustainable Development –Green GDP.

II ECONOMETRICS - 10 Marks

1)Introduction to Econometrics(2 Marks)

Econometric modelling - Sample Regression Function and Population Regression Function - Simple linear Regression Model – Assumptions, Estimation through Ordinary Least Squares (OLS) Approach – Numerical properties - Gauss Markov Theorem - Normality assumption.

2)Hypothesis testing(1 Mark)

t and F tests-P value- Multiple Regression Model - Testing the Significance of Regression - Analysis of variance (ANOVA), F and the concept of R² and adjusted R².

3)Assumptions of the Classical Model (2 Marks)

Auto-correlation, Heteroscedasticity, Multicollinearity, - Nature, Consequences, Tests and Remedial measures-Model Specification and Diagnostic testing - Specification Errors -types, consequences and tests RAMSEY RESET test- Errors of Measurement in the dependent variable and independent variable

4)Dummy Variable Regression Models(2 Marks)

Dummy Variable Technique and its Applications - ANOVA models-ANCOVA models-Comparing two regressions, interaction effects, seasonal analysis, piece-wise linear regression.

5)Time Series Econometrics(2 Marks)

Time Series Analysis- Stationarity & Non Stationarity-Random Walk Models-Autocorrelations and Partial Autocorrelation Functions-Unit roots and Units roots tests- AR, MA, Integrated Process, ARMA ARIMA modelling.

6) Panel Data(1 Mark)

Concept, importance and limitations of panel data

III ECONOMIC STATISTICS - 10 Marks

Quantitative information on distribution, production, manpower, prices, foreign trade, investments, employment, national income, and expenditures(**5 marks**)

Official statistics-Introduction to Indian Statistical systems- Important secondary data sources in India CSO, NSSO, Census, NFHS, PLFS, RBI Statistics, EPWRF, etc(**2 marks**)

Sustainable Development Goals –SD Indicators- India's and Kerala's position(**3 marks**).

IV Commerce: 20 marks

Module 1- Financial Management

Capital budgeting – Capital structure – Sources of finance and cost of capital- Dividend policy – Working capital – Portfolio management - Financial Statement Analysis -- Requirements of Financial Reporting and Recent trends in reporting - Usage of Ratio analysis - liquidity ratios – turnover ratio - leverage ratios - Insolvency ratio and profitability ratio - DuPont Analysis - Reading and Interpretation of Financial Statements- Financial planning – preparation of cost estimation and budget estimation (6 marks)

Module 2- Project Management

Project proposal and project report preparation- Project finance –Project management- project planning and implementation- project monitoring and control- Project evaluation- Project Auditing – Phases of project Audit- Project Closure- Risk management- Environmental Impact Assessment- sustainability reporting (4 marks)

Module 3- Functions of Management

Nature and Evolution of Management - Schools of Management Thought- planning- organising- controlling – directing – staffing – Leadership and Theories – Motivation and Theories – Total Quality Management (3 marks)

Module 4- Research Methodology

Social Science Research- Problem Identification and Formulation – Research Question – Research design- qualitative, quantitative and mixed methods- Triangulation methods- Hypothesis —Null Hypothesis and Alternative Hypothesis- Hypothesis Testing – Logic and Importance- Measurement Issues – Concept of measurement– Measurement and scaling - theoretical framework – conceptual framework - Validity and Reliability - Levels of measurement - Sampling, Sample, Sampling Frame, Sampling Error, Sample Size, Non-Response- Characteristics of a good sample- Probability Sampling – Simple Random Sampling- Systematic Sampling – snowball sampling Stratified Random Sample and Multi-stage sampling- Determining size of the sample – Practical considerations in sampling and sample size- data- different types of data- cross-sectional- time series and panel data. (2 marks)

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V STATISTICS (15 Marks)

Unit I:- Probability Theory And Distribution Theory (5 marks)

Probability – Definitions, Limit of Sequence of events, monotone and continuity properties of probability measure, conditional probability, Bayes' Theorem, Borel – Cantelli lemma, Borel Zero-one law, Kolmogorov zero -one law. Random variables, probability distribution and distribution function -its properties, Moment generating function and characteristic function. Law of large numbers, Central limit theorem.

Standard distributions:-Uniform , Binomial, Poisson, Geometric, Hypergeometric , Normal, Exponential, Pareto, Gamma and Beta distributions and their characterizations , sampling distributions - Chi square, t, F distributions and their properties and applications.

Multivariate normal distribution :-properties and characteristics

Unit II:- Sampling and Design of Experiments (5 marks)

Probability and non-probability sampling, Sampling design, Probability sampling methods – Simple random sampling, Systematic sampling, Stratified random sampling, Cluster sampling , Multi – stage sampling, PPS sampling, Non-Probability sampling methods;

Principles of Design of Experiments, Completely Randomized design, Randomized Block Design, Latin square design, Incomplete block design, BIBD, PBIBD, Factorial experiments 2^2 , 2^{k-2} and 2^{k-1} .

Unit III:- Statistical Inference and Regression Analysis (5 marks)

Point estimation – properties of estimators, BLUE, UMVU estimators, Interval estimation , methods of estimation – MLE, Method of moments, Minimum chi square, Testing of hypothesis – Types of hypothesis, significance level, power of a test, Most powerful Test, UMP test, Unbiased test, Likelihood ratio tests and Non-Parametric tests, Analysis of variance.

Simple linear regression, Simple Correlation, Multiple Correlation, Ordinary Least Square estimation of regression parameters, Inference on regression coefficients, Multiple regression models- estimation, properties, assumptions, Solutions to the violation of assumptions.

VI MATHEMATICS (20 Marks)

Unit I : Linear and Abstract Algebra:- (5 Marks)

System of linear equations; Elementary matrices, the process of Gaussian elimination, Row-reduced echelon matrices, Rank of a matrix. Determinants-Eigen values and eigenvectors, characteristic equations. Vector space- Examples and properties, subspaces, linear independence of vectors, finite vector spaces, basis, dimensions, linear transformations, and Representation of linear transformations as matrices.

Groups, subgroups, normal subgroups, cyclic groups, permutation groups, group homomorphism, isomorphism, isomorphism theorems, Sylow theorems and applications. Rings and fields, examples.

Unit II : Real and Complex Analysis:- (5 Marks)

Algebraic and completeness properties of real numbers, intervals, cluster points, open and closed set, sequence and their limits, monotone sequences, subsequences, divergent sequences, Limit of functions, continuous functions, combination of continuous functions, sequence of functions, uniform convergence and pointwise convergence, properties of Riemann integral, integral as a limit, convergence of infinite series, test of convergence, series of functions, derivatives.

Analytic and harmonic functions, Cauchy Riemann equations, analytic functions as mappings, Mobius transforms, power series representations of analytic functions, zero of analytic functions, singularities, residue theorem and applications in the evaluation of integrals.

Unit III : Ordinary and Partial Differential Equations:- (5 Marks)

Orthogonal trajectories, exact equations, Non-Linear differential equations of the first order, second order differential equations with constant or variable coefficient and their solutions, Simultaneous differential equations and their applications. Linear differential equations of first order., solution by successive approximation, Lipschitz condition, Picard's theorem -convergence of successive approximations, 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.

Unit IV : Topology and Functional Analysis0 (5 Marks)

Metric spaces, Open Sets, Closed Sets in Metric Spaces, Interior, Closure and Boundary, Continuous Functions, Complete Metric Spaces. Topological Spaces, Interior, Closure, and Boundary, Basis and Sub basis, Continuity and Topological Equivalence, Subspaces, Connectedness, Connected and Disconnected Spaces, Connected Subsets of the Real Line, Applications of Connectedness, Path Connected Spaces.

Normed spaces, Riesz lemma, continuity of linear maps, operator norm. Hahn Banach theorems, Hahn Banach separation theorem, Hahn Banach extension theorem, Banach spaces. Bounded linear maps on Banach spaces, Uniform boundedness principle, closed graph theorem and open mapping theorem. Spectrum of bounded operator, Gelfand Mazur theorem, Spectral radius formula. Duals and transposes, reflexivity. Compact linear maps, spectrum of a compact operator.

VII - AGRICULTURAL STATISTICS (15 MARKS)

Unit 1: Agricultural Statistics system in India (5 marks)

Design and organization of pilot and large scale surveys, National sample surveys, Agricultural statistics system in the country-land use statistics, CSO, NSSO, crop estimation surveys, Crop cutting experiment

Unit 2: Statistical Methods for surveys (5 marks)

Frequency distribution; Principles governing their formation and standard distributions. t, F, chi square tests and large sample tests; Confidence intervals; Transformation of Variables; Z-transformation; Distribution free statistics- run test, sign test; Wilcoxon sign-rank test, Mann-Whitney U-test; Wald – Wolfowitz run test; Median test etc. Multivariate techniques - Hotellings T^2 and Mahalanobis D^2 , Discriminant functions, Multivariate Analysis of variance, Principal component analysis, Canonical correlations and factor analysis.

Unit 3: Statistical computing (5 marks)

Introduction of Software packages for data analysis, Basics of R programming language- Basic data types, control structures, data manipulation, exploratory data analysis. Introduction to MS Excel- Descriptive statistics, Data management and manipulation, Statistical analysis tools.

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.

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