Tamil Nadu Public Service Commission
Syllabus
Statistics and Economics
(PG Degree Standard)

Code: 564

Unit I: Probability, Random Variables and Distribution Theory (25 Questions)

Introductory concepts of Probability, Definition, Axioms, Basic Theorems and Baye's Theorem. Random Variables – Mathematical Expectation and Conditional Expectation. Chebechev's inequality – Convergence in Probability – Weak and Strong laws of large numbers – CLT (Lindberg-Levy and Lyapunov's). Marginal and Conditional distributions, MGF, PGF and CGF. Univariate Distributions: Negative Binomial, Hyper geometric, Geometric, Cauchy, Beta, Gamma, Weibull, Log-Normal. t, F and Chi-square distributions. Bivariate Binomial, Bivariate Poisson, Multinomial, Bivariate Normal distributions.

Unit II: Estimation Theory, Testing of Hypothesis and Non-Parametric Tests (20 Questions)

Properties of Estimators, Cramer – Rao inequality, Rao-Blackwell, Lehman-Scheffe and Factorization theorems and applications. Methods of Estimation – MLE, Moments and Least squares. Confidence intervals for mean and variance in large and small samples.

Elements of Testing of Hypothesis – Definitions, Types of errors – Critical region, size and level of a test – Power function. Most powerful test, NP Lemma, UMP and Unbiased tests. MLR property and simple applications.

Non-Parametric Tests: Run, median, Sign, Mann-Whitney, Wilcoxon, K-S (one and two samples) and Kruskal-wallis tests

Unit III: Sampling Theory, Design of Experiments and Index numbers and Time series (25 Questions)

Sampling Designs: SRSWR, SRSWOR, Stratified, Systematic, Cluster and Multistage sampling methods – Estimation procedures and properties of estimators. Ratio and Regression estimators (under SRSWOR and Stratified], CSO and NSO.

Linear models - Fixed, Random and Mixed effect models. Construction and analysis of 2^n and 3^n Factorial experiments including partial and complete confounding. Incomplete block designs – BIBD, PBIBD. Split plot design and Youden square design.

Index Numbers: Introduction – Construction of simple and weighted index numbers, Tests of Ideal index number, Cost of living and Whole Sale Price Index numbers.

Time series: Introduction, Models and their components. Determination of trend by the method of moving averages and fitting of linear, quadratic and exponential curves. Determination of Seasonal indices by Ratio-to- Trend and Ratio to moving averages. Estimation of variance for random components by Autoregressive (AR) and Moving Averages (MA) and ARIMA models.

Unit IV: Correlation, Regression and Machines Learning Techniques using Python (15 Questions)

Correlation Analysis – Simple, Partial and Multiple correlations. Regression Analysis – Simple and Multiple Linear regression models, description, estimation and Testing of hypothesis of regression coefficients. Model Adequacy measures – Multicollinearilty Analysis and selection of variables by step-wise method.

Generalized linear models – Introduction, Components of GLM, Logistic regression – Fitting and interpretation.

Introduction to Python – Character set, Data types, Operators expressions, Control and Loop statements, Arrays, Lists, Dictionaries. Libraries - numpy, scipy, matplotlib and Pandas. Machine Learning Techniques - Supervised learning – Classification using KNN, and Regression (Linear and Logistic) techniques. Unsupervised learning - Linkage methods, k-means and k-Medoids methods.

Unit V: Multivariate Statistical Analysis (15 Questions)

Normal distribution, lnference concerning single mean vector and two mean vectors using Hotelling's T^2 Statistic – Mahalanobis D^2 statistic and its distribution - Relation between T^2 and D^2 statistic. Principal Component Analysis and its uses - Factor Analysis and its applications – Classification problems – Fisher method for two populations, linear discriminant function and its applications

Unit VI: Micro Economics (20 Questions)

Theory of Consumer Behaviour – Indifference curve analysis – Revealed Preference theory – Choices under uncertainty – Neumann – Morgernstern hypothesis – utlity functions under uncertainty Asymmetric information – Adverse selection and moral hazards – Asymmetric information in the Labour market – Market structure – oligopoly Market – cartel and Price leadership – Theory of distribution in imperfect product and factor market.

Unit VII: Macro Economics (20 Questions)

General equilibrium – IS-LM –BP model for an open economy – Welfare criteria – Arrow's impossibility theorem – Second Best solution – Calculation of National income, GNP, GNP Green GDP, Mundell – Fleming model – Effect of monetary and Fiscal Policies – Business cycle- Real Business cycle theory and New Keynesian approach

Unit VIII: Growth and Development (15 Questions)

Steady state growth – Harrod – Domar model, Balanced and unbalanced growth theories – Rostow's growth model – New Growth theory – Theories of dualism – Regional, national and international dualism models – Composition and Direction of foreign trade – BOP disequilibrium – Methods to correct disequilibrium – New International Economic order – Functions of IMF, IBRD and ADB.

Unit IX: Stabilisation Policies (15 Questions)

Monetary Policy instruments – Creation of Money and Creation of credit – Role of Banks and NBFIs – Money multiplier – Fiscal Policy instruments – Taxes – Government expenditure – Government debts – Deficits – Budget – FRBM – Fiscal federalism – Fiscal multiplier

Unit X: Indian Economy (30 questions)

Leading issues in India and in Tamil Nadu – Human Development Index – Program in Human Development in India – Multi Dimensional Poverty – Poverty and Growth – Reforms on Poverty – India's demographic transition – Population policy in India – Unemployment and employment perspective

Characteristics of Indian Labour Market – Employment policy in India – Migrant labourers – Agriculture prospects and problems – Trends in Agricultural productivity – Land reforms and effects – Second Green Revolution – Industrialisation in India – Performance of MSMEs – Large Scale industries in India – New Industiral Policy of 1991 – New Direction of policy on Public Sector- Planning

Objectives and achievements at national and State level – Development strategy in India – Failures of Five Year Plans in India – NITI AAYOG – Liberalisation and Privatisation – Globalisation in India –

MNC’s – Global Financial Crisis and its impact on Indian Economy – Environmental degradation and sustainable development – Issues and Challenges.

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