Indira Gandhi
National Open University
School of Sciences

# MST-004
# STATISTICAL INFERENCE

Block

# 4

## NON-PARAMETRIC TESTS

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**Acknowledgement:** I gratefully acknowledge my colleague Mr. Rajesh Kaliraman , Statistics Discipline, School of Sciences for their great support.

July, 2013
© *Indira Gandhi National Open University, 2013*
ISBN-978-81-266-

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*Further information on the Indira Gandhi National Open University may be obtained from University's Office at Maidan Garhi, New Delhi-110068 or visit University's website http://www.ignou.ac.in*

Printed and published on behalf of the Indira Gandhi National Open University, New Delhi by the Director, School of Sciences.

Printed at:

# NON-PARAMETRIC TESTS

In the previous block, we described the procedure for testing various hypotheses involving population parameter(s) such as mean(s), proportion(s), variance(s), etc. But in many real life problems particularly in Social and Behavioural Sciences where the requirement of parametric tests cannot be satisfied, that is, neither one can know the form of population nor the observations measured in quantitative form. In such situations, the parametric tests are not applicable. Thus, statisticians discovered various tests and methods which are independent of population distribution and also applicable when the observations are not measured in numerical scale that is in ordinal scale or nominal scale. These tests are known as "Non-parametric tests" or "Distribution Free Tests".

**Unit 13: One-Sample Tests**

This unit explains the need of non-parametric tests and application of non-parametric tests in various fields with their advantages and disadvantages over parametric tests. In this unit, some of the frequently used non-parametric tests for one sample such as sign test, Wilcoxon signed-rank test, run test and Kolmogorov-Smirnov goodness of fit test are discussed.

**Unit 14: Two-Sample Tests**

This unit explores two samples tests such as paired sign test, Wilcoxon matched-pair signed-rank test, Mann-Whitney U test and Kolmogorov-Smirnov test.

**Unit 15: k-Sample Tests**

This unit provides the brief discussion on the procedures for testing for the significance of differences among three or more populations. Kruskal -Wallis test and Friedman test for k( > 2) samples are discussed.

**Unit 16: Analysis of Frequencies**

Last unit of this block is devoted to describe the procedure of chi-square tests for categorical data such as goodness of fit test and test for independence of two attributes.

## Notations and Symbols

| | | |
|---|---|---|
| $X_1, X_2, ..., X_{n'}$ | : | Random sample of size $n'$ |
| $H_0$ | : | Null hypothesis |
| $H_1$ or $H_A$ | : | Alternative hypothesis |
| $\alpha$ | : | Size of critical region or type-I error or level of significance |
| $\tilde{\mu}$ | : | Median |
| $\lvert d \rvert$ | : | Absolute value of d |
| $S^+$ and $S^-$ | : | Number of plus and minus signs |
| $T^+$ and $T^-$ | : | Sum of positive and negative ranks |
| $T_\alpha$ | : | Critical value of Wilcoxon signed-rank test at $\alpha$ level of significance |
| R | : | Number of runs |
| $R_L$ and $R_U$ | : | Lower and upper critical values of run test at $\alpha$ level of significance |
| F(x) | : | Cumulative distribution function of the population |
| S(x) | : | Empirical or observed or sample cumulative distribution function |
| $\sup_x \lvert d(x) \rvert$ | : | Supreme over all x, of the absolute value of d(x) |
| $U_{L,\alpha}$ and $U_{U,\alpha}$ | : | Lower and upper critical values of Mann-Whitney U test at $\alpha$ level of significance |
| $\chi^2_{(\nu),\alpha}$ | : | Critical value of $\chi^2$-test with $\nu$ degrees of freedom at $\alpha$ level of significance |