

# **RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER**

## **SYLLABUS FOR THE POST OF ASSISTANT STATISTICAL OFFICER (AGRICULTURE DEPARTMENT)**

**(1) Descriptive Statistics :** Classification, tabulation and frequency distribution. Diagrammatic and Graphical Representation: Bar diagram, Pie chart, histogram, frequency polygon, frequency curve. Measures of central tendency: Arithmetic mean, geometric mean, harmonic mean, median, mode, quartiles, deciles and percentiles. Measures of Dispersion : Range, quartile deviation, mean deviation standard deviation, variance, co-efficient of variation, moments, measures of skewness and kurtosis.

**(2) Probability:** Classical and Axiomatic approaches of probability, Conditional Probability, Bayes theorem, Simple problems on Probability. Random variable and Mathematical Expectation with applications, Chebychev's inequality, Probability distributions: Probability mass function, Probability density function and their properties. Concept of moment generating function, cumulant generating function and characteristic function.

**(3) Theoretical distributions:** Discrete probability distributions :Bernoulli, binomial, Poisson, negative binomial, geometric and hypergeometric. Continuous probability distributions: Rectangular, normal, gamma and beta type one and type two and Cauchy. Sampling distributions: Chi-square, t-distribution, F-distribution their applications and inter-relationship.

**(4) Correlation, Regression and Multivariate Analysis:** Karl-Pearson's co-efficient of correlation and Spearman's rank correlation co-efficient, simple linear regression, method of least squares. Multivariate Normal Distribution, Hotelling's  $T^2$  distribution. Discriminant, Principal Component and Factor Analysis. Wishart's distribution and its properties.

**(5) Sampling methods:** Simple random sampling with and without replacement, stratified random sampling, cluster sampling, systematic sampling, sampling for proportions.

**(6) Experimental Design:** Concept of analysis of variance (ANOVA) for one way and two way classified data, uniformity trials, principles of design of experiments. Completely randomised design (CRD), Randomised block design (RBD), Latin square design (LSD), missing plot technique,  $2^2$  and  $2^3$  factorial experiments in RBD, complete and partial confounding.

**(7) Theory of estimation and Testing of Hypothesis:** Point and interval estimation, properties of estimators. Methods of estimation :method of least squares and maximum likelihood estimation. Confidence interval and confidence limits. Concept of hypothesis, types of errors, Neyman-Pearson's lemma, parametric tests for large and small samples. Non-parametric tests : run, sign and median.

**(8)Time Series Analysis and Index Number:** Components, Measurements of Trend, Seasonal, Cyclical and irregular variations, Autocorrelation, Auto regression, Periodogram. Uses, types, tests and limitations of index numbers, construction of index numbers, simple and weighted aggregate method, Simple and weighted average price-relatives, Chain base index numbers, base shifting, Splicing and Deflating of Index numbers, cost of Living index numbers.

**(9)Agriculture Statistics and Statistical Organization in India:** Importance of Statistics in Agriculture, Agricultural statistical system in India, Agricultural Census, Livestock Census, Land use statistics. Agriculture Survey.National Agricultural Production Index.Crop production Index, CSO, NSSO, National Income Statistics, Population Census.

**(10) Interpolation, Extrapolation and Numerical Integration:** Finite differences, divided differences, Newton's forward and backward interpolation , Newton's divided difference interpolation, Lagrange's interpolation, Starling's interpolation and Bessel's interpolation formulae, Simpson's  $1/3$ rd and  $3/8$  th rule of numerical integration.

**Linear Programming :** Graphical method of solution of linear programming in two variables, convex sets and their properties, simplex method, Assignment problems, Transportation problems.

**(11)Matrices** :Various types of matrices, their basic operations and properties. Rank of a Matrix ; Invertible matrices and their inverse. Determinants : Determinant of a square matrix and their properties. Solution of system of linear equations in two or three variables using inverse of a matrix.Theory of equations:Relation between the roots and coefficients of general polynomial equation in one variable. Transformation of equations.Descartes' rule of signs.

**(12)Calculus** :Partial derivatives, curvature, asymptotes, envelopes and evolutes, maxima and minima of functions upto two variables, Beta and Gamma functions, double and triple integrals.

**Advanced Calculus** : Mean value theorems (Rolle's, Lagrange's, Taylor's theorems), sequence and series with convergence properties.

**(13) Ordinary and Partial differential equations** :Linear differential equations of first order and higher degree, Clairaut's form, Linear differential equations of constant coefficients, ordinary homogeneous differential equations, Linear differential equations of second order with variable coefficients. Partial differential equations of first order, solution by Lagrange's method.

**(14) Integral transforms and Special functions** :Hypergeometric functions, Legendre's polynomials, Bessel's functions. Recurrence relations and orthogonal properties. Laplace transform, inverse Laplace transform. Fourier sine and cosine transforms. Convolution theorem.

\*\*\*\*\*

Pattern of Question Paper:

1 Objective Type Paper.

2 Maximum Marks:180

3 Number of Questions:180

4 Duration of Paper: Three Hours.

5 All Questions carry equal marks.

6 Medium of Screening Test : Bilingual English & Hindi

7 There will be **Negative Marking.**

*(For every wrong answer, one third of marks prescribed for that particular question will be deducted)*

\*\*\*\*\*