Syllabus for Ph.D. Registration in Statistics

**Paper-1 (General)**

Duration:- 01 hr.

Maximum mrks:-50

Number of Questions:-50

Questions to be attempted:-50

Probability (4) : Probability Distribution : Binomial, Poisson and Normal (6), Test of significance : Large sample tests (2), small sample tests : t-test (1), F-test (1) and Chi-square test (2), Correlation and Regression: Simple , rank, Partial, Multiple correlation and regression (6), Sampling and Design of Experiments: Random Sampling Stratified Sampling (4), RBD, CRD, LSD (4), Linear Programming : simplex method, Methods of findings BFS for the transportation problems (4), Infrence : Testing of hypothesis , simple against simple, properties of good estimators (4), Time Series: Methods of measuring : linear trend , seasonal variations (4), Vital Statistics: Measures of fertility and Mortality(4), Queues and Stochastic Processes : Basics of queues : Markovchain ; Markov Process -(4)

Note:- The number shown in the brackets stand for the number of questions to be set from that very preceding topic.

Syllabus for Ph.D. Entrance Test in Statistics

Paper-I (Objective)

Duration : 02 Hours

Marks : 200

**Research Methodology**

Measurement scales; Sources of data: Primary & Secondary; Measures of Central tendency & dispersion; Measures of skewness and kurtosis; Correlation and Regression: Simple, rank, Partial, Multiple correlation and regression, Basic concepts concerning testing the Hypothesis; Tests of Hypotheses.

Analysis of Variance: The basic principle of ANOVA; Analysis of one-way classified data; Analysis of two-way classified data, Applications of the technique of ANOVA, Nonparametric tests: The ordinary sign test, Wilcoxon Signed-rank test and Kolmogrov-smirnov tests.

**Probability Theory & Inference**

Basic concepts of probability: Random variable, sample space, events, different definitions of probability, distribution functions. Additive law of probability, theorem of total probability, theorem of compound probability and Baye’s theorem.

Tchebycheff’s and Kolmogorov’s inequalities, Various modes of convergence: in probability, almost sure, in distribution and in mean square and their inter-relationship. Central Limit Theorems.

Properties of a good estimator, Concept of likelihood function, Cramer-Rao inequality, Bhattacharya Bounds, Minimum mean square estimation, Rao-Black well theorem, Methods of Estimation.

**Statistical Methods:**

Binomial, Poisson, Geometric, Normal, Exponential, Beta and Gamma distributions. Sampling distributions; Student-t distribution, F-distribution and Chi-square distribution. Simple tests based on t, f, Chi-square and normal variate z.

**Sampling Theory and Design of Experiment:**

Simple random sampling, systematic sampling, stratified sampling; allocation problems in stratified sampling, sampling with probability proportional to size, Horvitz Thompson and Desraj estimators for a general sample size and Murthy’s estimator for a sample of size two. Basic principles of experimental design. Construction and analysis of completely randomized, randomized blocks and Latin-square designs. Factorial experiments: symmetrical factorials. Factorial experiment with each factor at two levels

**Multivariate Analysis**

Multivariate normal distribution Marginal and Conditional distributions. Estimation of the mean vector and covariance matrix, maximum likelihood estimator of the parameters of multivariate normal distribution. The distribution of the sample mean vector and sample dispersion matrix. Hotteling’s T2 and Mahalanobis-D2 Statistic; distribution and uses. Principal components and Canonical correlation in the population.

**Applied Statistics**

Analysis of Time-series: Components of time series; measurement of (i) secular-trend (ii) seasonal fluctuations (iii) cyclic fluctuation.

Statistical Quality Control: different types of quality measures, technique of control charts, 3 sigma control limits, control charts of mean, s.d. and range, Natural tolerance limits and specification limits.

Vital Statistics Methods: Measurement of mortality and measurement of fertility.

Demand Analysis: Price-elasticity of demand and supply; Income-elasticity of demand.

Index numbers: Purpose of the index, choice of the base period, choice of commodities, collection of data, choice of weights, Interpretation of the index, Tests for index numbers.

Reference:

1. Kingman, J F C & Taylor, :Introduction to Measure and Probability.

S.J. (1966). :Cambridge University Press.

2. Bhat, B.R. :Modern Probability Theory, Wieley,Eastern

3. Kendall and Stuart : Advanced Theory of Statistics Vol.-II

4. Kaley, B.K. : A first course on Parametric Inference.

5. Kapur, J.N. Sexena, H.C. : Mathematical Statistics & S. Chand & Co.

6. Goon, A.M., Gupta, M.K. : Fundamental of Statistics, Vol.II ed. VI

and Dasgupta, B. word Press Calcutta 1988.

7. Cochran W.G. : Sampling Techniques (3rd Edition, 1977), Wiley.

8. Des Raj and Chandak (1988) : Sampling Theory, Narosa.

9. Das M.N. and Giri N (1979) : Design and Analysis of Experiments, Wiley

Eastern.

10. Anderson T.W. (1983) : An Introduction of Multivariate Statistical

analysis, second Edition John Wiley.

11. Bhuyan, K.C. : Multivariate Analysis and its applications.

12. Das, M.N. Giri N. (1979) : Design and Analysis of experiments, Wiley

Eastern.

13. C.R. Kothari : Research Methodology, Methods and Techniques, Wiley Eastern Ltd.

**Note:-** Total number of questions to be set are eight. A candidate will be required to attempt four questions selecting one from each unit.