

RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

**SCHEME & SYLLABUS FOR THE POST OF ASSISTANT
CONSERVATOR FOREST & FOREST RANGE OFFICER GRADE Ist
COMPETITIVE EXAMINATION, 2018
FOREST DEPARTMENT**

OPTIONAL SUBJECT - STATISTICS

- 1. Descriptive Statistics :** Frequency distribution, graphic representation of a frequency distribution:- Histogram, frequency polygon, frequency curve and Ogive curve. Measures of central tendencies, different measures of dispersion, skewness, kurtosis, moments.
- 2. Bivariate Analysis :** Correlation- Karl-Pearson's and Spearman's rank correlation. Linear regression and curvilinear regression. Theory of attributes - consistency of data, independence of attributes, association of attributes. Yule's co-efficient of association and co-efficient of colligation.
- 3. Probability :** Random experiment, sample space and events, probability measures and probability space, random variable as a measurable function, addition and multiplication theorems on probability, conditional probability and Baye's theorem. Distribution function of a random variable, discrete and continuous random variables, probability mass function, probability density function, bivariate random variables, marginal and conditional distributions, stochastic independence of events and random variables, expectation and moments of random variables, conditional expectation, convergence of a sequence of random variable in a distribution, in probability and almost everywhere. Borel-Cantilli lemma, Chebyshev's and Khinchine's weak laws of large number, strong law of large numbers and Kolmogorov's theorems. Probability generating function, characteristics function, inversion theorem, Laplace transform, related uniqueness and continuity theorems, determination of distribution by its moments. Linderberg and Levy forms of central limit theorem.

4. Probability distributions : Binomial, Poisson, Negative binomial, Geometric and Hypergeometric. Rectangular, Normal, Exponential, Cauchy's, Gamma and Beta distribution.

5. Sampling distributions : Chi-square, Student's t and Fisher's t and F distributions and their properties & interrelationships.

6. Statistical Inference : Point estimation - consistency, unbiasedness, efficiency, sufficiency, minimal sufficiency and completeness, Factorization theorem, minimum variance unbiased (MVU) estimator, Uniformly minimum variance unbiased (UMVU) estimator, Rao-Blackwell and Lehmann-Scheffe theorems, Cramer-Rao inequality for single parameter of a distribution. Minimum variance bound (MVB) estimator and its properties, Bhattacharyya's bounds. Estimation by method of moments, maximum likelihood, least square and minimum chi-square. Properties of maximum likelihood estimators. Interval Estimation-Confidence interval and confidence co-efficient. Testing of Hypothesis : Simple, Composite, Null and Alternative hypotheses. Types of errors, critical region, level of significance, power of the test, most powerful test, Uniformly most powerful (UMP) test, Neyman - Pearson's lemma, likelihood ratio test. Non-parametric tests - Sign test, Run test, Wilcoxon signed-ranks test, Kolmogorov - Smirnov two sample test, Wilcoxon-Mann-Whitney test, Median test.

Wald's SPRT and its properties, OC and ASN function, Wald's fundamental identity, Sequential estimation.

7. Sampling Theory : Probability and non-probability sampling schemes, simple random sampling with and without replacement, Stratified random sampling, Systematic sampling, Cluster sampling, Two stage and Multistage sampling. Ratio and Regression methods of estimation involving one auxiliary variable, Two phase sampling, probability proportional to size sampling with and without replacement, the Hansen-Hurwitz and the Horvitz - Thompson estimators, sampling and non-sampling errors.

8. Design of Experiment : Fixed effect model, random effect model and mixed model. Theory of least squares and Analysis of Variance for one way and two way classified data, Gauss-Markoff theorem, Normal equations. Basic principles of design of experiments, Completely randomised design (CRD),

Randomised block design (RBD), Latin Square design (LSD) and their analysis, incomplete block designs. Concepts of orthogonality and balance. Balanced incomplete block designs (BIBD), missing plot technique, Factorial experiments : 2^n , 3^2 and 3^3 factorial experiments, confounding in factorial experiments and their analysis.

9. Multivariate Analysis : Multivariate normal distribution, Hotelling's T^2 and Mahalanobis D^2 statistics and their properties and applications. Discriminant analysis, canonical correlation, one way multivariate analysis of variance (MANOVA), Principal Component Analysis, Elements of Factor Analysis. Multiple regression, multiple and partial correlations.

10. Statistical Quality Control : Process and product control, General theory of control charts, different types of control charts for variables and attributes : \bar{X} , R, s, p, np and c charts, Lot tolerance limits and Specification limits. Concepts of producer's and consumer's risk, AQL, LTPD and AOQL, Rectifying Inspection Plans, Single and Double sampling plans.

11. Economic Statistics : Index numbers-Laspeyre's, Paasche's Marshall-Edgeworth, Drobish-Bowley and Fisher's ideal index numbers, chain-base index numbers. Uses and limitations of index numbers. Index number of wholesale prices, consumer price index number, criteria of good index number.

12. Time Series Analysis : Components of time series, measurements of trend, measurements of seasonal variations. Auto-regression of first and second order, auto-correlation and correlogram.

13. Vital Statistics : Methods of obtaining vital statistics, Construction and uses of vital rates and ratios, measures of mortality, measures of fertility, reproduction rates. Life tables-Construction and uses of life tables.

Note :- **Pattern of Question Paper**

- 1. Objective type paper**
- 2. Maximum Marks : 200**
- 3. Number of Questions : 120**
- 4. Duration of Paper : Three Hours**
- 5. All questions carry equal marks.**
- 6. There will be Negative Marking.**