PROPOSED METHODS FOR THE NONDECREASING ORDER-RESTRICTED ALTERNATIVE IN A MIXED DESIGN

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DOCTOR OF PHILOSOPHY

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ABSTRACT

Nonparametric statistics are commonly used in the field of statistics due to their robustness when the underlying assumptions are violated for the usual parametric statistics. In this dissertation, we proposed eight nonparametric methods to test for nondecreasing ordered alternative for a mixed design consisting of a combination of completely randomized design (*CRD*) and randomized complete block design (*RCBD).* There were four nonparametric tests, based on the Jonckheere-Terpstra test and modifications of it, employed to propose these nonparametric methods.

A Monte Carlo simulation study was conducted using *SAS* program to investigate the performance of the proposed tests under a variety of nondecreasing location shifts among *three, four* and *five* populations and then compare these powers to each other and with the powers of the test statistics introduced by Magel et al. (2009). Three underlying distributions are used in the study including the standard normal distribution, the standard exponential distribution and student's t-distribution (3 degrees of freedom). We considered three scenarios of proportions of the number of blocks in the *RCBD* portion to the sample size in the *CRD* portion, namely, assuming that the portion of the number of blocks in *RCBD* is *larger*, *equal*, and *smaller* than the portion of the sample size in the *CRD*.

Moreover, equal and unequal sample sizes were both considered for the *CRD* portion. The results of the simulation study indicate that all the proposed methods maintain their type one error and also indicate that at least one of the proposed methods did better compared to the tests of Magel et al. (2009) in terms of the estimated powers. In general, situations are found in which the proposed methods have higher powers and situations are found in which tests in Magel et al. (2009) have higher powers.

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DEDICATION

To My Kids: Yasser and Nora, with love

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CHAPTER 1. INTRODUCTION

Statistical analysis has a very central role in terms of making decisions in real-life applications. Hence, a detailed knowledge of statistical procedures is required to help making the correct decision. As an example, let us suppose researchers are interested to know which statistical inference tests can be used to conduct hypothesis testing. Statistically speaking, there are two classifications of tests that can be applied; parametric and nonparametric. Some of these tests rely heavily on underlying assumptions about the nature of the population from which the data are drawn. These tests are called parametric (sometimes referred to as classical) tests due to their concentration on specific parameters of the population. For instance, the analysis of variance test, *ANOVA*, is a procedure for testing the differences among a group of means requires that the random samples should be mutually independent and drawn from normally distributed populations with equal variances.

In practice, sometimes researchers may not have complete knowledge about the underlying population distributions. Thus, the researchers would not be able to be sure whether the assumptions are met or not. In such cases, any conclusions based on these tests can be misleading. Nonparametric, or sometimes distribution-free, tests consider one of the alternative approaches to conduct tests on populations that have not met the required assumptions.

Hollander and Wolfe (1999) have shown several advantages of using nonparametric tests. Nonparametric tests are often easier to apply due to the fact that they require few assumptions about the populations. For example, nonparametric tests do not require that the underlying distributions of populations are known beforehand, whereas in parametric tests this assumption is necessary. Nonparametric tests are often more convenient than the parametric counterparts in cases where the population does not follow normal distribution. Moreover, nonparametric tests are found

to be less sensitive when the data contains outlier observations. Lastly, nonparametric tests are often more useful than the parametric tests in the analysis of ordinal scale data due to the fact that they do not require the actual magnitude of the observations (Gibbons, 1993).

1.1. Motivation

In many experimental studies, the aim of using nonparametric tests is to test the effect of treatments by conducting a hypothesis test. In order to do so, researchers need to determine the nature of the hypothesis test and the design structure for the test. Occasionally, the null hypothesis is used to test that there are no differences among treatment effects. Though, in terms of the alternative hypothesis, the treatments sometimes follow a priori order. In such cases, the so-called ordered alternative may be more appropriate than testing the alternative that the treatments effects are different. The scope of our dissertation concentrates on the nondecreasing ordered alternative hypothesis. That is,

$$H_0\colon\ \mu_1 = \mu_2 = \cdots = \mu_k$$

versus

$$H_1\colon\ \mu_1 \leq \mu_2 \leq \cdots \leq \mu_k$$ (with at least one strict inequality).

As for the design structure, it is possible that researchers may run an experiment by choosing a specific design structure for the test. However, after a while, the researchers may realize that they cannot continue with their initial design structure due to some reasons beyond their control and might need to shift to another design structure before the experiment is completed. According to Magel et al. (2009), let us suppose a large company is interested in controlling the increasing cost of insurance of its employees. In order to achieve its goal, the company introduces a wellness program in an attempt to enhance the overall health by reducing the average cholesterol level, *LDL*, of its employees. To test the competence of the program, the company

starts measuring the cholesterol levels of random employees' samples – after their consent – three times in two years: at the beginning of the program and two times, annually, afterward. However, because the company is large and has an annual turnover of nearly 18% in its employees, many observations become obsolete because their donor employees left the company before completing them; therefore, their cholesterol level cannot be obtained anymore. To counter this problem, the company decides to discard observations that were incomplete for at least one year and perform a test using only a randomized complete block design (*RCBD*) to get accurate results on cholesterol levels over two years.

Yet, the company realizes that it loses a lot of data by sticking to a randomized complete block design (*RCBD*) which, in turn, hampers its effort to enhance its employees' overall health. Thus, the company comes up with an idea to take advantage of the leftover observations that do not constitute a complete block and collect more observations in next years using a completely randomized design (*CRD*). Therefore, a required statistical test combines the observations from the randomized complete block with those from the completely randomized design is needed.

Page (1963), Jonckheere (1954) and Terpstra (1952) were among the first who proposed nonparametric tests for testing nondecreasing ordered alternatives. However, Page (1963) proposed a test that can be used when the design structure is viewed as a randomized complete block design (*RCBD*). Jonckheere-Terpstra test can be used when the design structure is viewed as a completely randomized design (*CRD*).

Magel, Terpstra, and Wen (2009) have introduced two nonparametric tests for the nondecreasing order alternatives in a mixed design. These two tests were a combination of Page and Jonckheere-Terpstra tests. A simulation study was conducted to compare the power of these tests with the power of Page test. The conclusion of the simulation showed that it would be more

appropriate to use one of their tests instead of tossing out some observations and stick with a randomized complete block design (*RCBD*).

1.2. Outline of the Dissertation

The aim of this dissertation is to provide new nonparametric methods for the nondecreasing ordered alternative in cases where we have a mixed design. The proposed methods are based on the Jonckheere-Terpstra test and modifications of it. Additionally, the design structure for these tests is a combination of a randomized complete block design and a completely randomized design. A simulation study is conducted to compare the power of these newly proposed methods with the tests proposed by Magel et al. (2009) for *three*, *four* and *five* populations under a variety of distributions. Powers of all methods used in the study are estimated based on a significance level of 0.05.

The outline of this dissertation is structured as follows: Chapter 2 introduces a review of the literature for the relevant tests for ordered alternative in the *CRD*, *RCBD* and mixed designs. In Chapter 3, we introduce the main contribution of this dissertation by presenting the newly proposed methods along with an illustrative example. Chapter 4 describes the design of the simulation study that will be used to study the performance of the proposed tests. Chapter 5 presents the results of the simulation study described in Chapter 4. Chapter 6 discusses the conclusion, limitation, and future work of this research.

CHAPTER 2. REVIEW OF LITERATURE

2.1. Introduction

There are a number of proposed parametric and nonparametric test statistics that can be used for analyzing data from independent samples. If the main interest of researchers is to do comparison between two location parameters (means or medians) on a single response variable, one can possibly apply the two independent samples t-test or the Mann-Whitney test, which is a nonparametric test. In this chapter, we provide an overview of previous work regarding the nonparametric test statistics to test for differences in location for various designs, including the randomized complete block design (*RCBD*), the completely randomized design (*CRD*) and the mixed designs.

2.2. Relevant Literature

2.2.1. Mann-Whitney Test

Mann and Whiney (1947) considered a general procedure for testing the differences between two treatment effects in terms of location parameters. The hypotheses for this test can be formulated as follows:

$$H_0\colon \mu_1 = \mu_2 \quad \text{vs} \quad H_1\colon \mu_1 < \mu_2 \quad \text{or} \quad H_1\colon \mu_1 > \mu_2 \quad \text{or} \quad H_1\colon \mu_1 \neq \mu_2$$

where μ_i is the location parameter for the i^{th} population. This procedure does assume two independent samples. It also assumes the populations that differ only in location, if they differ. The test statistic is known as the *U*-statistics of Mann-Whitney and can be defined as

$$U = \sum_{i=1}^{n_x} \sum_{j=1}^{n_y} \emptyset(X_i, X_j) \tag{2.1}$$

$$\text{with} \quad \emptyset(X_i, X_j) = \begin{cases} 1, & \text{if } X_i < X_j \\ 0, & otherwise \end{cases}$$

Under H_0, the test statistic has an asymptotic normal distribution with mean and variance $\frac{n_x n_y}{2}$ and $\frac{n_x n_y (n_x + n_y + 1)}{12}$, respectively. Furthermore, in the case of no ties, the test statistic can be rewritten in terms of Wilcoxon two-sample rank sum test (1945) as follows:

$$U = W - \frac{n_y(n_y + 1)}{2} \tag{2.2}$$

where $W = \sum_{j=1}^{n_y} R(Y_j)$ is the Wilcoxon two-sample rank sum test statistic and $R(Y_j)$ represents the joint ranking of the two samples.

2.2.2. Dubnicka, Blair, and Hettmansperger Test

Dubnicka, Blair, and Hettmansperger (2002) introduced a rank-based nonparametric approach to testing hypotheses in a mixed two-sample design. The mixed design is a mixture of paired data and independent observations. Since the design was a combination of paired data and independent observations, the Wilcoxon signed rank statistic (S^+) was applied to the paired data, and the Mann-Whitney statistic (U^+) was applied to the independent samples. That is,

$$T^+ = S^+ + U^+ \tag{2.3}$$

Under H_0, the standardized version of the proposed approach by Dubnicka et al. (2002) can be written as

$$Z = \frac{T^+ - E_0(T^+)}{\sqrt{Var_0(T^+)}} \tag{2.4}$$

where

$$E_0(T^+) = \frac{n(n+1)}{4} + \frac{n_1 n_2}{2} \tag{2.5}$$

and

$$Var_0(T^+) = \frac{n(n+1)(2n+1)}{24} + \frac{n_1 n_2 (n_1 + n_2 + 1)}{12} \tag{2.6}$$

where n denotes the sample size of the paired data portion and n_1 n_2 denote the sample sizes of the first sample and second sample, respectively. In equation (2.5), it can be seen that the mean of Dubnicka et al. (2002) test can be expressed as the sum of Wilcoxon signed-rank test and the Mann-Whitney test. where $\frac{n(n+1)}{4}$ denotes the mean of the Wilcoxon signed-rank test and $\frac{n_1 n_2}{2}$ denotes the mean of the Mann-Whitney test. Likewise, in equation (2.6), $\frac{n(n+1)(2n+1)}{24}$ and $\frac{n_1 n_2 (n_1+n_2+1)}{12}$ denote the variance of the Wilcoxon signed-rank test and the variance of the Mann-Whitney test, respectively.

Moreover, a weighted version of the proposed test (T^+) was also introduced by Dubnicka et al. (2002). That is,

$$T^* = \frac{2N}{(nN + 2n_1 n_2)(n+1)} S^+ + \frac{2}{nN + 2n_1 n_2} U^+ \qquad (2.7)$$

where $N = n_1 + n_2$.

Fu and Magel (2014) developed a nonparametric test statistic that is similar to the test proposed by Dubnicka et al. (2002). However, the idea of Fu's test is based on assigning equal weights, $\frac{1}{\sqrt{2}}$, to the standardized versions of Wilcoxon signed-rank test and the Mann-Whitney test, and then add them together. They concluded that the proposed test has higher power than the test of Dubnicka's et al. (2002) in situations when the sample portion of paired data is *equal* or *greater* than the sample portion for the independent data.

2.2.3. Kruskal -Wallis Test

Kruskal and Wallis (1952) proposed a nonparametric procedure for testing the treatment effects in cases where we have more than two independent samples. This test is known as the analogous test for the classical analysis of variance test, *ANOVA*. Of note, the Kruskal-Wallis test is considered as the extended version of Mann-Whitney test and does assume population

distributions are the same except a possible difference in locations. The hypotheses are formulated as follows:

$$H_0\colon\ \mu_1 = \mu_2 = \cdots = \mu_k$$

versus

$$H_1\colon\ \mu_i \neq \mu_j \qquad \text{(for some } i \text{ and } j\text{)}$$

where μ_i is the location parameter of the i^{th} population. The procedure for testing these hypotheses is to rank the data in order of magnitude from smallest to largest, keeping the identity of the sample to which the observations belong. In case of the ties, the average of ranks is assigned to those observations. The Kruskal-Wallis test is defined as follows:

$$H = \frac{12}{N(N+1)} \sum_{j=1}^{k} \frac{1}{n_j} \left(R_j - \frac{n_j(N+1)}{2} \right)^2$$

$$= \left(\frac{12}{N(N+1)} \sum_{j=1}^{k} \frac{R_j^2}{n_j} \right) - 3(N+1) \qquad (2.8)$$

where R_j is the sum of ranks in the j^{th} sample, N is the total number of observations in the k samples, and n_j is the number of observations in the j^{th} sample. Under H_0, for large sample size, the statistic H has an asymptotic chi-square (χ^2) distribution with k-1 degrees of freedom (Daniel,1990).

2.2.4. Jonckheere-Terpstra Test

Jonckheere-Terpstra test (referred to as *JT*) is a widely known nonparametric test for the nondecreasing ordered alternatives in the k-sample case when the design is a completely randomized. The test was proposed independently by Terpstra (1952) and Jonckheere (1954). For this test, the samples must be independent, and each sample is assumed to be drawn from a

continuous population in which the distribution is the same for each population and may only differ in the location parameters. The null hypothesis is:

$$H_0\colon\ \mu_1 = \mu_2 = \cdots = \mu_k$$

and the ordered alternative is

$$H_1\colon\ \mu_1 \leq \mu_2 \leq \cdots \leq \mu_k \qquad \text{(with at least one strict inequality).}$$

where μ_i is the location parameter of the i^{th} population.

The test statistic is based on the summation of $k(k-1)/2$ Mann-Whitney statistics. Namely, it can be expressed as

$$JT = \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} U_{ij} \tag{2.9}$$

where U_{ij} is the U-statistics of Mann-Whitney and is defined as the number of pairs of observations (X_{ia},X_{ib}) in which X_{ia} is less than X_{ib}, once more, X_{ia} is the a^{th} observation in i^{th} treatment sample, $a = 1, 2, \ldots, n_i$ and X_{jb} is the b^{th} observation in j^{th} treatment sample, $b = 1, 2, \ldots, n_j$. Under the null hypothesis, H_0, the JT statistic follows an asymptotic normal distribution with mean

$$E(JT) = \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} \frac{n_i n_j}{2} = \frac{N^2 - \sum_{i=1}^{k} n_i^2}{4} \tag{2.10}$$

and variance

$$Var(JT) = \frac{N^2(2N+3) - \sum_{i=1}^{k} n_i^2(2n_i+3)}{72} \tag{2.11}$$

where $N = \sum_{i=1}^{k} n_i$, and n_i denotes the sample size of the i^{th} treatment. However, the asymptotic normality of JT depends on the number of samples. Jonckheere (1954) mentioned that the normality approximation might be inaccurate if only one n_i tends to infinity as N increases.

Therefore, to achieve the normality approximation, at least two samples increase as N tends to infinity. Therefore, the standardized version of the test statistic, JT, is defined as

$$Z_{JT} = \frac{JT - \left[(N^2 - \sum_{i=1}^{k} n_i^2)/4\right]}{\sqrt{[N^2(2N+3) - \sum_{i=1}^{k} n_i^2(2n_i+3)]/72}} \tag{2.12}$$

Mahrer and Magel (1995) did a comparison between the JT, Cuzick and Le tests. The results of their comparison indicated that the tests are the same in terms of the power and concluded that one can utilize the test that is easiest to use.

2.2.5. Modified Jonckheere -Terpstra Test

Tryon and Hettmansperger (1973) introduced a modified version of the *JT* test, *MJT*. Both tests, *JT* and *MJT*, are dealing with the nondecreasing ordered alternatives. However, the *MJT* test assigns more weights for each Mann-Whitney statistic based on the distance between the i^{th} and j^{th} populations. Thus, if the distance between the two populations is considered to be large, more amount of weight will be assigned to each Mann-Whitney statistic. The test statistic can be written as follows:

$$MJT = \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} (j-i) U_{ij} \tag{2.13}$$

Under H_0, the asymptotic distribution for the test statistic follows a normal distribution with mean

$$E_0(MJT) = \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} (j-i) \frac{n_i n_j}{2} \tag{2.14}$$

and variance

$$Var_0(MJT) = Var\left\{\sum_{i=1}^{k-1}\sum_{j=i+1}^{k}(j-i)U_{ij}\right\} \tag{2.15}$$

$$= \sum_{i=1}^{k-1}\sum_{j=i+1}^{k}(j-i)^2\ Var\left(U_{ij}\right) + 2\sum_{i=1}^{k-1}\sum_{j=i+1}^{k}\sum_{s=1}^{k-1}\sum_{t=s+1}^{k}(j-i)(t-s)\ Cov\left(U_{ij}, U_{st}\right)$$

where the values of the variance and the covariance terms can be defined as in Hollander and Wolfe (1999) where

$$Var\left(U_{ij}\right) = \frac{n_i n_j\left(n_i + n_j + 1\right)}{12} \quad \text{for } 1 \le\ i\ \le\ j\ \le\ k \tag{2.16}$$

$$Cov\left(U_{ij}, U_{pq}\right) = \begin{cases} \dfrac{n_i n_j n_q}{12} & if \quad 1 \le i, p \le j \le k, j \ne q \\ -\dfrac{n_i n_j n_p}{12} & if \quad 1\ \le p < j \le k, i = q \\ -\dfrac{n_i n_j n_q}{12} & if \quad 1 \le\ i < j < q \le k, j = p \\ \dfrac{n_i n_j n_p}{12} & if \quad 1 \le i, p \le j \le k, i \ne p \\ 0 & if \quad i, j, p, q \text{ are different} \end{cases} \tag{2.17}$$

To illustrate the procedure, let assume that we are sampling from three populations (k = 3) with unequal sample sizes. The variance of the modified Jonckheere-Terpstra can be derived as

$$\begin{aligned} Var(MJT) &= Var(U_{12} + 2U_{13} + U_{23}) \\ &= Var(U_{12}) + 4\,Var(U_{13}) + Var(U_{23}) + 4\,Cov(U_{12}, 2U_{13}) + 2Cov(U_{12}, U_{23}) \\ &\quad + 4\,Cov(U_{13}, U_{23}) \\ &= \frac{n_1 n_2(n_1 + n_2 + 1)}{12} + 4\frac{n_1 n_3(n_1 + n_3 + 1)}{12} + \frac{n_2 n_3(n_2 + n_3 + 1)}{12} + 6\frac{n_1 n_2 n_3}{12} \\ &= \frac{n_1 n_2(N+1)}{12} + 4\frac{n_1 n_3(N+1)}{12} + \frac{n_2 n_3(N+1)}{12} \\ &= \frac{(n_1 n_2 + 4n_1 n_3 + n_2 n_3)(N+1)}{12} \end{aligned}$$

In such way, we can estimate the variance for situations where we have *four* and *five* populations. For further information, see Appendix. Consequently, the standardized version of the modified Jonckheere-Terpstra can be written as follows

$$Z_{MJT} = \frac{MJT - E_0(MJT)}{\sqrt{Var_0(MJT)}} \tag{2.18}$$

Neuhäuser et al. (1998) illustrated that in situations when the sample sizes are relatively small, the modified Jonckheere-Terpstra (MJT) has higher power than the original Jonckheere-Terpstra (JT).

2.2.6. Terpstra and Magel Test

Unlike the *JT* and *MJT* tests, which are dependent on information that is obtained from all the $k(k-1)/2$ pairs of samples, Terpstra and Magel (2003) introduced a new nonparametric test for testing the nondecreasing ordered alternative that does not depend on pairwise information. Instead, it depends on the information that is obtained across all samples at the same time. The test statistic is given as follows

$$TM = \sum_{i_1=1}^{n_i} \cdots \sum_{i_k=1}^{n_k} I(X_{1i_1} \leq X_{2i_2} \leq \cdots \leq X_{ki_k}) \tag{2.19}$$

where $I(X_{1i_1} \leq X_{2i_2} \leq \cdots \leq X_{ki_k})$ is the indicator function that is equal to one only when there is at least one strict inequality and zero otherwise. Terpstra and Magel (2003) compared their test to the Kruskal-Wallis (*H*), the *JT*, and the *MJT* tests. The result indicated that the proposed test has fairly higher power when the priori ordering is correct. However, if it is the other way around, the proposed test can have smaller power than the *JT*, and the *MJT* tests.

Some other noteworthy contribution that is related to the *TM* test is the nonparametric test proposed by Ferdhiana et al. (2008). For this test, it is similar to the test proposed by Terpstra and Magel (2003), with the exception of function. Ferdhiana et al. (2008) used the Kendall's Tau correlation coefficient instead of the indicator function used in the *TM* test.

Moreover, another nonparametric test is given by Terpstra et al. (2011) that is analogous test to the *TM*; however, in this test the indicator function in (2.19) was replaced by Spearman's correlation coefficient. The result of both tests indicate that the proposed test has higher power than the *JT*, the *MJT* and the *TM* when the sample sizes are small with large shift between the two adjacent location parameters.

2.2.7. Page Test

Page test (referred to as *L*) is a nonparametric procedure that is applicable for testing nondecreasing ordered alternative when the data can fit the two-way analysis of variance structure. This procedure developed by Page (1963). (Daniel, 1990) mentioned several assumptions for the validity of this test, including the independency of blocks, and no relation, interaction, between the blocks and the treatments. The hypotheses for the Page test, *L*, are similar to the hypotheses stated in Jonckheere-Terpstra test where the null hypothesis states that there are no differences among treatments, and the alternative hypothesis state that the treatment affects follow a nondecreasing order with at least one strict inequality. The test statistic is

$$L = \sum_{j=1}^{k} jR_j \tag{2.20}$$

where R_j is the j^{th} treatment rank sum, based on the within block ranks of the original observations. Under H_0, the statistic *L* has an asymptotic normal distribution with mean and variance, $bk(k+1)^2/4$, $b(k^3-k)^2/144(k-1)$, respectively. The standardized version of the statistic *L* can be defined as

$$Z_P = \frac{L - [bk(k+1)^2/4]}{\sqrt{b(k^3-k)^2/144(k-1)}} \tag{2.21}$$

where *b* denotes the number of the blocks and *k* denotes the number of treatments. Under H_0, the statistic Z_P follows an asymptotic standard normal distribution (i.e., $N(0,1)$) and so the standard normal table can be used to get the critical values.

Moreover, under the randomized blocks, Hollander (1967) and Pirie (1974) showed some comparisons between Page test and some extant tests when an a priori ordering for the alternatives is identified. Their findings did not give significant differences among them in terms of the estimated powers.

2.2.8. Magel, Terpstra and Wen Tests

Magel et al. (2009) proposed two tests for the nondecreasing ordered alternatives in mixed design. Part of the design is considered a data from a randomized complete block design and the other part is considered a data from a complete randomized design. The proposed tests are a mixture of Page test and Jonckheere-Terpstra test. The first proposed test, can be written as follows:

$$C_1 = \frac{Z_p + Z_{JT}}{\sqrt{2}} \tag{2.22}$$

Under H_0, C_1 follows a standard normal distribution since the standardized version of the Page test, and the standardized version of the Jonckheere-Terpstra, Z_p, Z_{JT}, respectively, follow a standard normal distribution. Thus, the null hypothesis will be rejected when $Z_{C_1} \geq Z_\alpha$ where Z_α is the upper α quantile of the standard normal distribution.

The second proposed test is based on the idea of Dubnicka et al. (2002). In this test, the Page and Jonckheere-Terpstra tests were added together first and then standardized. That is,

$$C_2 = \frac{L + JT - E(0)}{\sqrt{Var(0)}} \tag{2.23}$$

where

$$E(0) = \frac{bk(k+1)^2 + (N^2 - \sum_{i=1}^{k} n_i^2)}{4} \tag{2.24}$$

and

$$Var(0) = \frac{b(k^3-k)^2}{144(k-1)} + \frac{N^2(2N+3) - \sum_{i=1}^{k} n_i^2(2n_i+3)}{72} \tag{2.25}$$

It can be noted that the mean and variance are the sum of the Page test and the Jonckheere-Terpstra test. More specifically, $\frac{bk(k+1)^2}{4}$ denotes the mean of the Page test and $\frac{(N^2-\sum_{i=1}^{k} n_i^2)}{4}$ denotes the mean of the Jonckheere-Terpstra. Similarly, $\frac{b(k^3-k)^2}{144(k-1)}$ and $\frac{N^2(2N+3)-\sum_{i=1}^{k} n_i^2(2n_i+3)}{72}$ denote the variance of the Page test (*L*) and the variance of the Jonckheere-Terpstra test (*JT*), respectively.

CHAPTER 3. DESCRIPTION OF PROPOSED METHODS

3.1. Introduction

In this chapter, we introduce the main contribution of this dissertation, in which eight nonparametric methods are proposed. These methods can be used when there are three or more populations and a priori nondecreasing pattern for the sample data is identified if the populations are different. The methods are generalizations of the Jonckheere-Terpstra (*JT*) test. A test for the completely randomized design (*CRD*) portion is calculated and also a test for the randomized complete block design (*RCBD*) portion is calculated. Standardized version of both test statistics (e.g., the *CRD* and *RCBD*) are added together and then unstandardized versions of the test statistics are added to obtain test statistics for the overall design.

As previously mentioned, the experimenters sometimes may start with one design structure and for some reasons they must shift to another design structure before the experiment is completed. Thus, the design structure for these methods is a mixed design which is a combination of a completely randomized design (*CRD*) and a randomized complete block design (*RCBD*). These methods are designed to test the following hypotheses

$$H_0\colon\ \mu_1 = \mu_2 = \cdots = \mu_k$$

versus

$$H_1\colon\ \mu_1 \leq \mu_2 \leq \cdots\ \leq \mu_k$$

with at least one strict inequality, where μ_i is the location parameter of the i^{th} population with i = 1, 2, …, k and k being the total number of populations. This form of alternatives hypothesis is known as the nondecreasing ordered alternative.

3.2. Proposed Methods

The Jonckheere-Terpstra (*JT*) test and some modifications of the *JT* test already exist for the completely randomized design (*CRD*). However, we need to propose new version of the *JT* test for the randomized complete block design (*RCBD*) portion of the design. The following sections provide more details of the proposed methods.

3.2.1. Method Number One

In Chapter 2, equation (2.12), we have given the standardized version of Jonckheere-Terpstra as

$$Z_{JT} = \frac{JT - \left[(N^2 - \sum_{i=1}^{k} n_i^2)/4\right]}{\sqrt{[N^2(2N+3) - \sum_{i=1}^{k} n_i^2(2n_i+3)]/72}}$$

where *JT* is defined as the unstandardized version of Jonckheere-Terpstra test. *N* is defined as the total sample size of all treatments and n_i is defined as the sample size of the i^{th} treatment. Under H_0, as $\min(n_1, n_2, \ldots n_k)$ tends to infinity,

$$Z_{JT} \xrightarrow{D} N(0,1)$$

This test will be used in to the completely randomized design portion. As for the randomized complete block design portion, we calculate the *JT* test for each block (i.e., JT_1, JT_2, …. , JT_l; l = *1*, *2*,…, *b*) so that JT_1 denotes the Jonckheere-Terpstra test for the first block, JT_2 denotes the Jonckheere-Terpstra test for the second block, and so on. After that, we add up together all the *JT* tests from each block to from the *BJT* test. That is,

$$BJT = \sum_{l=1}^{b} JT_l \tag{3.1}$$

where *b* is the number of blocks. It can be seen that *BJT* is expressed as the summation of the Jonckheere-Terpstra test values for each block. In like manner, we get the mean and variance for the new test *BJT*, namely,

$$E(BJT) = \sum_{l=1}^{b} E(JT_l) = \sum_{l=1}^{b} \left(\frac{k^2 - k}{4} \right) \tag{3.2}$$

and

$$Var(BJT) = \sum_{l=1}^{b} Var(JT_l) = \sum_{l=1}^{b} \left(\frac{k^2(2k+3) - 5k}{72} \right) \tag{3.3}$$

Here *k* is defined as the total number of treatments in each block. In this design, we consider *one* observation per block-treatment. The standardized version of *BJT* test can be written as follows:

$$Z_{BJT} = \frac{BJT - E(BJT)}{\sqrt{Var(BJT)}} \tag{3.4}$$

Further, under H_0, as min $(n_1, n_2, \ldots n_k)$ tends to infinity,

$$Z_{BJT} \xrightarrow{D} N(0,1)$$

The first proposed method for the nondecreasing ordered alternative in the mixed design, T_1, is given in equation (3.5)

$$T_1 = \frac{Z_{JT} + Z_{BJT}}{\sqrt{2}} \tag{3.5}$$

Here, we added the standardized version of *JT* and *BJT* together first and then we standardized the two tests by subtracting the means and divided by the standard deviations. Under H_0, as min $(n_1, n_2, \ldots n_k)$ tends to infinity, this test will follow an asymptotic normal distribution since it is a combination of two tests which follow a standard normal distribution. Moreover, the null

hypothesis, H_0, will be rejected when $T_1 \geq Z_\alpha$, where Z_α is the (1- α) 100% of the standard normal distribution.

3.2.2. Method Number Two

The second proposed method for the nondecreasing ordered alternatives in a mixed design is an extension of the idea of Dubnicka's et al. (2002). In this method, we add the unstandardized version of *JT* and *BJT* first, and then standardize them simultaneously. This test can be written as follows:

$$T_2 = \frac{T_2^* - [E(JT) + E(BJT)]}{\sqrt{Var(JT) + Var(BJT)}} \tag{3.6}$$

where

$$T_2^* = JT + BJT = \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} U_{ij} + \sum_{l=1}^{b} JT_l \tag{3.7}$$

Here, *k* is the number of treatments and *b* is the number of blocks. JT_l is the Jonckheere-Terpstra test for the l^{th} block. Under H_0, this method will also follow an asymptotic standard normal distribution as $\min(n_1, n_2, \ldots n_k)$ tends to infinity. The null hypothesis, H_0, will be rejected when $T_2 \geq Z_\alpha$.

3.2.3. Method Number Three

Recall the standardized version of the modified Jonckheere-Terpstra, Z_{MJT} , as written in equation (2.20) is as follows:

$$Z_{MJT} = \frac{MJT - E(MJT)}{\sqrt{Var(MJT)}}$$

where *MJT* is defined as the unstandardized version of modified Jonckheere-Terpstra test. Under H_0, as $\min(n_1, n_2, \ldots n_k)$ tends to infinity,

$$Z_{MJT} \xrightarrow{D} N(0,1)$$

This test will be used in the completely randomized design portion. As for the randomized complete block design portion, we calculate the *MJT* test for each block (i.e., MJT_1, MJT_2,..., MJT_l ; $l = 1, 2,\ldots, b$) so that MJT_1 denotes the modified Jonckheere-Terpstra test for the first block, MJT_2 denotes the Modified Jonckheere-Terpstra test for the second block, and so on. Then we sum up all the *MJT* tests together to from the *BMJT* test. That is,

$$BMJT = \sum_{l=1}^{b} MJT_l \tag{3.8}$$

The standardized version of *BMJT* test can be written as follows:

$$Z_{BMJT} = \frac{BMJT - E(BMJT)}{\sqrt{Var(BMJT)}} \tag{3.9}$$

where *BMJT* is defined as the unstandardized version of the summation of the modified Jonckheere-Terpstra test for the entire blocks. Since we are considering *one* observation per block-treatment, using equation (2.14), the mean of *BMJT* in (3.8) can be define as

$$E(BMJT) = \sum_{l=1}^{b} E(MJT_l) = \sum_{l=1}^{b} \left(\sum_{i=1}^{k-1} \sum_{j=i+1}^{k} \frac{(j-i)}{2} \right) \tag{3.10}$$

Similarly, the variance of *BMJT* can be defined as

$$\begin{aligned} Var\,(BMJT) &= \sum_{l=1}^{b} Var(MJT_l) \\ &= \sum_{l=1}^{b} \left(3 \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} \frac{(j-i)^2}{12} + 2 \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} \sum_{s=1}^{k-1} \sum_{t=s+1}^{k} Cov(U_{ij}, U_{st}) \right) \end{aligned} \tag{3.11}$$

where b is the number of block and MJT_l is the modified Jonckheere-Terpstra for the l^{th} block. Furthermore, the values of the covariance term can be obtained from equation (2.17).

Under H_0, for large sample sizes,

$$Z_{BMJT} \xrightarrow{D} N(0,1)$$

The third proposed method for the nondecreasing ordered alternative in a mixed design, T_3, is given by

$$T_3 = \frac{Z_{MJT} + Z_{BMJT}}{\sqrt{2}} \tag{3.12}$$

In this method, we added the standardized version of *MJT* and *BMJT* together first and then we standardized the two tests. Under H_0, for large sample sizes, this test will follow an asymptotic normal distribution since it is a combination of two tests which follow a standard normal distribution. The null hypothesis, H_0, will be rejected when $T_3 \geq Z_\alpha$.

3.2.4. Method Number Four

The fourth proposed method for the nondecreasing ordered alternatives in a mixed design is an extension of the idea of Dubnicka's et al. (2002). In this method, we add the unstandardized versions of *MJT* and *BMJT* first, and then standardize them simultaneously. This test can be written as follows:

$$T_4 = \frac{T_4^* - [E(MJT) + E(BMJT)]}{\sqrt{Var(MJT) + Var(BMJT)}} \tag{3.13}$$

where

$$T_4^* = MJT + BMJT = \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} (j-i)U_{ij} + \sum_{l=1}^{b} MJT_l \tag{3.14}$$

Here, k is the number of treatments and b is the number of blocks. MJT_l is the modified Jonckheere-Terpstra test for the l^{th} block. Under the null hypothesis, as $\min(n_1, n_2, \ldots n_k)$ tends to infinity, this

method will also follow an asymptotic normal distribution. Additionally, the null hypothesis, $H_{0,}$ will be rejected when $T_4 \geq Z_\alpha$.

3.2.5. Method Number Five

We have shown that the modified version of the Jonckheere-Terpstra is performed by adding some weights to the Mann-Whitney statistics. In this proposed method, the distance between the two populations is squared. That is,

$$MJT^2 = \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} (j-i)^2 U_{ij} \tag{3.15}$$

Since we are dealing with a mixed design, the standardized version of the test that will be applied to the completely randomized portion is written as

$$Z_{MJT^2} = \frac{MJT^2 - E(MJT^2)}{\sqrt{Var(MJT^2)}} \tag{3.16}$$

where

$$E(MJT^2) = \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} (j-i)^2 \frac{n_i n_j}{2} \tag{3.17}$$

and

$$Var(MJT^2) = Var\left\{ \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} (j-i)^2 U_{ij} \right\} \tag{3.18}$$

$$= \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} (j-i)^4 \; Var\left(U_{ij}\right) + 2 \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} \sum_{s=1}^{k-1} \sum_{t=s+1}^{k} (j-i)^2 (t-s)^2 \; Cov\left(U_{ij}, U_{st}\right)$$

Under H_0, as $\min(n_1, n_2, \dots, n_k)$ tends to infinity,

$$Z_{MJT^2} \xrightarrow{D} N(0,1)$$

The test that will be used in the randomized complete block portion is calculating the MJT^2 test statistic in each block (i.e., MJT_1^2, MJT_2^2,..., MJT_l^2; *l = 1, 2,…, b*) where MJT_1^2 denotes the squared modified Jonckheere-Terpstra test for the first block, and so on. And then, we sum up all the MJT^2 tests together to get the $BMJT^2$ test. That is,

$$BMJT^2 = \sum_{l=1}^{b} MJT_l^2 \tag{3.19}$$

Further, the standardized version as follows:

$$Z_{BMJT^2} = \frac{BMJT^2 - E(BMJT^2)}{\sqrt{Var(BMJT^2)}} \tag{3.20}$$

where $BMJT^2$ is defined as the unstandardized version of the summation of the squared modified Jonckheere-Terpstra test for the entire blocks. From equation (3.17) and taking into account that we are considering *one* observation per block-treatment, the mean of $BMJT^2$ in equation (3.20) can be written as

$$E(BMJT^2) = \sum_{l=1}^{b} E(MJT_l^2) = \sum_{l=1}^{b} \left(\sum_{i=1}^{k-1} \sum_{j=i+1}^{k} \frac{(j-i)^2}{2} \right) \tag{3.21}$$

Following the same procedures as before, the variance of $BMJT^2$ can then be defined as

$$Var(BMJT^2) = \sum_{l=1}^{b} Var(MJT_l^2) \tag{3.22}$$

$$= \sum_{l=1}^{b} \left(3 \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} \frac{(j-i)^4}{12} + 2 \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} \sum_{s=1}^{k-1} \sum_{t=s+1}^{k} (j-i)^2 (t-s)^2 Cov(U_{ij}, U_{st}) \right)$$

where b is the number of blocks and MJT_l^2 is the squared modified Jonckheere -Terpstra for the lth block. The covariance term can be obtained from equation (2.17). Under H_0, as $\min(n_1, n_2, \ldots, n_k)$ tends to infinity,

$$Z_{BMJT^2} \xrightarrow{D} N(0,1)$$

Hence, the fifth proposed method for the nondecreasing ordered alternatives in a mixed design is written as follows:

$$T_5 = \frac{Z_{MJT^2} + Z_{BMJT^2}}{\sqrt{2}} \tag{3.23}$$

In this method, we added the standardized version of MJT^2 and $BMJT^2$ together first and then we standardized the two tests by subtracting the means and then divided by the standard deviations for the two tests. Under H_0, for large sample sizes, this test will follow an asymptotic normal distribution since it is a combination of two tests which follow a standard normal distribution. The null hypothesis, H_0, will be rejected when $T_5 \geq Z_\alpha$.

3.2.6. Method Number Six

In this method, we added the two tests together first and then we standardized them. Thus, the test we are proposing for the nondecreasing ordered alternatives in a mixed design can be written as follows:

$$T_6 = \frac{T_6^* - [E(MJT^2) + E(BMJT^2)]}{\sqrt{Var(MJT^2) + Var(BMJT^2)}} \tag{3.24}$$

where

$$T_6^* = MJT^2 + BMJT^2 = \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} (j-i)^2 U_{ij} + \sum_{l=1}^{b} MJT_l^2 \tag{3.25}$$

Here, k is the number of treatments, and b is the number of blocks. MJT_l^2 is the squared modified Jonckheere-Terpstra test for the l^{th} block. Under H_0, for large sample sizes, this method will also follow an asymptotic normal distribution. The null hypothesis, H_0, will be rejected when $T_6 \geq Z_\alpha$.

3.2.7. Method Number Seven

In this proposed method, we are applying the idea proposed by Tryon (1973) where the distance between the two populations is multiplied by the i^{th} population. That is,

$$NMJT = \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} i(j-i)U_{ij} \tag{3.26}$$

Since we are dealing with a mixed design, the standardized version of the test that will be applied to the completely randomized portion is written as

$$Z_{NMJT} = \frac{NMJT - E(NMJT)}{\sqrt{Var(NMJT)}} \tag{3.27}$$

where $NMJT$ is defined as the unstandardized version of the new modified Jonckheere-Terpstra test with mean

$$E(NMJT) = \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} i(j-i)\frac{n_i n_j}{2} \tag{3.28}$$

and variance

$$Var\ (NMJT) = Var\left(\sum_{i=1}^{k-1} \sum_{j=i+1}^{k} i(j-i)U_{ij}\right) \tag{3.29}$$

$$= \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} i^2(j-i)^2\ Var\left(U_{ij}\right) + 2\sum_{i=1}^{k-1} \sum_{j=i+1}^{k} \sum_{s=1}^{k-1} \sum_{t=s+1}^{k} (i.s)(j-i)(t-s)\ Cov\left(U_{ij}, U_{st}\right)$$

Moreover, the values of the variance and the covariance terms can be obtained using equation (2.16) and (2.17), respectively. Under H_0, as $\min(n_1, n_2, \ldots, n_k)$ tends to infinity,

$$Z_{NMJT} \xrightarrow{D} N(0,1)$$

As for the randomized complete block design portion, a test is designed by applying the $NMJT$ test to each block (i.e., $NMJT_1$, $NMJT_2$,..., $NMJT_l$; $l = 1, 2, \ldots, b$) where $NMJT_1$ denotes the

new version of the modified Jonckheere-Terpstra test for the first block, $NMJT_2$ denotes the new version of the modified Jonckheere-Terpstra test for the second block, and so on. Then, we sum up all the $NMJT$ tests together to form the $BNMJT$ test. That is,

$$BNMJT = \sum_{l=1}^{b} NMJT_l \tag{3.30}$$

where *b* is the number of blocks. Corresponding to equation (3.27) and since we are considering *one* observation per block-treatment, the mean of $BNMJT$ test can then be written as

$$E(BNMJT) = \sum_{l=1}^{b} E(NMJT_l) = \sum_{l=1}^{b} \left(\sum_{i=1}^{k-1} \sum_{j=i+1}^{k} \frac{i(j-i)}{2} \right) \tag{3.31}$$

In like manner, the variance of $BNMJT$ test can be defined as

$$Var(BNMJT) = \sum_{l=1}^{b} Var(NMJT_l) \tag{3.32}$$

$$= \sum_{l=1}^{b} \left(3 \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} \frac{i^2(j-i)^2}{12} + 2 \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} \sum_{s=1}^{k-1} \sum_{t=s+1}^{k} (i.s)(j-i)(t-s)\, Cov(U_{ij}, U_{st}) \right)$$

where *b* is the number of blocks and $NMJT_l$ is the new (multiplied) modified Jonckheere-Terpstra test for the l^{th} block. Moreover, the covariance term can be obtained from (2.17). The standardized version of $BNMJT$ test is written as

$$Z_{BNMJT} = \frac{BNMJT - E(BNMJT)}{\sqrt{Var(BNMJT)}} \tag{3.33}$$

where $BNMJT$ is defined as the unstandardized version of the summation of the new modified Jonckheere-Terpstra test for the entire blocks. Under H_0, as $\min(n_1, n_2, \ldots n_k)$ tends to infinity,

$$Z_{BNMJT} \xrightarrow{D} N(0,1)$$

The seventh proposed method for the nondecreasing ordered alternatives in a mixed design is written as follows:

$$T_7 = \frac{Z_{NMJT} + Z_{BNMJT}}{\sqrt{2}} \tag{3.34}$$

Here, we added the standardized version of $NMJT$ and $BNMJT$ together first, and then we standardized the two tests by subtracting the means and divided by the standard deviations.

Under H_0, for large sample sizes, this method will follow an asymptotic normal distribution since it is a combination of two tests which follow a standard normal distribution. Thus, the null hypothesis, H_0, will be rejected when $T_7 \geq Z_\alpha$.

3.2.8. Method Number Eight

The eighth method we are proposing for the nondecreasing ordered alternatives in a mixed design is designed as follows:

$$T_8 = \frac{T_8^* - [E(NMJT) + E(BNMJT)]}{\sqrt{V(NMJT) + V(BNMJT)}} \tag{3.35}$$

where

$$T_8^* = NMJT + BNMJT = \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} i(j-i)U_{ij} + \sum_{l=1}^{b} NMJT_l \tag{3.36}$$

Here, k is the number of treatments, and b is the number of blocks. $NMJT$ is the new modified Jonckheere-Terpstra test for the l^{th} block. Under H_0, for large sample sizes, this test will also follow an asymptotic normal distribution. The null hypothesis, H_0, will be rejected when $T_8 \geq Z_\alpha$.

3.3. Illustrative Example

The objective of this section is to provide a real-life example for the sake of illustration and to show how each of the proposed methods is being calculated. The data set that we are using is the data for the College of Arts and Sciences at Texas Tech University. More explicitly, these

data represent student evaluations of instructors for eight departments for Fall 2019 semester. The classes are innately defined by three levels (i.e., 1000/2000, 3000/4000, and 5000/6000) so that the first level (1000/2000) indicates the freshmen (1st year) and the sophomores (2nd year) classes, the second level (3000/4000) indicates the juniors (3rd year) and the seniors (4th year) classes, and the third level (5000/6000) indicates the graduate level of classes.

The variable we are interested in is the average evaluation score students give to an instructor based on answering the question "Overall, the instructor was effective teacher?". Therefore, the evaluation scores are scaled from one (Strongly Disagree) to five (Strongly Agree). In this example, each department is viewed as a block, and each level of classes is viewed as a treatment. Our aim is to determine any presence of nondecreasing trends among student evaluations as a class level increases. In other words, we are interested in testing the following hypothesis:

$$H_0: \mu_1 = \mu_2 = \mu_3 \quad \text{versus} \quad H_1: \mu_1 \leq \mu_2 \leq \mu_3$$

with at least one equality violated, where μ_i is the average of evaluation score for students in the i^{th} level. Let us assume that the data are collected using two different designs. The first design is the completely randomized block design (*RCBD*) by randomly selecting one class from each level within each department. The results of the *RCBD* are shown in Table 3.1. The second design is a completely randomized design (*CRD*) by randomly selecting eight classes from each level regardless of department. Table 3.2. represents the result of the *CRD*.

Table 3.1. Data Display for the Randomized Complete Block Design (*RCBD*)

Departments	Class Level		
	Level 1	Level 2	Level 3
Biological sciences	2.93	3.25	4.83
Chemistry	3.50	3.90	3.80
Economics	4.29	4.12	4.14
English	3.71	4.33	4.64
Geosciences	4.74	4.67	4.57
History	4.47	4.75	4.88
Mathematics and Statistics	4.02	4.94	5.00
Political Sciences	4.18	3.69	4.38

Table 3.2. Data Display for the Completely Randomized Design (*CRD*)

Class Level		
Level 1	Level 2	Level 3
3.13	3.90	4.20
3.80	4.82	4.72
4.38	3.76	3.20
4.51	4.60	4.64
3.57	3.40	4.71
3.71	4.40	4.67
4.17	4.27	4.30
4.44	4.85	4.89

The values of the tests proposed by Magel et al. (2009) are calculated as follows:

$$C_1 = \frac{Z_{Page} + Z_{JT}}{\sqrt{2}} = \frac{1.75 + 1.957}{\sqrt{2}} = 2.62$$

with P-value = 0.004.

$$C_2 = \frac{(L + JT) - [E(L) + E(JT)]}{\sqrt{Var(L) + Var(JT)}} = \frac{(103 + 133) - (96 + 96)}{\sqrt{(16 + 357.3)}} \cong 2.28$$

with P-value = 0.011.

Similarly, the values of the proposed methods along with their p-values are presented as follows:

Method Number One:

$$T_1 = \frac{Z_{JT} + Z_{BJT}}{\sqrt{2}} = \frac{1.957 + 1.84}{\sqrt{2}} = 2.68$$

with P-value = 0.0037.

Method Number Two:

$$T_2 = \frac{(JT + BJT) - [E(JT) + E(BJT)]}{\sqrt{Var(JT) + Var(BJT)}} = \frac{(17 + 133) - (12 + 96)}{\sqrt{(7.33 + 357.3)}} \cong 2.20$$

with P-value = 0.0139.

Method Number Three:

$$T_3 = \frac{Z_{MJT} + Z_{BMJT}}{\sqrt{2}} = \frac{1.75 + 1.979}{\sqrt{2}} = 2.64$$

with P-value = 0.0041.

Method Number Four:

$$T_4 = \frac{(MJT + BMJT) - [E(MJT) + E(BMJT)]}{\sqrt{Var(MJT) + Var(BMJT)}} = \frac{(23 + 184) - (16 + 128)}{\sqrt{(16 + 800)}} = 2.21$$

with P-value = 0.0136.

Method Number Five:

$$T_5 = \frac{Z_{MJT^2} + Z_{BMJT^2}}{\sqrt{2}} = \frac{1.63 + 1.991}{\sqrt{2}} = 2.56$$

with P-value = 0.0052.

Method Number Six:

$$T_6 = \frac{(MJT^2 + BMJT^2) - [E(MJT^2) + E(BMJT^2)]}{\sqrt{Var(MJT^2) + Var(BMJT^2)}} = \frac{(35 + 286) - (24 + 192)}{\sqrt{(45.3 + 2229.3)}} = 2.20$$

with P-value =0.0138.

Method Number Seven:

$$T_7 = \frac{Z_{NMJT} + Z_{BNMJT}}{\sqrt{2}} = \frac{1.86 + 1.852}{\sqrt{2}} = 2.62$$

with P-value = 0.0044.

Method Number Eight:

$$T_8 = \frac{(NMJT + BNMJT) - [E(NMJT) + E(BNMJT)]}{\sqrt{V(NMJT) + V(BNMJT)}} = \frac{(29 + 223) - (20 + 160)}{\sqrt{(23.3 + 1157.3)}} = 2.10$$

with P-value = 0.0179.

For this example, it can be seen that, at 0.05 level of significance, all the proposed methods are highly significant, which means the null hypothesis of equally student's evaluation scores average across all the levels is rejected. As a result, a nondecreasing trend among student evaluations is observed and so we conclude that the graduate level is higher than the undergraduate level (Level 1).

CHAPTER 4. SIMULATION STUDY

4.1. Introduction

The aim of this chapter is to describe in detail the Monte Carlo simulation study that is used to investigate the performance of the proposed methods in Chapter 3 and to compare them to each other and with the methods proposed by Magel et al.(2009). The performance of the methods is evaluated by the power and the level of significance (α). The power of a test can be defined as the probability of rejecting a false H_0. Likewise, the level of significance (α) is defined as the probability of rejecting a true H_0.

In this study, three underlying distributions are used including, the standard normal distribution, the exponential distribution with mean one, and the student's t-distribution with three degrees of freedom. For each distribution, we consider three scenarios of proportions of the number of blocks in the *RCBD* portion to the sample size in the *CRD* portion, namely, assuming that the portion of the number of blocks in *RCBD* is *larger*, *equal*, and *smaller* than the portion of the sample size in the *CRD*. Regarding the *CRD* portion, we consider cases where the sample sizes are equal and unequal.

Based on 5000 iterations, the study is conducted for each combination of distributions with nondecreasing location parameters at 0.05 level of significance. The level of significance is estimated for each method by generating 5,000 sets of samples from the populations when the null hypothesis is true (i.e., the location parameter arrangements are the same for all treatments) and counting the number of times the null hypothesis is rejected, dividing by the number of iterations. Similarly, the power for each method is estimated by generating 5,000 sets of samples from the populations when the alternative hypothesis is true (i.e., the location parameter arrangements are different for at least one treatment) and count the number of times the null hypothesis is rejected,

divided by the number of iterations. In general, it is said that a test has a higher power over another test if the observed difference between the two tests' powers is 0.01 or higher. However, such a difference may not have any practical significance. All the simulations are performed using the statistical program SAS9.4.

4.2. Distributions Considered

As mentioned earlier, there were three underlying distributions considered in this study. For each simulation, SAS used the so-called *RAND* function to generate data under a given distribution. Subsequently, starting from a single seed, a single stream of random numbers for all *k* treatments will be created by the *RAND* function. Of note, creating a single stream instead of multiple streams is considered as an advantage of the *RAND* function because the probability of overlapping increased by using multiple streams (SAS Institute Inc 2011). However, prior to using the *RAND* function, the seed or launch point for the random numbers must be determined. This can be done by using the function Call Streaminit. The syntax for this function as follows:

Call Streaminit (Seed).

Throughout the simulation study, the seed was set up to be zero. As a result, the *RAND* function used the system clock to generate the random numbers. The syntax for this function is defined as follows:

RAND (*distribution, parameter-1,...., parameter-k*)

For example, data from the standard normal distribution was generated by using

RAND (*'Normal'*, μ , σ)

where μ and σ are the mean and the standard deviation, respectively. In this study, the values of the mean and the standard deviation were set to be *zero* was *one*, respectively. The above function generates a single stream of random numbers for samples from a standard normal distribution.

However, to obtain random samples from the normal distribution, we added the location parameters on to every observation from the samples. For instance, we added the first location parameters on to every observation from the first sample, the second location parameters on to every observation from the second sample and so on. Similarly, data from the standard exponential distribution was generated by using

RAND (*'Exponential'*)

Here, the mean (μ) and the variance (σ^2) are both equal to one since we are generating random numbers from the standard exponential distribution. However, once the location parameters added to every observation from the sample, the random numbers follow exponential distribution with distinct mean (μ + Location parameter); however, the variance remain the same. Lastly, data from the student's t-distribution was generated by using

RAND (*'T', df*)

where *df is* the degree of freedom. Here, *three* degrees of freedom was used. Once the generating was completed, the location parameters added to each observation.

4.3. Sample Sizes Considered

In this study, the estimated power along with the level of significance for the proposed methods are considered under a variety of different scenarios. As we already mentioned, we consider three scenarios of proportions for the number of blocks in the *RCBD* portion to the sample size in the *CRD* portion, namely, assuming that the portion of the number of blocks in *RCBD* is *larger*, *equal*, and *smaller* than the portion of the sample size in the *CRD*. Furthermore, for each scenario, two phases are considered: equal and unequal sample sizes for the *CRD* portion.

In the first phase, we consider equal sample sizes for the *CRD* portion. For each distribution, the following situations are used when k = 3, 4, and 5 for the three scenarios. First,

when the proportion of the number of blocks in *RCBD* portion is *larger* than the portion of the sample size in the *CRD*. To be more specific, the sample sizes are selected so that they are 1/8, 1/4, and 1/2 the number of blocks in the *RCBD* portion.

1) RCBD portion: Block = 16; CRD portion: n = 4
2) RCBD portion: Block = 16; CRD portion: n = 8
3) RCBD portion: Block = 32; CRD portion: n = 4
4) RCBD portion: Block = 32; CRD portion: n = 8
5) RCBD portion: Block = 40; CRD portion: n = 5
6) RCBD portion: Block = 40; CRD portion: n = 10
7) RCBD portion: Block = 40; CRD portion: n = 20

Secondly, when the proportion of the number of blocks in the *RCBD* portion is *equal* to the portion of the sample size in the *CRD.*

1) RCBD portion: Block = 10; CRD portion: n = 10
2) RCBD portion: Block = 20; CRD portion: n = 20

Lastly, when the proportion of the number of blocks in the *RCBD* portion is *smaller* than the portion of the sample size in the *CRD.*

1) RCBD portion: Block = 4; CRD portion: n = 16
2) RCBD portion: Block = 8; CRD portion: n = 16
3) RCBD portion: Block = 4; CRD portion: n = 32
4) RCBD portion: Block = 8; CRD portion: n = 32

In the second phase of the simulation study, we consider the unequal sample sizes of the *CRD* portion. For each distribution, the following situations are being considered for the three scenarios.

First, when the proportion of the number of blocks in the *RCBD* portion is *larger* than the portion of the sample size in the *CRD*. The following situations are considered:

For k = 3:

1) RCBD portion: Block = 16; CRD portion: $n_1 = 8, n_2 = n_3 = 4$
2) RCBD portion: Block = 16; CRD portion: $n_1 = n_3 = 4, n_2 = 8$
3) RCBD portion: Block = 16; CRD portion: $n_1 = n_2 = 4, n_3 = 8$

For k = 4:

1) RCBD portion: Block = 16; CRD portion: $n_1 = 8, n_2 = n_3 = n_4 = 4$
2) RCBD portion: Block = 16; CRD portion: $n_1 = n_3 = n_4 = 4, n_2 = 8$
3) RCBD portion: Block = 16; CRD portion: $n_1 = n_2 = n_3 = 4, n_4 = 8$
4) RCBD portion: Block = 32; CRD portion: $n_1 = 8, n_2 = n_3 = n_4 = 4$
5) RCBD portion: Block = 32; CRD portion: $n_1 = n_3 = n_4 = 4, n_2 = 8$
6) RCBD portion: Block = 32; CRD portion: $n_1 = n_2 = n_3 = 4, n_4 = 8$

For k = 5:

1) RCBD portion: Block = 16; CRD portion: $n_1 = 8, n_2 = n_3 = n_4 = n_5 = 4$
2) RCBD portion: Block = 16; CRD portion: $n_1 = n_2 = n_4 = n_5 = 4, n_3 = 8$
3) RCBD portion: Block = 16; CRD portion: $n_1 = n_2 = n_3 = n_4 = 4, n_5 = 8$
4) RCBD portion: Block = 32; CRD portion: $n_1 = 8, n_2 = n_3 = n_4 = n_5 = 4$
5) RCBD portion: Block = 32; CRD portion: $n_1 = n_2 = n_4 = n_5 = 4, n_3 = 8$
6) RCBD portion: Block = 32; CRD portion: $n_1 = n_2 = n_3 = n_4 = 4, n_5 = 8$

Secondly, when the proportion of the number of blocks in the *RCBD* portion is *equal* to the portion of the sample size in the *CRD*. The following situations are considered:

For k = 3:

1) RCBD portion: Block = 8; CRD portion: $n_1 = 16,\ n_2 = n_3 = 4$

2) RCBD portion: Block = 8; CRD portion: $n_1 = n_3 = 4,\ n_2 = 16$

3) RCBD portion: Block = 8; CRD portion: $n_1 = n_2 = 4,\ n_3 = 16$

For k = 4:

1) RCBD portion: Block = 8; CRD portion: $n_1 = 20, n_2 = n_3 = n_4 = 4$

2) RCBD portion: Block = 8; CRD portion: $n_1 = n_3 = n_4 = 4, n_2 = 20$

3) RCBD portion: Block = 8; CRD portion: $n_1 = n_2 = n_3 = 4, n_4 = 20$

For k = 5:

1) RCBD portion: Block = 8; CRD portion: $n_1 = 20, n_2 = n_3 = n_4 = n_5 = 5$

2) RCBD portion: Block = 8; CRD portion: $n_1 = n_2 = n_4 = n_5 = 5, n_3 = 20$

3) RCBD portion: Block = 8; CRD portion: $n_1 = n_2 = n_3 = n_4 = 5, n_5 = 20$

Lastly, when the proportions of the number of blocks the *RCBD* portion is *smaller* than the portion of the sample size in the *CRD*. The following situations are considered:

For k = 3:

1) RCBD portion: Block = 8; CRD portion: $n_1 = 16,\ n_2 = n_3 = 8$

2) RCBD portion: Block = 8; CRD portion: $n_1 = n_3 = 8,\ n_2 = 16$

3) RCBD portion: Block = 8; CRD portion: $n_1 = n_2 = 8,\ n_3 = 16$

For k = 4:

1) RCBD portion: Block = 8; CRD portion: $n_1 = 20, n_2 = n_3 = n_4 = 10$

2) RCBD portion: Block = 8; CRD portion: $n_1 = n_3 = n_4 = 10, n_2 = 20$

3) RCBD portion: Block = 8; CRD portion: $n_1 = n_2 = n_3 = 10, n_4 = 20$

For k = 5:

1) RCBD portion: Block = 8; CRD portion: $n_1 = 16, n_2 = n_3 = n_4 = n_5 = 8$

2) RCBD portion: Block = 8; CRD portion: $n_1 = n_2 = n_4 = n_5 = 8, n_3 = 16$

3) RCBD portion: Block = 8; CRD portion: $n_1 = n_2 = n_3 = n_4 = 8, n_5 = 16$

4.4. Location Parameters

Powers are estimated based on a variety of location parameter arrangements. In order to compare the new proposed methods with the tests proposed by Magel et al. (2009), the arrangements considered are the same as in Magel et al. (2009). These location parameter arrangements are denoted by $\mu_1, \mu_2, \mu_3, \mu_4,$ and μ_5 for treatment *one*, *two*, *three*, *four*, and *five*, respectively. Below in Table 4.1. we are listing all the location parameter arrangements that is used to evaluate the performance of the proposed methods.

Table 4.1. Location parameter arrangements considered at the simulation study.

	k = 3			k = 4				k = 5				
Case	μ_1	μ_2	μ_3	μ_1	μ_2	μ_3	μ_4	μ_1	μ_2	μ_3	μ_4	μ_5
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0.5	0	0.1	0.2	0.3	0.05	0.15	0.25	0.35	0.45
3	0	0.5	0.5	0	0	0.25	0.25	0	0.025	0.075	0.175	0.375
4	0.05	0.25	0.5	0	0.125	0.25	0.25	0	0	0	0	0.5
5	0	0.3	0.5	0	0	0	0.5	0	0	0.125	0.25	0.25
6	0	0	1	0.05	0.1	0.3	0.5	0	0.05	0.05	0.3	0.3
7	0	1	1	0	0.25	0.5	0.5	0.05	0.2	0.3	0.4	0.5
8	0	0.5	1	0	0.5	0.5	1	0	0	0	0.25	0.5
9	0.5	0.5	1	0.1	0.2	0.6	1	0	0	0	0.35	0.35
10	0.5	1	1	0.25	0.25	0.5	0.5	0	0	0.25	0.25	0.5
11	0.1	0.5	1	0	0.1	0.3	0.7	0	0	0	0.1	0.3
12	0.1	0.3	0.7	0	0.05	0.15	0.35	0	0	0	0.2	0.7
13	0	0.25	0.5	0	0.15	0.2	0.5	0	0.1	0.1	0.6	0.6
14	0.2	0.5	0.8	0	0	0.05	0.3	0	0.1	0.3	0.4	0.4
15	0	0.1	0.8	0	0	0.1	0.6	0	0.05	0.2	0.4	0.4

Furthermore, a detailed explanation of the types of these location parameter arrangements are given as follows:

For cases with k = 3, the following types of location parameter arrangements are considered:

- There is an equal distance between the parameters such as (0, 0.25, 0.5);
- Cases where the first two parameters are equal and the third one was different such as (0.5, 0.5, 1);
- Cases where the last two parameters are equal and the first one is different such as (0.5, 1, 1);
- Cases where the distance between the last two parameters is twice as large as the distance between the first two such as (0.1, 0.3, 0.7);
- Cases where the distances between the parameters are not equal, for example (0.1, 0.5, 1) and (0, 0.1, 0.8).

For cases with k = 4, the following types of location parameter arrangements are considered:

- There is an equal distance between the parameters such as (0, 0.1, 0.2, 0.3);
- Cases where the first two parameters are equal and last two parameters are equal such as (0, 0, 0.25, 0.25);
- Cases where the first two parameters are not equal while the last two parameters are equal such as (0, 0.25, 0.5, 0.5);
- Cases where the first two parameters are equal while the last two parameters are not equal such as (0, 0, 0.1, 0.6);

- Cases where the distance between the first two parameters are chosen to be the same as the distance between the last two such as (0, 0.5, 0.5, 1);
- Cases where the distance between fourth and third parameters is twice as large as the distance between third and second, while distance between third and second is twice as large as the distance between second-first such as (0, 0.05, 0.15, 0.35);
- Cases where the distances between the parameters are not equal, for example (0, 0.15, 0.2, 0.5).

For cases with k = 5, the following types of location parameter arrangements are considered:

- There is an equal distance between the parameters such as (0.05, 0.15, 0.25, 0.35,0.45);
- Cases where the distance among parameters doubles each time such as (0, 0.025, 0.075, 0.175, 0.375);
- Cases where the first four parameters are equal and last one parameter is different such as (0, 0, 0, 0, 0.5);
- Cases where the first three parameters are not equal while the last two parameters are equal such as (0, 0, 0, 0.35, 0.35);
- Cases where the first three parameters are equal while the last two parameters are not equal such as (0, 0, 0, 0. 25, 0.5);
- Cases where the distances between the parameters are not equal, for example (0.05, 0.2, 0.3, 0.4, 0.5).

CHAPTER 5. RESULTS OF THE STUDY

5.1. Introduction

The results of the simulation study play a significant role in evaluating the performance of the proposed methods compared to each other and to those proposed by Magel et al.(2009). Thus, the aim of this chapter is to introduce the results of the simulation study described in Chapter 4. As previously mentioned, the proposed methods are designed to analyze data in a mixed design of a *CRD* and a *RCBD*.

In each table, the results of the simulation study are defined based on number of treatments (k), the distribution used to simulate the data, the sample size in the *CRD* portion, and the number of blocks in the *RCBD* portion. Besides, a variety of location parameter arrangements, shifts, are considered on k = 3, 4, and 5 treatments. These location parameter arrangements are grouped by the number of cases so that each case represents a different type of the location parameters arranges as shown in Table 4.1. The estimated level of significance (α) and the estimated power for each method are given so that the first case, raw, of each table represents the estimated α-level, however, the rest of cases represent the estimated powers.

The tables of the results that are presented are two-fold. First, we start with presenting the tables for the equal sample sizes in the *CRD* portion, taking into account the proportion of the *RCBD* portion to the *CRD* portion (e.g., the *RCBD* portion *larger*, *equal*, and *smaller* than the *CRD* portion). Second, in the same manner, we present the tables for the unequal sample sizes in the *CRD* portion.

5.2. Equal Sample Sizes for the CRD

Before the results are presented, we will give a guideline for the procedures used to present the results of the simulation study. Because we consider three proportions of the sample sizes in

the *CRD* portion to the number of blocks in the *RCBD*, this motivates us to take these proportions into account in terms of organizing the results. Thus, the results are grouped based on these proportions.

In Sec. 5.2.1, Table 5.1 through Table 5.21 show the results of the proposed methods in terms of the estimated level of significance and the estimated powers for the normal, exponential, and student's t distributions for three treatments ($k = 3$) when the proportion of the *RCBD* portion is *larger* than the *CRD* portion. Similarly, Table 5.22 though Table 5.42 represent the results for four treatments ($k = 4$) and Table 5.43 though Table 5.63 represent the results for five treatments ($k = 5$). Situations are considered so that the sample sizes in the *CRD* portion are 1/8, 1/4, and 1/2 the number of blocks in the *RCBD* portion. Moreover, In Sec. 5.2.2, Table 5.64 through Table 5.69 represent the estimated powers along with the levels of significance of the proposed methods for three treatments ($k = 3$) for the three underlying distributions when the proportion of the *RCBD* portion is *equal* to the *CRD* portion. Similarly, Table 5.70 though Table 5.75 represent the results for four treatments ($k = 4$) and Table 5.76 though Table 5.81 represent the results for five treatments ($k = 5$).

In Sec. 5.2.3, the estimated powers along with the levels of significance for the proposed methods are presented when the number of blocks in *RCBD* portion is *smaller* than the sample size in the *CRD* portion. Results are given in Table 5.82 through Table 5.93 for three treatments ($k = 3$). Table 5.94 through Table 5.105 give the results for four treatments ($k = 4$). Table 5.106 through Table 5.117 give the results for five treatments ($k = 5$).

5.2.1. Portion of the RCBD is larger than the CRD

Here, we discuss the results of the simulation study when the proportion of the number of blocks in the *RCBD* portion is larger than the sample size in the *CRD* portion. In terms of the level

of significance (α), all the proposed methods maintain their type-I error. The estimated type-I are close to 0.05 which is the desired level of significance. This holds for k = 3, 4 and 5 regardless of the underlying distribution.

For k = 3, when the arrangements of location parameters follow the pattern that the first two parameters are equal and the third one is different and there is not equal distance among the parameters such as (0, 0, 0.5) and (0, 0, 1), the proposed methods T_7 and T_8 have higher estimated powers compared with the others including the tests proposed Magel et al. (2009). An exception occurs when there are equal spaces among parameters such as (0.5, 0.5, 1). In this case, only T_7 has higher powers than others and T_8 only has higher estimated powers than the proposed methods T_2, T_4, and T_6.

Yet, a special case arises with equal spaces when the proportion of the sample sizes in the *CRD* portion is *one-eighth* the number of blocks in the *RCBD* portion (i.e. *Block* = 32, n = 4). In that case, both T_7 and T_8 have higher estimated powers than all the proposed methods. This special case can be seen in Tables (5.7-5.9).Moreover, when the arrangements of location parameters follow the pattern that all the parameters are different and a large jump between the last two parameters is presents such as (0, 0.1, 0.8), T_7 has higher estimated powers than the other method including the tests proposed Magel et al. (2009). When the arrangements of location parameters follow the pattern that the last two parameters are equal such as (0, 0.5, 0.5) and (0.5, 1, 1), the proposed method T_1, T_3, and T_5 have approximately the same estimated powers as the tests proposed by Magel et al. (2009). However, the proposed methods T_7 and T_8 have the smallest estimated powers among the other proposed methods under that pattern. In general, T_1, T_3, T_5 and T_7 have higher powers than T_2, T_4, and T_6 under k = 3.

For k = 4, when the arrangements of location parameters follow the pattern of equal distance among the parameters such as (0, 0.1, 0.2, 0.3), cases where the arrangements of location parameters follow the pattern that the first two parameters are equal and the last two are equal such as (0.25, 0.25, 0.5, 0.5), and cases where the first two parameters are not equal while the last two parameters are equal such as (0, 0.125, 0.25, 0.25), the proposed methods T_1, T_3, T_5 generally have larger estimated powers than C_2 and powers similar to C_1. However, when the proportion of the number of blocks in the *RCBD* portion is one-eighth the sample size in the *CRD* portion (i.e. *Block* = 40, n = 5), C_2 has larger estimated powers than other methods (see Tables 5.28-5.30 and Tables 5.34-5.36). Recall, C_1 and C_2 denote the tests proposed by Magel et al. (2009).

Furthermore, when the arrangements of location parameters follow the pattern that first two parameters are equal and the last two parameters are different such as (0, 0, 0.05, 0.3) and (0, 0, 0.1, 0.6), the estimated powers of the proposed methods T_7 and T_8 are mostly larger than the estimated powers of the other methods including C_1 and C_2. Cases where the arrangements of location parameters following the pattern that distance between the first two parameter is equal to the distance between the last two parameters such as (0, 0.5, 0.5, 1), the estimated powers of T_1, T_3, and T_5 are generally comparable to C_1 and C_2. However, in few cases C_2 has higher estimated powers than the rest of proposed method. Lastly, cases where the arrangements of location parameters follow the pattern that the distance between the fourth and third parameters is twice as large as the distance between the third and the second, while the distance between the third and the second is twice as large as the distance between the second and the first such as (0, 0.1, 0.3, 0.7). Under these cases, T_7 mostly has higher powers than the proposed methods.

For k = 5, when the arrangements of location parameters follow the pattern of equal distance among the parameters such as (0.05, 0.15, 0.25, 0.35, 0.45), the estimated powers for T_1,

$T_{3,}$ and T_5 are similar to the estimated power of C_1 and C_2. An exception to this occurs when the proportion of the number of blocks in the *RCBD* portion is *one-eighth* the sample size in the *CRD* portion. In this case, C_2 has higher estimated powers compare to all the proposed methods (see Tables 5.49-5.51 and Tables 5.55-5.57). Other cases are when the arrangements of location parameters follow the pattern that the distance among parameters doubles each time such as (0.05, 0.15, 0.25, 0.35, 0.45), and also when the arrangements of location parameters follow the pattern that all the parameters are the same except the last parameter such as (0, 0, 0, 0, 0. 5), we found that the proposed method T_7 has the highest estimated powers among all the proposed methods including C_1 and C_2.

Further, regardless of the distance between the last two parameters, when the arrangements of location parameters follow the pattern all the parameters are the same except the last two parameters such as (0, 0, 0, 0.25, 0.5) and (0, 0, 0, 0.2, 0.7), the proposed method T_7 has powers much larger than the other proposed methods. However, when the location parameters following the pattern that the first three parameters are the same and the last two parameters are equal such as (0, 0, 0, 0.35, 0.35), the proposed method T_7 has larger estimated powers compared to others except in these two situations: 1) when *Block* = 32, n = 4; under this situation, C_2 has higher estimated powers than T_7 (see Tables 5.49-5.51); 2) when *Block* = 40, n = 5; the estimated powers of T_7 and C_2 are comparable (see Tables 5.55-5.57). Lastly, when the location parameters follow the pattern that the first three parameters are different and the last two parameters are the same such as (0, 0.1, 0.3, 0.4, 0.4), $T_{1,}$ T_3, in some cases, T_5 have powers similar to C_1 and C_2 unless when the proportion is *one-eighth*. In this case, C_2 has higher estimated powers.

Table 5.1. Percentage of Rejection for $k = 3$; Normal Distribution: Block = 16 and $n = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.88	4.98	4.74	5.16	4.64	4.28	4.58	4.42	4.74	4.36
2	36.52	35.58	35.40	31.44	36.30	28.88	35.94	29.18	**41.28**	33.70
3	36.32	35.68	35.14	32.30	**36.34**	30.26	35.88	30.10	27.48	23.18
4	31.92	30.96	32.68	29.72	**33.40**	27.88	32.84	27.70	32.14	26.18
5	**37.10**	36.14	36.04	32.60	36.56	30.70	36.84	30.88	33.76	27.90
6	80.92	78.96	80.74	73.96	81.90	72.04	81.38	72.60	**88.84**	80.40
7	80.86	78.92	80.84	73.42	**81.64**	71.58	81.08	71.74	66.56	56.16
8	81.86	80.32	82.52	75.52	**82.92**	73.28	82.60	73.22	80.62	70.96
9	36.52	35.58	35.20	31.78	35.72	29.78	35.76	30.20	**41.70**	34.44
10	36.22	35.68	36.38	33.00	**37.32**	30.84	36.82	30.62	29.34	23.98
11	74.12	72.38	75.52	68.00	**76.28**	65.88	75.78	65.94	75.36	64.90
12	46.30	44.92	45.98	40.94	46.36	38.30	45.84	38.48	**47.60**	38.78
13	**36.88**	35.94	36.12	33.34	36.18	30.56	36.00	30.20	35.32	29.52
14	46.12	44.96	45.58	40.74	**46.30**	38.46	45.96	38.36	43.98	36.38
15	65.68	63.34	65.24	58.28	66.22	56.38	66.00	56.74	**71.64**	61.24

* Cases of the location parameter arrangements are given on page 38

Table 5.2. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 16 and $n = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.78	5.02	5.24	5.32	5.08	4.52	4.98	4.52	5.28	4.56
2	58.70	57.26	58.42	51.84	59.54	49.86	58.98	50.20	**68.70**	57.48
3	58.92	56.88	58.46	52.54	**59.52**	50.00	59.16	50.28	45.90	37.02
4	**55.92**	53.44	54.80	49.16	54.68	46.00	53.60	45.70	54.28	44.58
5	62.54	60.54	**62.56**	55.80	62.50	52.28	61.06	51.88	58.14	49.04
6	95.04	93.98	94.08	89.34	94.44	88.18	94.04	87.90	**98.24**	94.28
7	92.52	91.12	92.00	86.70	**93.26**	86.56	93.50	87.44	82.42	73.16
8	**96.62**	95.56	96.36	92.80	96.10	90.40	95.30	89.02	95.82	90.62
9	58.70	57.26	57.74	50.34	58.32	48.12	58.02	48.76	**67.98**	56.38
10	58.92	56.88	57.36	51.74	**58.98**	49.44	58.40	49.26	45.06	37.42
11	**94.02**	92.86	93.98	89.62	93.66	87.26	92.80	85.54	93.88	87.80
12	73.70	71.64	74.92	68.18	74.28	64.90	72.46	63.74	**76.98**	67.10
13	62.92	60.80	**62.98**	56.02	62.70	53.16	60.78	52.08	60.60	50.32
14	73.40	72.16	**74.52**	66.76	73.66	63.34	72.06	62.14	72.08	61.56
15	88.28	86.94	87.32	80.76	86.92	78.36	85.96	77.96	**92.00**	84.52

* Cases of the location parameter arrangements are given on page 38

Table 5.3. Percentage of Rejection for $k = 3$; T-Distribution: Block = 16 and $n = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.92	5.04	4.82	5.28	4.76	4.64	4.78	4.84	5.16	4.62
2	27.38	26.68	27.30	24.36	27.52	22.18	27.38	22.74	**31.92**	25.96
3	27.00	26.14	27.44	24.74	**28.02**	22.78	27.70	23.18	21.76	18.14
4	24.08	23.58	24.50	23.22	**25.28**	20.84	25.00	20.84	24.46	20.72
5	27.10	26.46	26.58	24.50	**27.42**	22.80	27.06	22.94	25.38	21.20
6	64.20	62.32	65.22	58.50	66.44	56.66	66.52	57.10	**73.98**	63.84
7	**64.34**	62.24	63.30	56.84	64.00	54.36	63.54	54.66	49.90	41.34
8	65.32	63.54	65.96	58.78	**66.36**	55.68	66.00	55.88	64.00	53.06
9	27.38	26.68	27.64	25.62	27.90	23.84	28.04	23.72	**32.50**	26.42
10	27.00	26.14	26.68	24.36	27.04	22.40	**27.16**	22.72	21.80	17.94
11	58.48	56.40	59.08	52.22	**59.68**	49.58	58.48	49.66	58.36	48.70
12	34.76	33.92	35.16	32.14	35.92	30.02	35.56	30.34	**36.30**	30.20
13	27.10	26.44	27.62	25.36	**28.12**	23.26	27.92	23.64	27.16	22.52
14	**34.78**	33.86	34.22	30.98	34.22	28.56	33.94	29.06	33.02	27.36
15	49.70	48.16	49.72	44.44	50.04	42.46	49.70	42.54	**54.68**	46.30

* Cases of the location parameter arrangements are given on page 38

Table 5.4. Percentage of Rejection for $k = 3$; Normal Distribution: Block = 16 and $n = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.76	5.58	4.90	5.48	4.84	5.12	4.74	5.00	4.72	4.80
2	44.70	34.98	43.96	31.80	44.86	31.54	44.00	31.36	**50.10**	35.70
3	**45.58**	35.18	43.72	31.26	44.88	31.28	44.34	31.34	34.68	24.30
4	**39.78**	31.14	38.02	27.96	38.78	27.76	37.80	27.72	37.50	27.06
5	**45.74**	34.98	43.62	31.22	44.74	30.74	44.30	30.40	40.96	27.90
6	91.02	78.70	89.58	73.28	90.62	73.68	90.42	73.74	**94.98**	81.06
7	90.60	78.64	89.80	73.52	**91.04**	73.62	90.86	73.58	77.58	58.52
8	91.32	80.18	90.92	75.06	**91.52**	74.92	91.06	74.54	89.48	72.78
9	44.70	34.98	44.10	32.12	45.28	31.66	44.66	31.52	**51.68**	36.62
10	**45.58**	35.18	43.30	30.32	44.98	30.20	44.32	30.12	34.10	22.90
11	**85.82**	72.66	84.42	67.58	85.78	67.60	85.00	67.06	84.58	66.00
12	57.44	44.60	57.28	41.00	58.96	40.76	58.10	40.34	**59.12**	40.84
13	**45.82**	35.40	44.42	32.64	45.14	32.30	44.26	32.00	43.12	31.46
14	**57.44**	44.48	55.10	39.50	55.88	39.28	55.16	39.24	52.48	36.38
15	77.08	63.00	76.58	57.20	77.72	57.56	76.80	57.34	**82.24**	62.84

* Cases of the location parameter arrangements are given on page 38

Table 5.5. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 16 and $n = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.32	5.16	4.98	5.06	5.22	4.72	5.32	4.86	4.74	5.04
2	71.84	55.26	69.82	50.98	71.58	51.64	71.18	52.00	**79.24**	58.54
3	69.52	55.12	67.44	51.82	**69.74**	52.04	69.40	52.10	54.40	39.80
4	**67.20**	52.66	66.48	49.62	66.44	48.54	65.16	47.62	65.30	47.04
5	**73.80**	58.90	72.86	55.40	73.06	54.22	71.44	52.98	68.92	49.70
6	98.68	92.72	98.46	89.64	98.66	89.48	98.38	89.10	**99.62**	95.18
7	97.46	89.46	97.12	87.60	97.76	88.64	**97.96**	88.86	91.40	75.30
8	**99.10**	95.04	98.90	92.36	98.78	91.20	98.42	89.86	98.78	91.22
9	71.84	55.26	71.00	53.08	72.00	53.04	71.48	52.70	**80.26**	60.66
10	69.52	55.12	69.12	51.64	**70.92**	51.82	70.54	51.68	56.36	39.50
11	98.04	91.80	97.74	88.04	97.66	86.80	96.86	85.52	**98.30**	87.66
12	84.42	70.32	84.14	66.20	83.98	64.80	82.62	63.46	**85.60**	67.24
13	**74.34**	59.30	72.86	55.90	72.96	53.94	71.36	53.12	71.44	52.52
14	84.34	70.40	84.22	66.26	**84.64**	65.14	83.26	64.10	82.66	63.50
15	95.20	85.14	95.60	81.58	95.52	80.82	94.70	80.20	**97.88**	86.94

* Cases of the location parameter arrangements are given on page 38

Table 5.6. Percentage of Rejection for $k = 3$; T-Distribution: Block = 16 and $n = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.00	4.76	4.60	4.70	4.68	4.50	4.64	4.58	5.12	4.64
2	33.40	25.80	34.18	25.36	35.04	25.06	34.46	24.94	**39.26**	27.98
3	33.72	26.08	33.70	25.04	**34.98**	24.92	34.40	24.98	26.60	19.32
4	**29.62**	23.16	28.04	20.52	29.02	20.34	28.46	20.28	28.12	19.76
5	33.94	26.24	33.74	25.20	**34.28**	24.88	33.72	24.46	31.52	22.16
6	77.30	62.00	74.78	55.76	76.38	56.06	76.10	56.44	**83.60**	64.20
7	**77.20**	61.72	74.80	56.18	76.62	56.52	75.78	56.60	60.88	43.42
8	78.24	64.00	77.24	58.16	**78.28**	57.68	77.40	57.24	75.62	55.20
9	33.40	25.80	31.94	23.12	32.68	22.78	32.06	22.76	**37.24**	25.72
10	**33.72**	26.08	33.00	24.42	33.54	23.94	33.32	23.72	25.94	19.52
11	70.62	56.20	70.16	52.42	**71.28**	51.92	70.38	51.62	69.00	50.48
12	42.94	33.48	42.72	30.00	43.72	29.84	42.86	29.72	**43.94**	29.98
13	34.12	26.16	33.56	25.00	**34.82**	24.70	33.76	24.38	32.42	23.64
14	**43.02**	33.72	41.00	30.60	41.94	30.58	41.68	30.16	39.82	28.70
15	61.24	47.64	60.96	43.90	61.92	43.62	61.60	43.42	**66.66**	47.96

* Cases of the location parameter arrangements are given on page 38

Table 5.7. Percentage of Rejection for $k = 3$; Normal Distribution: Block = 32 and $n = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.48	4.42	4.66	4.64	4.96	4.84	5.00	4.80	4.78	5.06
2	37.66	42.66	48.96	45.02	50.58	46.10	50.30	47.46	**57.36**	53.40
3	50.70	**51.98**	48.80	44.62	49.78	45.98	49.40	46.58	38.36	35.76
4	44.34	**45.38**	43.34	39.50	43.92	40.06	43.46	40.78	42.98	40.14
5	51.10	**52.30**	49.00	44.56	49.58	45.42	49.26	46.30	46.30	43.12
6	94.08	94.90	94.04	91.18	94.76	92.22	94.68	92.40	**97.28**	95.96
7	94.24	**95.38**	93.94	91.16	94.46	92.06	94.08	92.16	84.58	81.04
8	94.86	**95.74**	94.96	92.40	95.20	92.92	94.68	92.74	94.28	91.82
9	50.18	51.86	49.98	45.86	51.44	47.00	50.94	47.76	**58.24**	54.32
10	50.70	**51.98**	48.78	44.84	50.48	45.84	49.92	46.92	38.46	35.62
11	90.56	**91.70**	89.28	85.54	90.08	86.24	89.62	86.30	89.32	85.98
12	63.54	**65.06**	62.84	58.20	64.26	58.80	63.32	59.44	64.96	60.88
13	50.80	**52.36**	48.48	44.74	49.82	45.18	49.46	45.86	47.76	44.72
14	64.08	**65.50**	62.12	57.18	62.86	57.66	61.92	58.28	60.88	57.00
15	83.36	84.88	82.58	78.96	83.84	79.82	83.46	80.00	**88.20**	84.98

* Cases of the location parameter arrangements are given on page 38

Table 5.8. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 32 and $n = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.16	4.14	4.94	4.84	4.96	4.84	5.02	5.24	5.14	5.36
2	76.98	78.60	75.84	71.08	77.32	72.08	76.80	72.22	**85.12**	81.52
3	74.40	**76.36**	74.14	69.88	75.56	71.34	75.52	72.06	61.82	58.22
4	71.96	73.66	73.42	68.46	**73.76**	68.70	72.38	67.94	73.14	69.46
5	78.46	**80.02**	78.40	74.02	78.82	74.12	77.48	73.16	75.14	70.96
6	99.30	99.52	99.40	99.00	99.50	98.88	99.38	98.76	**99.90**	99.72
7	98.62	**99.08**	98.32	97.24	98.70	97.84	98.90	98.04	94.32	91.62
8	99.74	**99.82**	99.66	99.28	99.70	99.18	99.48	99.02	99.56	99.26
9	76.98	78.60	76.48	71.40	77.96	72.50	77.04	73.20	**85.96**	81.92
10	74.40	76.36	75.38	70.84	**76.64**	72.10	76.48	72.84	62.80	58.98
11	99.02	**99.40**	99.10	98.06	98.88	97.86	98.36	97.26	99.08	98.22
12	88.62	90.08	88.96	84.98	88.68	84.76	87.90	84.20	**90.38**	87.12
13	78.88	**80.40**	78.58	73.76	78.04	72.74	76.26	72.28	77.06	73.20
14	88.74	**90.12**	89.82	85.94	89.60	85.84	88.26	85.00	89.02	85.40
15	96.86	97.48	97.70	95.70	97.38	95.56	96.76	95.06	**99.12**	98.14

* Cases of the location parameter arrangements are given on page 38

Table 5.9. Percentage of Rejection for $k = 3$; T-Distribution: Block = 32 and $n = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.86	4.58	5.14	5.08	5.14	4.98	5.28	5.22	4.98	5.40
2	37.66	38.46	37.98	34.36	39.06	35.02	38.52	35.68	**44.10**	40.50
3	37.64	38.70	37.62	33.84	**38.88**	35.02	37.90	35.74	28.62	27.20
4	33.06	**33.90**	32.64	30.16	33.22	30.88	33.16	31.26	32.96	31.14
5	37.86	**38.58**	36.84	33.90	38.26	35.02	37.90	35.68	34.98	32.96
6	83.22	84.84	81.28	76.36	82.58	77.24	81.80	77.82	**88.52**	85.20
7	83.24	**84.96**	82.48	77.66	83.14	78.88	82.52	79.20	69.46	65.30
8	84.18	**85.56**	82.98	78.72	83.60	79.54	82.78	79.36	81.28	77.90
9	37.66	38.46	38.28	34.84	39.50	35.74	39.38	36.60	**45.08**	41.86
10	37.64	38.70	37.36	33.74	**38.84**	35.04	38.28	35.90	29.38	27.32
11	77.66	**79.34**	75.62	70.58	76.34	71.10	75.14	71.12	74.96	70.78
12	48.40	**49.68**	47.52	43.26	48.50	43.86	47.68	45.06	49.58	46.00
13	37.96	38.80	38.42	35.16	**38.94**	35.32	38.20	36.34	37.72	35.18
14	48.30	**49.68**	47.94	43.34	48.44	43.88	47.50	44.34	46.40	43.02
15	68.42	70.22	67.82	63.40	69.40	64.86	68.74	65.64	**73.74**	70.08

* Cases of the location parameter arrangements are given on page 38

Table 5.10. Percentage of Rejection for $k = 3$; Normal Distribution: Block = 32 and $n = 8$

			Method							
Case	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.74	4.64	5.00	4.74	4.88	4.60	4.60	4.68	5.06	4.82
2	57.02	44.28	57.70	39.02	59.04	39.84	58.32	39.88	**66.42**	45.22
3	57.28	44.46	57.42	38.56	**58.66**	39.36	58.60	39.70	46.14	30.56
4	50.32	38.96	49.90	33.58	**50.58**	33.94	50.26	34.52	49.66	33.18
5	**57.96**	44.86	57.06	38.24	57.88	39.16	56.86	39.46	53.46	36.00
6	98.24	91.54	97.60	84.34	97.82	85.14	97.76	85.74	**99.32**	91.18
7	**97.82**	91.22	97.74	85.08	97.80	85.78	97.58	86.26	91.30	70.94
8	**98.22**	92.12	98.02	84.94	98.00	85.18	97.96	85.10	97.48	83.76
9	57.02	44.28	56.46	38.54	57.84	39.12	57.74	39.42	**65.70**	45.36
10	57.28	44.46	57.96	39.38	**59.64**	39.74	59.24	40.44	46.28	30.80
11	95.56	86.74	95.44	79.64	**95.72**	79.88	95.44	80.16	95.18	78.92
12	71.44	56.92	71.12	50.34	72.12	50.68	71.30	50.82	**73.24**	51.00
13	57.72	44.82	56.86	37.74	**57.96**	38.34	57.40	38.36	56.20	36.68
14	71.66	56.86	71.36	48.80	**72.40**	49.26	71.74	49.56	69.28	46.92
15	90.36	78.46	90.34	69.04	91.12	69.88	90.56	70.28	**93.98**	76.26

* Cases of the location parameter arrangements are given on page 38

Table 5.11. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 32 and $n = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.14	5.40	4.52	4.60	4.66	4.72	4.82	4.80	5.14	4.64
2	85.42	72.96	86.02	62.76	86.50	63.36	85.70	63.72	**92.48**	72.12
3	83.16	70.40	83.92	63.06	**84.96**	64.00	84.86	64.84	72.78	50.16
4	81.24	68.50	**81.78**	59.62	**81.76**	59.00	80.38	58.50	81.46	58.72
5	86.56	74.58	87.18	65.88	**87.46**	65.20	86.20	64.78	85.00	61.70
6	99.90	98.64	99.84	96.16	99.86	96.10	99.80	96.08	**100.00**	98.82
7	99.66	97.34	99.64	93.82	99.80	94.82	**99.84**	95.38	98.18	85.34
8	99.96	**99.98**	99.96	97.80	99.94	97.36	99.92	96.88	**99.98**	97.66
9	85.42	72.96	86.34	63.52	86.66	64.42	86.32	64.50	**93.02**	73.52
10	83.16	70.40	82.32	61.38	83.94	62.70	**84.20**	63.44	71.04	48.74
11	**99.88**	97.94	99.86	95.82	99.80	95.30	99.72	94.44	99.82	95.70
12	94.24	84.60	94.14	77.44	94.08	76.60	93.24	75.92	**95.26**	79.22
13	86.78	75.42	**87.46**	65.74	87.26	65.44	86.66	65.28	86.90	63.70
14	94.24	84.80	**95.02**	78.48	94.90	77.54	94.02	76.64	94.54	76.60
15	99.40	95.42	99.34	91.04	99.20	90.44	98.84	89.96	**99.76**	94.76

* Cases of the location parameter arrangements are given on page 38

Table 5.12. Percentage of Rejection for $k = 3$; T-Distribution: Block = 32 and $n = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.34	5.58	4.88	5.28	4.88	5.26	4.84	5.32	5.20	5.28
2	45.36	35.38	43.50	29.66	44.18	29.98	44.14	30.18	**50.58**	33.70
3	45.02	35.14	44.66	30.22	**45.26**	30.50	44.84	30.88	35.74	24.52
4	**39.62**	31.44	38.14	25.22	39.24	25.28	38.94	25.60	38.14	24.92
5	**45.58**	35.80	44.34	30.16	45.12	30.30	44.48	30.74	41.38	27.80
6	89.58	77.90	90.06	69.42	90.30	70.34	90.22	70.70	**94.66**	77.30
7	**89.82**	77.98	88.48	66.78	89.46	68.02	89.58	68.50	76.44	53.06
8	**90.96**	79.24	89.38	69.86	89.94	69.84	89.54	69.68	88.50	67.18
9	45.36	35.38	43.48	29.50	44.74	30.26	44.50	30.54	**50.60**	33.76
10	**45.02**	35.14	43.30	29.82	44.56	30.24	44.58	30.62	34.56	23.30
11	85.08	72.34	84.18	62.40	**85.14**	62.68	84.50	62.74	83.88	61.36
12	57.06	44.16	56.04	37.52	56.38	37.88	55.64	38.18	**58.00**	38.14
13	45.26	35.58	44.32	29.68	**45.48**	29.84	45.16	30.52	43.92	29.08
14	**57.12**	44.52	55.58	37.52	56.32	37.40	55.36	37.36	53.46	35.88
15	76.88	63.16	75.94	54.04	77.22	54.96	76.80	55.38	**81.50**	59.42

* Cases of the location parameter arrangements are given on page 38

Table 5.13. Percentage of Rejection for $k = 3$; Normal Distribution: Block = 40 and $n = 5$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.80	5.10	4.60	5.04	4.48	4.56	4.56	4.44	4.64	4.78
2	57.84	58.08	56.92	50.14	57.48	49.08	56.76	48.04	**65.02**	56.56
3	57.48	57.74	57.38	50.78	**58.52**	50.18	58.10	49.24	45.72	38.92
4	50.58	50.98	50.36	44.82	**51.36**	43.32	50.32	42.22	50.16	42.94
5	58.20	58.40	57.52	51.36	**58.68**	50.04	57.96	48.92	54.22	46.62
6	97.48	97.48	97.40	94.50	97.72	94.18	97.76	93.86	**99.14**	97.34
7	**97.56**	97.52	96.64	93.04	97.16	93.14	97.10	92.66	89.94	82.84
8	**97.68**	97.56	97.32	94.16	97.56	93.98	97.22	93.54	96.92	92.74
9	57.84	58.08	57.50	50.42	58.44	49.90	57.62	48.76	**65.42**	56.78
10	57.48	57.74	57.26	50.20	**59.04**	49.32	58.48	48.88	45.42	38.40
11	95.14	95.04	94.94	91.04	**95.28**	90.34	94.96	89.50	95.22	90.34
12	71.38	71.66	71.30	64.08	72.62	63.10	71.80	62.06	**73.24**	64.72
13	71.94	72.14	71.88	64.18	**73.10**	63.42	72.08	62.20	69.80	60.44
14	58.32	58.50	58.80	51.66	**59.92**	50.62	59.08	49.96	57.18	49.00
15	90.30	90.14	89.68	83.32	90.54	82.76	89.92	82.28	**93.36**	87.56

* Cases of the location parameter arrangements are given on page 38

Table 5.14. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 40 and $n = 5$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.72	5.10	4.90	5.48	4.82	5.00	5.04	4.86	4.86	4.98
2	86.50	86.48	84.48	77.00	85.18	75.98	84.28	75.14	**92.40**	84.92
3	**83.84**	**83.84**	81.66	74.40	82.92	74.44	82.68	74.26	69.76	61.40
4	82.04	**82.14**	81.06	73.90	81.30	72.16	79.98	70.46	81.38	71.80
5	**87.30**	**87.30**	86.30	79.76	86.38	78.30	84.92	76.60	83.40	75.04
6	99.92	99.86	99.82	99.18	99.82	99.08	99.74	98.92	**99.98**	99.84
7	99.54	99.50	99.56	98.24	**99.72**	98.48	99.74	98.60	97.86	94.26
8	99.92	99.90	**99.98**	99.50	99.96	99.32	99.88	98.96	99.96	99.40
9	86.50	86.48	84.58	77.46	85.14	76.30	84.26	75.26	**91.96**	84.86
10	**83.84**	**83.84**	82.22	74.90	83.74	75.04	83.74	74.58	70.26	61.52
11	99.72	99.68	99.74	99.04	99.72	98.72	99.56	98.20	**99.78**	98.90
12	94.74	94.70	93.84	89.16	93.92	87.76	93.06	86.38	**94.98**	89.82
13	**87.58**	87.46	86.62	80.12	86.82	78.94	86.12	77.24	85.86	77.66
14	**94.60**	94.52	94.20	89.80	94.08	88.56	93.14	87.18	93.74	88.34
15	99.20	99.00	99.20	97.54	99.22	97.18	98.86	96.50	**99.86**	98.92

* Cases of the location parameter arrangements are given on page 38

Table 5.15. Percentage of Rejection for k = 3; T- Distribution: Block = 40 and n = 5

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.02	5.34	4.76	5.32	4.88	4.80	4.82	4.68	4.78	4.98
2	45.10	44.80	42.64	38.32	43.78	37.38	43.60	36.74	**49.96**	42.80
3	45.02	**45.46**	43.18	38.68	44.26	37.52	43.82	36.68	34.80	29.46
4	39.56	**39.98**	37.92	34.20	38.88	32.88	38.44	32.54	38.26	33.00
5	45.62	**45.86**	44.92	39.48	45.64	38.18	44.88	37.38	41.86	35.74
6	90.02	88.96	89.38	83.52	90.20	82.94	89.84	82.12	**94.46**	89.34
7	90.22	90.24	89.30	83.12	**90.38**	82.56	89.74	82.18	78.18	68.52
8	90.72	**90.74**	90.14	83.76	90.62	83.12	89.78	81.96	88.52	80.48
9	44.80	45.10	43.24	38.42	44.28	37.42	43.82	37.24	**50.70**	42.96
10	45.02	**45.46**	43.10	38.18	44.24	37.44	43.78	36.84	33.80	28.76
11	84.60	**84.58**	84.54	78.16	85.22	77.04	84.66	76.22	83.94	76.38
12	56.70	**56.96**	54.72	48.52	55.62	48.02	54.94	46.90	56.78	48.80
13	45.32	**45.78**	42.70	38.74	43.92	37.52	43.32	36.54	41.80	36.42
14	56.96	**57.26**	54.94	48.26	55.86	47.36	55.48	47.04	54.42	45.76
15	76.32	76.32	75.98	69.56	77.14	68.38	76.68	67.24	**81.92**	73.80

* Cases of the location parameter arrangements are given on page 38

Table 5.16. Percentage of Rejection for k = 3; Normal Distribution: Block = 40 and n = 10

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.98	4.96	5.40	5.16	5.28	5.14	5.22	5.08	5.20	5.04
2	65.92	48.24	65.20	40.34	66.20	40.88	66.24	41.44	**73.86**	47.82
3	65.96	48.56	65.96	41.00	**67.02**	41.50	66.52	41.70	53.14	32.38
4	58.20	42.06	57.68	35.44	**58.22**	35.96	57.08	36.22	57.44	35.50
5	65.92	48.52	65.38	41.44	**66.24**	41.68	65.56	42.16	61.20	38.54
6	99.50	93.42	99.04	88.48	99.26	89.02	99.20	89.26	**99.84**	94.18
7	**99.34**	93.64	99.02	87.82	99.12	88.54	99.24	88.90	95.54	76.00
8	**99.44**	94.16	99.30	89.22	99.36	89.42	99.26	89.22	98.82	87.78
9	65.92	48.24	66.04	42.34	66.92	42.88	66.44	43.02	**75.14**	49.64
10	65.96	48.56	66.16	42.50	**67.08**	43.30	66.90	43.60	53.10	34.02
11	98.12	89.68	98.30	84.36	**98.44**	84.44	98.38	84.48	98.40	84.08
12	80.32	61.00	79.42	53.86	80.40	54.04	80.04	54.40	**81.44**	55.66
13	66.08	48.32	65.16	42.08	**66.28**	42.34	65.52	42.60	64.50	41.54
14	80.24	60.80	79.32	52.56	**80.32**	52.82	79.72	53.30	78.24	51.96
15	95.30	81.98	94.72	73.28	95.24	73.58	94.84	73.80	**96.92**	79.42

* Cases of the location parameter arrangements are given on page 38

Table 5.17. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 40 and $n = 10$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.78	4.72	5.08	4.52	5.10	4.56	5.06	4.80	5.08	4.76
2	92.68	76.60	91.24	68.36	91.78	68.80	91.10	68.94	**96.34**	77.20
3	**90.60**	74.64	89.16	66.12	90.34	67.00	90.50	67.48	79.30	53.86
4	**88.90**	72.44	88.74	63.24	88.64	62.36	87.46	61.70	88.32	63.30
5	**92.96**	78.56	93.04	71.58	92.86	70.78	92.20	70.18	91.46	67.90
6	**100.00**	99.10	**100.00**	98.00	99.98	97.94	99.98	97.64	**100.00**	99.58
7	99.88	98.34	99.90	95.70	**99.96**	96.42	**99.96**	96.74	99.26	89.06
8	**100.00**	99.42	**100.00**	98.74	99.98	98.36	99.98	97.92	**100.00**	98.48
9	92.68	76.60	91.62	68.02	92.06	68.22	91.70	68.86	**96.60**	78.04
10	90.60	74.64	89.88	66.92	**91.02**	67.82	90.90	68.44	79.80	54.70
11	99.96	98.80	99.98	97.18	99.98	96.74	99.98	96.26	**100.00**	97.42
12	97.82	88.60	97.92	82.84	97.76	82.04	97.30	81.18	**98.38**	84.54
13	93.34	78.94	**93.64**	72.20	93.58	71.58	92.46	70.68	92.86	70.78
14	**97.66**	88.26	97.60	82.82	97.56	81.88	97.04	81.16	97.60	81.70
15	99.80	97.38	99.76	93.86	99.76	93.40	99.70	93.20	**99.96**	96.90

* Cases of the location parameter arrangements are given on page 38

Table 5.18. Percentage of Rejection for $k = 3$; T-Distribution: Block = 40 and $n = 10$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.16	4.92	4.94	4.80	4.74	4.88	4.94	5.02	4.82	5.16
2	51.16	37.26	50.06	30.66	50.84	31.10	50.04	31.18	**58.02**	36.58
3	**51.92**	37.16	48.10	30.86	49.42	30.90	48.72	31.22	37.76	24.70
4	45.48	33.44	44.64	27.88	**45.50**	28.22	45.18	28.74	44.26	27.50
5	**52.26**	37.48	51.16	31.70	51.82	32.06	51.16	32.24	47.94	30.06
6	94.94	81.92	94.54	73.42	95.12	73.88	95.08	73.80	**98.00**	82.46
7	94.40	81.88	94.76	72.98	**95.04**	73.88	94.64	74.06	85.74	59.36
8	95.36	83.92	95.48	75.96	**95.68**	75.82	95.26	75.56	94.66	73.66
9	51.16	37.26	50.60	31.36	51.48	31.70	51.62	32.34	**58.50**	36.74
10	**51.92**	37.16	50.88	31.84	51.66	31.98	51.18	32.52	39.92	24.98
11	**91.42**	76.52	90.66	68.52	90.98	68.28	90.56	68.12	90.72	67.98
12	64.44	47.96	63.18	40.54	64.08	40.90	64.00	41.28	**64.76**	42.20
13	**52.26**	37.58	50.66	31.68	51.78	31.64	51.20	31.90	48.70	30.70
14	64.26	47.52	65.16	41.96	**66.08**	42.66	64.96	42.90	63.50	41.06
15	84.76	67.30	83.88	57.90	84.96	58.34	84.72	58.70	**88.68**	64.52

* Cases of the location parameter arrangements are given on page 38

Table 5.19. Percentage of Rejection for k = 3; Normal Distribution: Block = 40 and n = 20

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.30	5.20	4.70	4.98	4.72	4.78	4.78	4.84	5.04	5.04
2	77.42	53.26	77.14	50.72	77.88	50.74	77.46	50.72	**84.90**	58.42
3	77.26	53.22	77.22	51.02	**78.00**	51.06	77.48	51.16	62.66	39.32
4	70.16	46.46	69.70	44.22	**70.40**	44.08	70.32	43.96	68.98	43.38
5	77.44	53.74	77.36	50.50	**78.04**	50.54	77.50	50.80	73.48	46.60
6	99.94	96.40	99.84	95.04	99.90	95.26	99.88	95.40	**100.00**	98.20
7	99.32	96.30	99.94	94.84	99.96	94.94	**99.98**	95.14	99.04	84.98
8	99.94	96.76	**99.98**	95.60	**99.98**	95.58	**99.98**	95.56	99.96	94.54
9	77.42	53.26	76.54	50.22	77.44	50.14	77.02	50.52	**84.76**	58.22
10	77.26	53.22	77.20	50.12	**77.84**	50.00	77.38	49.98	63.08	38.38
11	**99.60**	93.04	99.58	90.46	**99.60**	90.44	99.54	90.50	99.42	89.68
12	**89.32**	66.82	87.92	63.76	88.28	63.60	87.86	63.46	89.18	64.42
13	77.38	53.88	77.22	51.74	**77.86**	51.64	77.12	51.60	75.82	49.26
14	89.16	66.84	88.96	63.36	**89.40**	63.50	88.98	63.30	87.44	61.26
15	98.86	87.00	98.56	83.78	98.80	84.06	98.62	84.22	**99.48**	88.74

* Cases of the location parameter arrangements are given on page 38

Table 5.20. Percentage of Rejection for k = 3; Exponential Distribution: Block = 40 and n = 20

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.70	4.74	4.86	4.94	4.72	4.98	4.62	5.00	4.80	4.80
2	97.16	82.50	97.06	78.96	97.12	78.74	96.72	78.56	**99.14**	87.38
3	95.62	79.32	95.36	75.84	96.12	76.66	**96.30**	77.16	88.72	63.54
4	**95.26**	78.34	95.10	75.10	95.02	73.94	94.20	72.96	95.02	74.84
5	97.08	83.58	**97.44**	80.50	97.42	79.24	96.96	78.50	96.32	76.86
6	100.00	99.82	100.00	99.64	100.00	99.58	100.00	99.46	100.00	99.96
7	100.00	99.10	100.00	98.66	100.00	98.82	100.00	98.96	99.96	95.38
8	100.00	99.88	100.00	99.72	100.00	99.60	100.00	99.48	100.00	99.68
9	**99.16**	82.50	97.06	78.80	97.16	78.70	96.90	78.08	**99.16**	86.26
10	95.62	79.32	95.30	75.64	95.88	76.52	**96.00**	77.22	88.20	63.62
11	100.00	99.52	100.00	99.32	100.00	99.06	100.00	98.96	100.00	99.20
12	99.50	92.56	99.46	90.30	99.34	89.48	99.22	88.56	**99.64**	91.54
13	97.38	84.22	**97.50**	81.90	97.28	80.88	96.58	79.80	97.28	79.78
14	99.48	92.16	**99.58**	89.46	99.56	88.36	99.32	87.56	99.48	88.58
15	100.00	98.60	100.00	98.04	100.00	97.94	100.00	97.44	100.00	99.38

* Cases of the location parameter arrangements are given on page 38

Table 5.21. Percentage of Rejection for k = 3; T-Distribution: Block = 40 and n = 20

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.06	5.10	4.88	5.02	4.96	5.04	4.92	5.06	4.76	4.94
2	62.30	41.56	61.18	38.40	62.06	38.76	62.28	38.98	**70.24**	44.66
3	**61.72**	41.82	60.98	38.52	61.40	38.24	60.60	38.12	48.52	29.20
4	**55.04**	38.86	53.40	33.30	53.74	32.94	53.14	32.50	52.26	32.22
5	**62.72**	42.00	60.94	39.50	61.66	39.06	61.26	39.14	57.08	36.30
6	98.48	86.62	98.12	84.24	98.34	84.48	98.38	84.62	**99.42**	90.16
7	98.38	86.38	98.22	83.32	**98.52**	83.34	98.34	83.18	92.88	68.90
8	94.48	87.58	98.76	84.78	**98.88**	84.64	98.80	84.30	98.30	82.38
9	62.30	41.56	61.42	38.02	62.60	38.06	62.00	38.02	**69.80**	44.00
10	**61.72**	41.82	61.24	38.12	61.54	38.08	61.44	38.26	48.44	29.36
11	96.26	81.30	96.80	77.72	**97.02**	77.66	96.82	77.28	96.42	77.12
12	75.78	52.40	74.50	48.26	75.20	47.96	74.94	47.90	**76.78**	49.20
13	**62.34**	42.16	61.62	39.10	62.06	39.18	62.02	39.12	60.10	37.02
14	75.60	52.02	75.58	50.52	**75.94**	50.30	75.86	50.18	74.08	48.84
15	92.18	71.58	92.96	68.92	93.20	68.92	92.66	68.94	**95.96**	74.40

* Cases of the location parameter arrangements are given on page 38

Table 5.22. Percentage of Rejection for k = 4; Normal Distribution: Block = 16 and n = 4

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.04	5.14	4.88	4.84	4.82	5.26	4.88	5.00	4.54	4.90
2	20.36	**21.16**	20.24	16.10	20.26	17.60	20.32	17.24	19.48	16.74
3	20.40	21.36	21.52	17.40	**21.84**	18.70	20.76	17.76	20.58	18.14
4	17.46	**18.34**	17.98	13.82	**18.34**	15.34	17.96	14.76	14.86	13.18
5	34.28	35.64	34.12	27.70	34.94	30.12	35.30	29.94	**42.60**	36.52
6	35.94	37.88	36.58	29.30	37.74	31.98	37.52	31.12	**38.00**	32.64
7	42.50	44.22	42.96	34.80	**43.92**	37.22	43.02	35.78	34.74	30.16
8	80.66	**82.16**	80.12	69.38	81.52	71.84	81.42	71.56	75.54	65.54
9	82.98	84.46	83.16	72.58	83.72	74.48	82.38	72.84	**85.16**	76.00
10	20.40	**21.36**	20.12	16.78	20.52	18.62	19.86	17.64	19.60	17.70
11	61.40	63.08	60.40	50.68	61.82	53.30	61.20	52.16	**63.86**	54.92
12	24.16	25.18	24.60	19.78	24.62	21.80	24.28	20.98	**25.48**	22.40
13	36.14	**37.50**	35.72	29.84	36.28	31.80	36.52	31.16	37.16	31.92
14	19.26	20.34	20.46	16.90	21.04	18.54	20.80	17.96	**23.54**	20.76
15	47.28	48.76	46.36	38.00	47.26	40.32	47.38	40.02	**55.66**	47.74

* Cases of the location parameter arrangements are given on page 38

Table 5.23. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 16 and $n = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.28	5.48	4.78	4.50	4.64	4.98	4.70	4.64	4.82	4.72
2	40.18	**40.66**	38.92	31.78	38.70	33.20	38.10	32.06	36.38	30.50
3	38.90	**40.56**	37.96	31.18	38.54	34.02	37.36	32.20	36.10	31.50
4	33.22	**34.62**	33.24	27.04	33.38	29.44	32.50	28.02	26.90	23.40
5	57.50	59.40	54.48	43.78	55.78	47.28	56.38	47.54	**68.90**	58.82
6	64.32	66.20	65.28	54.32	64.90	56.06	63.48	53.60	**67.54**	58.44
7	71.00	**72.58**	69.72	59.42	70.22	61.32	68.72	59.06	58.66	50.74
8	96.02	**96.70**	96.38	90.94	96.18	91.02	95.90	90.18	95.64	90.16
9	97.56	97.92	97.28	92.94	96.78	92.62	96.10	90.58	**98.30**	94.76
10	38.90	**40.56**	37.64	31.22	38.68	33.18	37.22	31.42	36.48	31.50
11	87.94	89.40	87.82	78.36	87.58	78.92	85.92	77.08	**90.94**	83.70
12	46.26	**48.22**	43.42	36.10	44.20	37.64	44.04	36.78	46.62	39.34
13	63.94	**65.44**	63.20	51.90	63.06	53.64	62.60	52.72	63.74	54.46
14	35.38	36.98	34.04	26.76	34.54	29.50	34.80	29.10	**39.92**	33.36
15	75.04	76.58	74.78	63.10	75.02	64.98	74.52	63.74	**84.80**	75.18

* Cases of the location parameter arrangements are given on page 38

Table 5.24. Percentage of Rejection for $k = 4$; T-Distribution: Block = 16 and $n = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.94	4.98	4.94	4.60	4.98	5.20	4.56	4.84	4.66	5.12
2	16.72	**17.62**	16.16	14.16	16.42	15.14	16.48	14.70	15.12	14.08
3	16.94	**17.64**	16.62	14.24	17.18	15.46	16.88	14.92	16.08	14.48
4	14.88	**15.60**	15.22	12.50	14.64	13.82	14.70	13.22	12.70	12.08
5	26.76	28.24	27.58	22.56	28.04	24.44	27.92	24.10	**33.82**	29.60
6	28.62	**29.84**	27.96	22.58	28.16	24.64	27.64	23.60	28.66	24.90
7	33.04	**34.58**	33.14	26.72	33.66	28.40	32.78	27.62	26.94	23.58
8	66.82	**68.42**	61.96	51.42	63.28	53.80	64.16	53.34	58.32	50.16
9	69.70	**71.44**	66.30	55.34	67.20	58.32	66.58	57.20	68.40	59.50
10	16.94	**17.64**	16.56	13.84	16.92	14.88	16.60	14.02	16.22	14.28
11	47.44	**49.58**	46.42	38.68	47.72	41.12	47.18	39.90	49.52	42.50
12	19.36	20.44	19.30	16.60	19.80	18.16	19.18	17.44	**20.28**	18.24
13	28.46	**29.82**	27.60	22.86	28.26	24.78	28.16	23.88	28.76	24.98
14	15.84	16.76	16.26	13.80	16.66	14.88	16.66	14.54	**18.42**	16.58
15	37.30	38.92	35.94	28.98	36.26	30.82	36.16	30.18	**42.58**	35.94

* Cases of the location parameter arrangements are given on page 38

Table 5.25. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 16 and $n = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.22	5.14	5.02	4.82	5.16	4.56	5.08	4.54	5.14	4.82
2	25.26	21.64	25.06	18.84	25.36	18.64	**25.56**	18.60	23.42	16.74
3	**25.24**	21.56	24.04	18.90	24.48	18.76	23.40	18.10	23.44	17.66
4	**21.86**	18.80	20.68	15.66	21.02	15.52	20.52	15.38	17.58	13.36
5	42.12	34.68	39.94	29.02	41.02	29.04	42.10	29.84	**51.28**	36.38
6	44.58	37.02	45.06	31.60	45.46	31.34	44.64	31.20	**46.52**	32.08
7	**51.82**	43.40	50.76	36.82	51.46	36.84	50.62	36.10	40.78	29.00
8	89.10	80.74	88.88	71.38	89.46	71.10	**90.12**	71.66	84.94	65.34
9	90.94	82.92	90.64	73.58	91.28	73.30	90.64	72.58	**92.28**	75.64
10	25.24	21.56	25.36	18.08	**25.88**	17.74	24.78	17.38	24.28	17.24
11	72.26	60.58	72.98	53.24	73.84	53.12	73.34	53.18	**76.22**	56.44
12	**29.86**	25.44	28.22	20.88	28.60	20.52	28.52	20.48	29.84	21.68
13	44.38	37.18	43.70	31.42	44.44	31.32	**44.68**	31.42	44.56	31.72
14	23.78	20.34	22.22	16.66	22.60	16.40	22.62	16.62	**25.98**	18.62
15	56.72	47.54	57.46	40.04	58.66	39.40	58.62	39.90	**67.20**	47.48

* Cases of the location parameter arrangements are given on page 38

Table 5.26. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 16 and $n = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.46	4.96	5.16	5.00	4.90	5.20	4.92	5.20	5.32	5.04
2	47.44	38.36	47.48	33.08	**47.68**	32.20	46.98	31.50	43.56	29.48
3	**47.22**	37.30	46.02	32.84	46.80	32.92	45.20	31.78	44.64	30.54
4	**40.18**	32.42	38.08	28.38	38.42	27.84	37.80	27.12	31.44	22.04
5	67.54	56.12	67.10	47.06	67.94	47.30	68.32	48.38	**81.80**	60.38
6	74.88	64.76	74.70	56.10	74.08	54.68	72.50	53.62	**76.68**	56.02
7	80.66	71.60	80.90	62.94	**81.68**	62.22	80.22	61.38	69.94	50.62
8	98.84	96.24	99.26	91.52	99.04	90.62	98.94	90.32	**99.08**	90.26
9	99.42	97.64	99.26	92.86	99.22	91.60	98.88	90.44	**99.50**	94.22
10	**47.22**	37.30	45.40	31.56	46.32	31.36	44.72	30.04	43.46	29.76
11	94.54	88.52	94.58	80.88	94.14	78.64	93.10	77.42	**96.24**	83.78
12	55.40	44.96	54.88	37.90	54.28	37.00	52.92	36.88	**57.38**	38.74
13	74.84	64.26	75.14	54.28	74.22	53.08	73.18	52.46	**76.14**	54.54
14	42.26	33.54	40.54	28.58	40.88	28.38	40.52	28.48	**48.24**	33.06
15	85.60	75.74	84.86	64.40	84.42	63.60	84.10	63.70	**92.66**	74.76

* Cases of the location parameter arrangements are given on page 38

Table 5.27. Percentage of Rejection for $k = 4$; T-Distribution: Block = 16 and $n = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.64	5.76	4.56	4.94	4.64	4.96	4.84	4.94	4.90	4.78
2	**21.30**	18.72	20.56	15.90	20.24	15.42	19.82	15.36	19.64	14.40
3	**21.12**	18.40	20.18	15.46	20.28	15.26	19.58	14.88	19.66	14.96
4	**18.88**	15.76	16.62	13.18	17.02	13.04	17.02	12.88	13.80	11.80
5	34.80	28.42	30.40	22.20	31.04	21.80	31.20	22.42	**38.40**	26.58
6	**36.44**	29.72	33.76	24.14	33.92	24.30	33.20	23.86	35.48	24.98
7	**41.96**	34.08	38.36	27.70	39.18	27.08	38.40	26.76	30.80	22.20
8	**77.94**	67.00	75.46	56.88	76.20	56.28	76.64	57.16	70.90	52.12
9	**80.04**	70.32	78.00	58.06	78.46	57.50	77.94	56.82	79.82	59.52
10	**21.12**	18.40	18.90	15.10	19.38	14.76	18.70	14.48	18.10	14.24
11	58.54	48.90	56.10	39.88	56.16	39.58	55.98	39.50	**58.88**	41.24
12	**25.08**	21.32	22.66	17.76	22.64	16.86	22.80	16.92	23.54	17.36
13	**36.62**	29.90	33.42	24.80	33.96	24.82	34.26	24.84	33.74	24.36
14	20.00	17.56	18.62	14.44	18.90	14.28	19.04	14.26	**21.64**	16.18
15	47.28	38.28	44.18	30.84	44.54	30.56	44.96	31.02	**52.34**	35.98

* Cases of the location parameter arrangements are given on page 38

Table 5.28. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 32 and $n = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.24	4.84	4.72	4.56	4.68	4.72	4.64	4.76	4.84	4.88
2	29.18	**30.64**	28.90	26.44	29.08	26.58	29.06	26.40	27.36	25.00
3	28.02	**30.06**	27.64	25.68	28.82	26.38	27.66	25.70	26.84	24.58
4	23.56	**25.12**	23.30	21.58	24.16	22.10	23.38	22.24	19.52	18.00
5	47.26	51.44	47.64	42.78	49.58	44.20	50.10	45.14	**60.22**	54.50
6	49.86	**54.42**	48.66	44.16	49.88	45.14	49.24	44.86	50.86	45.70
7	59.48	**63.78**	58.88	53.28	59.56	54.18	59.00	53.68	47.96	43.28
8	93.50	**95.68**	93.18	90.02	93.90	90.66	94.20	91.32	91.20	87.22
9	94.56	**96.72**	94.68	91.82	95.52	92.42	95.12	92.06	95.82	93.32
10	29.42	**30.50**	27.98	25.24	29.36	26.42	28.28	26.28	28.02	25.84
11	78.72	**82.86**	78.30	72.82	79.56	73.82	79.30	73.84	81.84	76.58
12	34.88	**37.02**	33.42	30.22	34.48	30.80	34.26	31.26	36.04	32.48
13	51.32	**55.32**	49.48	45.18	50.84	46.22	50.64	46.48	50.92	45.98
14	27.26	28.48	26.38	23.80	26.68	24.20	26.46	24.38	**30.30**	27.60
15	64.42	68.98	64.04	58.50	65.26	59.66	65.56	60.42	**74.08**	68.58

* Cases of the location parameter arrangements are given on page 38

Table 5.29. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 32 and $n = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.06	4.96	4.86	4.78	5.24	5.02	5.34	5.16	5.04	4.96
2	52.08	**56.52**	52.40	47.78	52.62	47.62	51.74	47.10	49.34	44.64
3	51.98	**55.60**	51.46	47.06	52.18	47.76	50.40	46.28	49.48	45.12
4	44.08	**47.84**	44.94	41.04	45.88	41.30	44.62	40.94	36.98	33.54
5	75.22	79.72	75.28	69.48	76.06	70.84	76.26	70.90	**88.12**	83.68
6	81.98	**86.14**	81.94	77.40	81.56	77.06	80.20	75.46	83.86	79.40
7	86.80	**90.48**	86.38	81.88	86.96	82.02	85.84	81.44	77.30	72.36
8	99.54	99.80	99.56	99.10	99.48	**98.88**	99.50	98.78	99.40	98.68
9	99.74	**99.94**	99.80	99.46	99.82	99.42	99.52	99.12	99.90	99.72
10	51.98	**55.60**	52.74	48.30	53.90	49.10	51.80	47.28	51.76	47.12
11	97.48	98.46	97.28	95.44	97.08	94.74	96.28	93.80	**98.52**	97.08
12	61.72	**66.00**	60.96	55.50	61.34	55.86	60.18	55.52	64.52	59.22
13	81.30	**85.48**	81.94	76.54	81.42	75.72	80.34	75.34	83.24	77.92
14	47.90	51.62	46.90	42.98	47.90	43.28	47.22	43.46	**56.32**	51.02
15	90.42	93.12	89.64	85.66	89.30	85.22	88.74	84.98	**95.72**	93.14

* Cases of the location parameter arrangements are given on page 38

Table 5.30. Percentage of Rejection for $k = 4$; T-Distribution: Block = 32 and $n = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.44	4.88	4.84	4.64	4.78	4.64	4.84	5.10	5.08	5.00
2	23.06	**24.14**	20.66	19.08	21.22	19.52	20.98	19.78	19.68	18.62
3	22.84	**23.48**	22.10	20.14	22.22	20.42	21.68	20.06	21.00	19.12
4	19.64	**20.52**	18.48	17.16	19.08	17.74	19.06	18.02	15.94	14.74
5	37.90	40.54	35.70	32.44	36.56	33.32	36.94	34.20	**45.30**	41.10
6	39.44	**42.28**	38.90	34.66	39.50	35.16	38.90	35.20	40.54	36.42
7	46.70	**49.86**	44.52	40.20	45.90	41.22	44.94	40.96	35.98	32.64
8	83.36	**87.44**	80.76	76.00	81.58	76.72	82.34	77.10	77.46	71.98
9	85.00	**88.90**	83.70	79.22	85.02	79.78	84.00	79.04	85.48	81.28
10	22.84	**23.48**	21.40	19.76	21.92	20.22	21.28	19.76	21.40	19.60
11	65.24	**69.82**	62.80	57.74	64.46	58.62	63.72	58.50	66.82	61.56
12	26.96	**28.40**	25.90	23.46	26.26	23.84	26.38	24.48	27.04	24.86
13	39.70	**42.34**	38.04	34.20	38.54	34.88	38.38	35.14	38.74	35.12
14	21.34	22.28	20.12	18.60	20.52	18.94	20.90	19.48	**23.72**	21.82
15	51.46	54.82	49.76	44.98	50.90	45.88	51.10	46.32	**59.06**	54.08

* Cases of the location parameter arrangements are given on page 38

Table 5.31. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 32 and $n = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.78	5.32	4.78	4.84	4.96	4.76	4.86	4.80	5.00	4.86
2	**33.84**	28.40	33.04	22.24	33.48	21.92	33.40	22.04	31.24	20.68
3	**33.58**	28.18	32.64	22.22	33.26	22.02	32.42	21.58	31.88	21.08
4	**28.84**	24.18	27.42	19.10	27.74	18.80	27.20	18.92	22.54	15.86
5	55.48	47.06	55.30	36.56	56.02	36.16	56.76	37.06	**68.00**	45.72
6	59.14	49.76	56.98	37.56	57.96	37.16	57.12	37.02	**59.34**	38.16
7	67.10	58.12	66.34	46.20	**67.16**	45.58	66.04	45.52	55.18	36.58
8	**97.14**	93.06	96.54	82.24	96.72	82.02	96.90	83.02	95.26	77.86
9	97.80	94.56	97.56	85.14	97.80	85.04	97.66	84.82	**98.12**	86.34
10	33.58	28.18	33.02	22.44	**33.72**	22.26	32.10	21.58	31.70	21.60
11	85.56	77.40	86.48	64.66	87.32	64.28	86.98	64.06	**89.26**	67.12
12	40.08	33.68	40.08	26.92	**41.12**	26.38	40.64	26.74	42.32	27.36
13	59.00	50.32	57.70	38.80	59.40	38.68	**59.72**	39.22	58.60	39.26
14	31.28	26.88	30.36	21.24	30.48	20.60	30.12	21.04	**35.98**	24.52
15	72.80	63.10	73.06	50.54	74.26	50.16	74.26	50.64	**83.18**	58.68

* Cases of the location parameter arrangements are given on page 38

Table 5.32. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 32 and $n = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.84	5.40	4.70	4.84	4.80	4.62	4.70	4.60	4.66	4.88
2	62.06	53.32	**62.10**	41.80	61.88	40.78	60.74	40.82	57.74	37.72
3	60.66	52.58	60.02	40.26	**61.34**	40.20	59.14	39.22	59.16	38.26
4	**52.14**	45.02	50.82	34.32	51.48	33.72	50.28	33.30	41.84	27.34
5	84.74	75.94	82.72	59.42	83.18	59.48	83.76	60.92	**94.22**	73.58
6	89.44	82.56	89.02	68.24	88.80	66.84	87.18	65.48	**90.92**	69.34
7	**93.10**	87.02	91.66	73.34	92.18	72.88	91.28	72.12	84.84	61.76
8	99.94	99.48	**99.96**	96.80	**99.96**	96.28	99.92	95.88	99.94	96.08
9	99.96	99.78	99.96	97.92	99.92	97.28	99.90	96.58	**99.98**	98.64
10	**60.66**	52.58	58.94	40.10	60.34	39.74	58.68	38.96	56.64	37.62
11	99.24	97.12	99.28	90.24	99.20	88.72	98.72	87.56	**99.70**	92.54
12	71.38	62.38	71.10	49.12	70.86	48.40	69.54	47.74	**74.58**	50.70
13	89.02	81.92	89.18	67.24	88.66	65.58	87.82	65.54	**90.64**	67.30
14	56.68	47.88	55.88	36.42	56.40	36.14	56.18	36.78	**65.72**	43.02
15	95.78	91.30	95.18	77.98	95.30	76.44	94.70	76.48	**98.84**	87.00

* Cases of the location parameter arrangements are given on page 38

Table 5.33. Percentage of Rejection for $k = 4$; T-Distribution: Block = 32 and $n = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.76	5.10	4.96	4.78	4.92	4.72	4.82	4.80	4.48	4.88
2	**25.70**	22.14	24.60	17.68	25.22	17.34	25.12	17.72	23.06	16.56
3	25.64	21.94	25.58	17.88	**26.20**	17.68	25.34	17.76	24.62	17.30
4	21.66	19.02	21.62	16.16	**21.88**	15.96	21.30	16.02	18.38	13.60
5	43.60	36.22	43.10	28.30	43.82	27.76	**44.08**	28.64	54.08	34.46
6	45.76	38.30	43.82	30.38	45.38	30.60	45.06	30.38	**46.04**	30.66
7	**54.30**	45.26	50.58	33.94	51.44	34.18	50.14	33.44	40.88	27.26
8	**90.76**	83.10	88.88	68.08	89.68	67.60	89.86	68.42	85.28	63.44
9	92.08	84.85	90.66	69.56	91.16	69.60	90.34	68.92	**92.36**	71.48
10	25.64	21.94	24.82	18.20	25.22	18.06	24.64	18.04	24.10	17.30
11	74.14	64.90	70.56	48.98	72.02	48.56	71.60	48.84	**74.20**	51.24
12	30.46	26.14	29.96	20.96	30.72	20.70	30.52	20.94	**32.06**	22.24
13	**45.92**	38.22	44.36	30.10	44.88	30.20	45.18	30.68	44.62	30.08
14	23.82	20.74	23.34	17.10	23.74	16.76	23.90	17.10	**27.18**	18.52
15	59.88	49.96	56.62	38.14	57.46	37.24	57.68	38.06	**66.34**	44.22

* Cases of the location parameter arrangements are given on page 38

Table 5.34. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 40 and $n = 5$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.48	4.38	4.90	5.00	4.80	4.68	4.58	4.60	5.16	4.88
2	32.84	**35.30**	31.64	27.70	33.08	27.64	32.62	28.12	30.50	26.02
3	32.64	**35.12**	33.14	28.42	33.44	27.78	32.18	27.06	32.00	26.50
4	27.62	**29.10**	27.26	23.40	27.86	23.18	27.32	23.22	22.86	19.14
5	55.98	59.06	55.46	47.62	57.18	47.08	57.88	47.98	**67.42**	57.50
6	59.00	**61.68**	57.72	49.44	58.72	49.66	58.04	49.76	59.94	50.92
7	67.92	**70.88**	67.06	57.74	68.10	57.12	67.10	56.30	56.24	46.74
8	97.16	**98.18**	97.30	93.50	97.46	93.34	97.38	93.62	95.56	89.66
9	98.24	**98.80**	97.68	94.54	97.88	94.32	97.72	93.92	98.24	94.78
10	32.64	**35.12**	32.96	28.34	34.18	27.62	32.76	27.14	32.50	26.68
11	86.16	**89.12**	85.34	77.10	86.44	77.14	86.38	76.90	88.70	79.96
12	39.86	**42.56**	38.54	33.14	39.46	32.56	39.40	32.64	41.38	34.96
13	59.06	**61.90**	57.42	49.12	59.08	49.02	59.04	49.92	58.84	49.40
14	30.52	32.86	31.40	27.56	32.32	27.02	32.66	27.40	**37.12**	31.34
15	73.28	76.40	72.82	63.38	74.42	63.02	74.06	63.58	**82.54**	72.52

* Cases of the location parameter arrangements are given on page 38

Table 5.35. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 40 and $n = 5$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.82	5.04	5.00	5.10	5.16	4.78	5.34	4.90	5.16	4.78
2	60.72	**64.10**	61.92	53.26	62.22	51.70	60.40	50.82	58.54	48.74
3	59.60	**63.56**	59.16	50.72	60.82	51.02	58.62	49.48	57.28	47.30
4	50.94	**54.20**	51.08	44.30	51.90	43.18	50.76	42.56	41.04	34.40
5	83.72	86.94	83.34	74.76	84.16	74.24	84.54	75.00	**93.90**	87.26
6	89.32	**91.42**	89.50	81.62	89.28	80.46	87.82	79.04	91.16	82.72
7	92.74	**94.54**	91.90	85.12	92.48	84.80	91.74	83.92	84.84	75.26
8	99.94	**99.96**	99.92	99.68	99.94	99.52	99.94	99.42	99.92	99.50
9	99.36	99.98	**100.00**	99.80	99.98	99.68	99.96	99.44	**100.00**	99.94
10	59.60	**63.56**	58.96	50.54	60.08	49.80	57.96	48.50	57.32	46.98
11	99.20	99.58	98.92	96.84	98.86	96.00	98.60	95.12	**99.64**	97.38
12	70.80	**74.20**	70.78	62.00	71.18	60.94	70.12	60.26	73.66	63.68
13	88.70	**91.16**	87.68	80.10	87.38	78.46	86.96	77.82	89.72	80.78
14	55.62	59.06	55.90	47.30	56.88	47.04	56.34	47.30	**66.32**	54.56
15	95.94	**98.96**	95.24	90.24	95.44	89.24	95.10	88.76	98.34	95.18

* Cases of the location parameter arrangements are given on page 38

Table 5.36. Percentage of Rejection for $k = 4$; T-Distribution: Block = 40 and $n = 5$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.72	4.82	4.94	5.16	4.98	4.70	4.94	4.84	4.90	5.04
2	25.82	**27.78**	24.82	22.16	25.56	21.76	25.24	21.62	23.42	19.70
3	25.94	**27.40**	25.32	22.20	25.84	21.52	24.98	21.12	24.56	20.68
4	21.76	**23.36**	21.46	18.84	21.70	18.28	21.28	18.26	17.88	15.30
5	42.50	44.94	41.46	36.10	42.70	35.76	43.02	36.30	**52.14**	43.42
6	44.40	**47.46**	44.36	38.02	45.62	37.58	44.94	37.88	46.56	38.76
7	52.04	**55.06**	52.92	44.72	54.06	44.20	52.92	43.56	43.12	35.68
8	89.26	**91.12**	88.96	81.10	89.48	80.90	89.54	81.48	85.56	76.12
9	91.00	**92.72**	90.80	83.38	91.60	83.12	90.82	82.64	92.00	84.96
10	25.94	**27.40**	25.12	21.84	25.74	21.38	24.98	20.86	24.78	20.72
11	72.54	**75.54**	70.56	62.34	71.78	61.62	71.56	61.80	74.56	64.94
12	30.80	**32.54**	29.36	25.54	29.80	24.82	29.68	25.08	31.92	26.84
13	44.40	**47.20**	43.68	37.22	44.34	36.54	44.44	37.00	44.14	36.02
14	24.48	25.98	22.74	20.12	23.34	19.50	23.26	19.94	**26.96**	23.10
15	57.30	60.86	56.58	48.86	57.90	48.18	57.98	48.66	**66.94**	56.34

* Cases of the location parameter arrangements are given on page 38

Table 5.37. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 40 and $n = 10$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.16	5.48	4.70	4.68	5.12	4.54	5.04	4.56	4.98	5.02
2	**39.52**	29.78	37.58	24.12	37.94	23.68	36.90	23.50	35.44	22.24
3	**39.02**	30.34	38.30	24.28	38.80	24.34	37.36	23.74	37.06	23.70
4	**32.54**	25.50	31.16	19.68	31.84	19.36	31.20	19.28	25.20	17.10
5	64.96	51.64	63.58	40.56	65.00	40.16	65.56	41.08	**75.30**	49.88
6	68.00	54.62	66.74	42.14	67.94	41.58	67.30	41.54	**68.48**	43.06
7	**77.38**	62.90	74.80	48.40	75.72	48.34	74.80	47.88	63.36	38.42
8	99.12	95.92	99.30	87.56	99.34	87.50	**99.36**	88.10	98.36	82.94
9	99.28	96.68	99.38	89.26	99.50	89.48	99.36	89.02	**99.52**	90.44
10	39.02	30.34	38.70	24.18	**39.40**	24.00	37.98	23.28	37.36	22.94
11	93.08	82.54	92.22	68.22	92.98	68.26	92.76	68.12	**94.18**	71.02
12	47.28	36.60	46.92	30.26	47.46	29.96	47.22	29.84	**49.16**	31.18
13	**68.38**	54.64	66.12	41.96	67.38	41.62	67.38	42.12	67.66	42.06
14	36.42	28.10	34.70	21.54	35.58	21.42	36.12	21.38	**41.78**	25.58
15	82.34	68.84	80.16	54.98	81.32	54.64	81.30	55.04	**89.12**	63.52

* Cases of the location parameter arrangements are given on page 38

Table 5.38. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 40 and $n = 10$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.92	4.50	4.64	4.96	4.98	4.96	4.98	4.88	4.70	5.06
2	69.32	54.66	**70.44**	45.76	70.40	44.98	68.96	44.84	66.64	42.10
3	68.02	53.10	67.88	44.08	**69.30**	44.14	66.76	42.54	66.16	41.92
4	58.94	46.40	60.42	38.60	**61.12**	38.12	59.88	37.34	49.88	30.58
5	90.50	78.84	90.22	65.18	90.52	64.88	90.64	66.16	**97.44**	78.90
6	94.40	85.42	94.48	73.44	94.44	72.02	93.30	70.66	**95.44**	74.64
7	**96.62**	89.38	96.38	78.62	**96.62**	78.30	96.14	77.46	91.54	67.36
8	100.00	99.88	100.00	98.58	100.00	98.08	100.00	97.88	100.00	98.06
9	100.00	99.92	100.00	99.30	100.00	98.94	100.00	98.48	100.00	99.44
10	68.02	53.10	67.24	43.44	**68.78**	43.14	67.16	41.98	65.76	41.16
11	99.86	98.34	99.82	93.64	99.80	92.16	99.64	90.98	**99.88**	95.06
12	78.98	64.64	79.26	53.44	78.78	52.34	77.44	51.62	**83.02**	55.52
13	94.10	84.32	93.92	71.24	93.50	69.84	92.86	69.10	**94.86**	71.52
14	63.82	49.48	64.72	39.44	65.48	39.46	64.78	39.72	**74.90**	47.08
15	98.50	92.94	98.34	82.02	98.18	80.74	98.00	80.44	**99.74**	91.04

* Cases of the location parameter arrangements are given on page 38

Table 5.39. Percentage of Rejection for k = 4; T-Distribution: Block = 40 and n = 10

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.10	5.14	4.94	4.80	4.78	4.70	4.94	4.76	5.18	4.54
2	**30.04**	24.18	28.70	18.56	29.06	18.12	28.72	18.16	27.10	17.24
3	**30.24**	24.04	28.98	18.72	29.12	18.82	28.22	18.54	27.96	18.22
4	**25.52**	20.84	23.82	15.96	24.40	15.62	24.12	15.46	20.02	13.58
5	50.40	38.78	47.98	30.18	49.54	30.02	50.16	30.54	**61.06**	37.42
6	52.60	40.90	51.60	31.42	52.52	31.46	51.80	31.00	**53.64**	32.38
7	**61.06**	47.92	59.22	37.66	59.88	37.08	58.80	36.78	48.84	30.42
8	**94.20**	84.82	93.26	72.12	93.86	71.70	94.12	72.64	91.38	66.48
9	95.58	86.84	95.10	74.38	95.76	73.98	95.40	73.56	**96.24**	75.54
10	**30.24**	24.04	28.94	18.76	29.62	18.72	28.18	18.26	27.80	18.04
11	80.10	66.74	78.90	52.48	79.80	52.36	79.12	52.36	**82.66**	55.54
12	36.06	28.20	34.02	21.54	34.54	21.62	34.48	21.80	**36.52**	22.50
13	**52.88**	40.44	49.62	31.18	50.54	31.32	50.62	31.58	51.28	31.52
14	28.38	22.46	27.30	17.86	27.94	17.62	28.02	18.06	**32.58**	20.30
15	65.98	52.22	66.08	41.92	67.06	41.94	66.56	42.32	**75.10**	48.84

* Cases of the location parameter arrangements are given on page 38

Table 5.40. Percentage of Rejection for k = 4; Normal Distribution: Block = 40 and n = 20

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.22	4.96	4.62	5.20	4.84	5.14	4.66	5.14	4.50	4.70
2	**48.24**	32.40	45.46	29.06	46.66	29.20	46.28	28.82	43.38	26.82
3	**47.60**	32.40	44.92	27.28	45.74	27.18	43.82	26.14	43.46	25.56
4	**40.16**	27.32	38.26	23.94	38.92	24.06	38.58	23.94	31.18	19.48
5	75.98	53.88	72.84	45.60	73.78	45.58	74.20	46.44	**85.10**	57.04
6	78.70	57.34	77.90	49.76	78.74	49.78	77.68	48.92	**79.88**	51.28
7	**86.52**	65.60	85.10	58.26	85.68	58.24	85.04	57.58	74.12	47.06
8	99.82	96.22	99.82	93.48	**99.88**	93.64	**99.88**	93.94	99.66	90.54
9	99.88	97.12	**99.92**	94.34	99.90	94.38	99.90	94.24	**99.92**	95.10
10	**47.60**	32.40	46.54	27.62	47.12	27.66	45.12	27.10	44.48	26.72
11	97.28	84.92	96.88	78.52	97.20	78.80	97.12	78.86	**97.94**	81.18
12	57.22	38.32	55.60	33.38	56.68	33.26	56.42	32.90	**59.36**	34.90
13	78.72	56.94	77.68	50.18	79.02	50.06	79.04	50.56	**78.84**	50.58
14	44.20	29.96	42.00	26.10	42.84	25.76	43.16	26.22	**51.02**	31.02
15	90.62	71.70	89.34	63.92	90.24	64.22	90.22	64.90	**95.08**	72.92

* Cases of the location parameter arrangements are given on page 38

Table 5.41. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 40 and $n = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.94	4.90	4.86	5.00	4.86	5.00	5.06	5.06	4.72	4.96
2	**80.12**	59.08	79.86	53.04	79.62	52.32	78.34	51.62	77.50	49.70
3	79.22	57.64	78.80	52.44	**79.88**	52.30	77.98	50.62	77.40	49.84
4	70.18	49.90	70.74	46.94	**71.30**	46.38	69.84	45.24	60.56	37.84
5	95.84	80.94	96.40	74.68	96.46	74.42	96.64	75.36	**99.50**	88.02
6	97.74	86.92	98.42	81.96	98.34	80.30	97.98	78.98	**98.90**	83.40
7	98.84	90.44	98.92	86.52	**99.08**	86.16	99.02	85.44	96.52	77.34
8	99.98	99.80	100.00	99.74	100.00	99.54	100.00	99.48	100.00	99.66
9	100.00	99.92	100.00	99.94	100.00	99.80	100.00	99.64	100.00	100.00
10	79.22	57.64	78.08	51.60	**79.34**	51.74	77.22	49.82	76.76	49.26
11	99.96	98.50	100.00	97.38	99.98	96.86	99.96	96.26	100.00	98.20
12	88.32	68.16	88.50	63.08	88.12	61.54	87.22	60.86	**91.14**	65.08
13	97.74	86.22	98.06	81.52	98.10	80.38	97.72	79.84	**98.46**	82.48
14	76.10	53.70	75.14	47.98	75.78	47.40	74.96	47.52	**84.44**	56.14
15	99.54	94.36	99.56	91.12	99.50	90.28	99.40	90.02	**99.94**	96.48

* Cases of the location parameter arrangements are given on page 38

Table 5.42. Percentage of Rejection for $k = 4$; T-Distribution: Block = 40 and $n = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.72	5.56	5.22	4.90	5.20	4.84	5.08	4.78	5.18	5.16
2	**35.32**	23.76	33.92	21.14	34.80	20.90	34.34	21.06	32.32	20.62
3	35.20	23.86	35.40	21.86	**36.04**	21.76	34.88	21.46	34.44	20.70
4	**28.88**	20.74	28.62	17.90	28.68	17.80	28.38	17.80	23.64	15.20
5	59.04	38.78	57.82	36.12	58.88	35.74	59.48	36.36	**70.40**	44.28
6	62.16	40.96	61.76	37.92	62.58	37.90	62.30	37.68	**63.66**	38.88
7	**71.20**	48.18	69.94	44.08	70.58	44.08	69.52	43.72	58.92	35.28
8	98.28	86.68	98.18	82.08	98.36	81.86	**98.38**	82.42	96.36	76.92
9	98.76	88.40	98.44	84.28	98.66	84.08	98.42	83.52	**98.82**	85.22
10	35.20	23.86	35.30	22.86	**36.02**	22.64	34.80	22.18	33.78	21.46
11	88.98	68.42	89.46	63.94	90.30	63.70	90.02	63.64	**91.98**	66.92
12	42.78	28.42	42.72	25.24	43.56	24.94	43.42	24.76	**45.34**	26.80
13	**62.42**	41.18	61.02	37.42	61.60	37.18	62.32	37.84	61.86	37.00
14	32.58	22.64	32.20	20.52	32.96	20.26	33.20	20.54	**38.80**	23.68
15	76.36	53.18	76.48	48.08	77.38	47.68	77.54	48.18	**85.56**	57.36

* Cases of the location parameter arrangements are given on page 38

Table 5.43. Percentage of Rejection for $k = 5$; Normal Distribution: Block = 16 and $n = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.14	5.02	5.10	4.86	4.94	4.88	5.06	4.82	4.86	4.66
2	34.28	**35.46**	33.14	27.00	33.80	28.36	33.04	28.40	29.90	25.30
3	29.94	30.78	29.26	24.16	29.78	25.14	29.44	25.00	**32.26**	27.14
4	33.94	34.32	30.94	25.70	32.00	26.60	33.42	27.72	**41.96**	34.08
5	23.72	**24.26**	23.48	19.92	23.66	21.04	23.58	20.26	22.44	19.46
6	27.96	**28.46**	26.74	22.22	27.60	23.74	27.00	23.18	26.88	22.26
7	38.38	**39.56**	37.18	30.50	38.00	32.10	37.52	31.60	32.86	27.14
8	45.58	46.92	43.16	34.90	44.16	36.66	43.86	36.48	**51.96**	42.76
9	36.18	**37.36**	34.24	27.94	34.78	29.08	33.64	28.30	36.58	30.56
10	45.94	**47.08**	44.06	36.66	45.84	38.32	45.06	38.08	44.50	37.32
11	22.40	22.30	21.96	18.36	22.24	19.42	22.22	19.22	**25.64**	21.66
12	60.80	62.46	58.42	48.70	60.00	50.52	60.30	50.98	**70.92**	60.66
13	65.96	**67.58**	65.56	54.58	66.50	56.82	65.14	55.08	66.06	55.92
14	38.42	**39.46**	37.44	30.34	38.16	32.22	37.34	31.42	30.64	25.56
15	40.76	**42.10**	40.56	33.22	41.10	34.68	40.02	33.94	37.40	32.12

* Cases of the location parameter arrangements are given on page 38

Table 5.44. Percentage of Rejection for $k = 5$; Exponential Distribution: Block = 16 and $n = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.82	4.76	5.10	4.94	5.08	5.20	5.00	5.06	5.10	5.36
2	59.18	60.94	**61.38**	51.60	61.36	52.60	60.24	51.46	56.50	47.50
3	51.80	53.18	53.48	44.44	54.22	45.78	53.32	45.06	**58.96**	48.92
4	51.56	53.50	53.10	42.30	54.50	44.64	56.18	46.44	**69.78**	57.90
5	42.26	**43.08**	42.48	35.34	42.92	36.16	41.30	34.82	39.72	33.28
6	48.80	50.42	49.62	40.70	50.22	42.62	48.64	41.48	**50.74**	41.88
7	65.54	**66.92**	65.82	56.04	66.02	56.56	64.76	55.44	59.46	50.36
8	72.32	74.42	73.28	61.56	73.00	62.04	71.92	60.90	**82.86**	72.80
9	60.66	62.70	61.02	51.30	62.56	53.96	61.12	52.30	**67.14**	57.12
10	73.42	75.40	75.42	65.62	75.72	66.26	74.38	64.94	**76.08**	66.38
11	36.96	38.22	36.86	29.84	37.54	31.08	37.52	31.08	**45.52**	37.22
12	86.24	87.80	87.32	76.88	86.88	76.96	86.08	76.82	**95.44**	88.46
13	90.42	**91.58**	90.32	81.38	90.72	82.06	89.08	80.22	91.14	83.54
14	64.40	66.66	65.94	55.62	**66.72**	57.06	64.92	55.52	55.98	46.92
15	67.84	**69.62**	69.40	58.72	69.52	59.86	66.94	57.76	64.06	54.86

* Cases of the location parameter arrangements are given on page 38

Table 5.45. Percentage of Rejection for $k = 5$; T-Distribution: Block = 16 and $n = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.08	4.86	4.74	4.52	5.08	4.94	5.28	5.04	4.72	4.66
2	26.22	26.90	25.82	21.40	**26.56**	22.16	26.14	22.24	23.00	19.48
3	23.02	23.30	23.16	18.78	23.28	20.34	23.36	20.40	**25.76**	21.98
4	25.48	26.24	24.22	19.74	24.96	21.22	25.26	21.82	**32.02**	26.84
5	18.66	18.86	**18.88**	15.42	18.62	16.32	17.92	16.20	17.76	15.12
6	21.78	**21.98**	20.50	16.46	20.80	17.66	20.24	17.36	20.06	17.30
7	29.54	**30.00**	29.04	23.58	29.38	24.74	29.36	24.84	25.58	21.64
8	34.68	35.48	32.92	26.82	33.96	28.70	34.00	28.94	**39.78**	32.62
9	27.70	28.30	27.20	23.26	27.44	24.04	26.48	23.62	**28.70**	24.92
10	34.46	**35.52**	33.82	27.64	33.92	28.42	34.00	28.50	34.86	28.64
11	17.36	17.40	16.10	13.44	16.72	14.70	17.02	14.58	18.90	16.38
12	47.00	48.74	45.86	37.02	46.58	38.64	46.84	39.00	**55.64**	46.62
13	52.24	**53.90**	51.72	42.06	52.76	44.10	51.36	43.16	52.12	43.10
14	29.52	**30.58**	27.56	22.74	28.22	24.22	27.60	23.58	22.98	19.96
15	31.28	**32.58**	30.02	25.06	30.82	26.34	29.74	25.78	27.94	23.96

* Cases of the location parameter arrangements are given on page 38

Table 5.46. Percentage of Rejection for $k = 5$; Normal Distribution: Block = 16 and $n = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.38	4.86	4.78	4.56	4.92	4.52	5.02	4.72	5.06	4.78
2	**40.76**	35.06	39.98	27.48	40.50	27.54	40.10	27.48	37.22	26.12
3	34.90	30.04	35.34	24.72	36.06	24.76	35.64	25.24	**39.42**	27.02
4	39.86	33.24	39.00	27.72	39.60	28.02	41.04	28.98	**51.70**	35.72
5	**27.70**	23.74	26.28	19.32	26.90	19.26	26.12	18.94	25.48	19.02
6	**32.62**	27.78	30.66	22.06	31.14	22.26	30.56	21.88	31.02	21.82
7	45.74	39.62	45.36	31.38	**45.86**	31.54	45.80	31.92	41.16	28.78
8	53.34	46.82	53.10	36.80	53.94	37.14	53.64	37.26	**62.08**	43.60
9	42.90	37.00	43.62	29.72	44.42	30.24	43.36	29.50	**46.80**	32.04
10	53.88	46.86	53.32	36.90	**54.46**	37.40	54.08	37.74	53.66	36.66
11	25.42	22.06	25.12	17.32	25.90	17.52	25.92	17.74	**30.28**	20.30
12	71.18	63.20	70.88	50.46	72.02	51.18	72.12	52.04	**81.62**	61.48
13	76.70	69.10	76.44	55.42	**77.52**	56.14	75.88	55.06	76.76	56.04
14	45.82	39.80	46.56	31.44	**47.54**	31.66	46.14	31.32	38.80	25.88
15	**48.64**	42.20	47.48	32.04	48.42	32.46	46.94	32.12	43.76	29.74

* Cases of the location parameter arrangements are given on page 38

Table 5.47. Percentage of Rejection for k = 5; Exponential Distribution: Block = 16 and n = 8

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.34	4.62	4.84	4.90	4.64	4.88	4.76	4.98	5.00	4.94
2	71.98	63.30	**72.18**	50.76	71.48	50.26	70.20	49.74	66.98	45.68
3	63.96	55.20	63.30	43.46	62.48	43.12	61.58	43.00	**68.18**	46.68
4	64.38	55.32	63.74	42.70	64.70	43.60	66.40	45.54	**80.92**	57.58
5	51.88	43.98	52.26	37.54	**52.94**	37.14	50.92	36.24	49.32	34.88
6	**59.78**	50.94	58.10	41.08	58.94	41.18	57.62	40.38	58.82	40.88
7	**78.18**	69.56	76.80	56.62	76.54	55.44	75.60	54.44	70.30	49.62
8	85.10	76.94	84.12	63.74	83.64	62.78	82.34	62.22	**91.18**	72.80
9	74.00	65.10	72.04	51.28	73.22	51.72	71.42	50.84	**77.66**	55.22
10	**85.80**	78.00	83.66	63.26	83.44	62.02	82.36	61.62	84.56	63.10
11	46.04	38.96	44.26	29.46	44.52	29.98	44.10	30.54	**54.28**	34.92
12	94.60	90.12	94.06	77.62	93.34	76.94	93.12	77.06	**98.24**	88.38
13	96.42	92.92	96.02	82.36	96.20	82.24	95.14	80.56	**96.96**	83.62
14	**77.20**	69.22	76.40	57.30	76.66	57.10	75.22	56.04	66.50	46.84
15	**80.90**	72.34	79.78	59.44	79.82	59.06	77.76	57.26	75.66	55.16

* Cases of the location parameter arrangements are given on page 38

Table 5.48. Percentage of Rejection for k = 5; T-Distribution: Block = 16 and n = 8

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.06	5.08	4.94	4.72	5.02	4.62	5.14	4.92	5.12	5.16
2	**30.98**	26.40	29.74	21.40	30.36	21.54	30.02	21.60	27.30	19.98
3	26.80	23.22	26.22	18.78	26.42	18.76	26.54	19.10	**29.26**	20.44
4	29.80	26.02	28.96	19.96	29.56	19.88	30.26	20.70	**38.06**	25.56
5	21.40	18.72	21.82	15.20	**22.06**	15.34	21.62	15.22	20.84	14.68
6	24.62	21.82	24.76	17.70	**25.16**	17.80	24.56	17.74	24.32	17.82
7	34.64	30.10	34.78	24.78	**35.40**	24.90	35.22	25.08	29.74	20.88
8	41.04	35.36	39.50	27.20	40.20	27.44	39.50	27.60	**45.86**	32.04
9	32.76	28.20	32.90	23.52	33.08	23.70	32.20	23.22	**35.10**	24.38
10	**41.64**	35.50	40.26	28.02	40.98	28.48	40.76	28.50	40.34	27.94
11	19.92	17.36	19.40	13.92	19.30	13.92	19.08	14.10	**21.98**	16.02
12	56.44	49.02	55.70	37.36	56.46	37.58	56.42	38.56	**67.74**	46.12
13	**62.10**	53.98	59.92	42.14	61.10	41.86	59.86	41.02	59.94	41.40
14	**34.76**	30.10	33.68	23.64	34.00	23.64	32.88	23.52	28.08	20.04
15	**36.92**	31.82	35.84	24.82	36.42	24.98	35.12	24.70	33.54	23.96

* Cases of the location parameter arrangements are given on page 38

Table 5.49. Percentage of Rejection for $k = 5$; Normal Distribution: Block = 32 and $n = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.02	5.12	4.86	4.70	4.84	4.92	4.82	5.12	4.86	4.88
2	45.48	**51.74**	45.24	40.58	46.48	41.76	45.74	41.40	42.00	38.78
3	39.54	**44.98**	39.50	35.26	40.38	36.42	40.62	36.92	43.02	39.28
4	44.76	51.38	45.58	41.44	46.52	42.72	47.48	44.02	**59.74**	54.92
5	31.24	**35.38**	30.66	27.70	31.28	28.52	30.06	27.76	29.36	26.92
6	37.14	**41.96**	37.02	33.10	37.70	34.00	36.44	33.52	37.60	34.08
7	52.10	**57.48**	51.96	46.74	52.76	47.94	52.44	47.88	46.34	42.58
8	60.42	68.12	60.04	54.14	60.96	54.78	60.36	54.66	**68.86**	63.98
9	47.94	**55.04**	47.76	43.04	48.62	44.22	46.98	43.14	51.30	47.40
10	60.52	**68.22**	59.54	54.00	61.00	55.34	60.60	55.90	59.56	54.98
11	28.50	32.22	28.22	24.98	28.54	25.88	28.74	26.14	**34.24**	31.02
12	78.36	84.10	77.34	71.62	78.34	73.32	78.70	73.84	**87.62**	83.66
13	82.46	**88.68**	83.18	77.76	84.44	78.36	82.66	77.02	83.60	78.74
14	51.34	**57.86**	50.44	45.30	51.88	46.94	50.70	46.28	42.36	38.58
15	54.28	**61.58**	55.64	50.70	56.60	51.86	55.30	50.66	51.08	46.30

* Cases of the location parameter arrangements are given on page 38

Table 5.50. Percentage of Rejection for $k = 5$; Exponential Distribution: Block = 32 and $n = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.62	4.96	5.18	4.62	4.96	4.58	4.84	4.86	5.16	4.96
2	77.56	**83.62**	78.64	73.22	79.16	73.16	77.74	72.42	74.96	69.38
3	70.64	**76.94**	71.18	65.84	71.28	65.66	70.66	65.18	76.00	70.98
4	72.06	78.70	71.10	65.34	72.62	66.98	74.28	68.70	**87.76**	83.00
5	57.98	**64.62**	58.76	53.56	59.52	54.18	57.40	52.60	55.64	50.70
6	66.54	**73.48**	66.88	61.26	67.98	62.30	65.76	60.84	67.58	62.28
7	83.96	**88.62**	84.32	78.72	84.26	78.54	82.96	77.82	78.00	73.16
8	89.72	93.84	89.64	85.08	89.24	84.68	88.04	83.70	**95.24**	92.14
9	79.82	**85.46**	79.08	73.84	80.64	75.56	79.24	74.34	83.42	78.66
10	89.76	**93.58**	90.18	85.78	90.06	85.76	88.88	84.80	90.98	86.70
11	51.60	58.74	52.32	47.44	53.08	48.48	53.18	48.56	**63.72**	58.74
12	96.90	98.40	97.22	95.24	97.08	94.74	96.70	94.46	**99.52**	98.92
13	98.20	**99.26**	98.20	96.56	98.36	96.80	98.08	96.04	98.50	97.16
14	83.04	**88.10**	83.24	77.94	83.24	78.06	81.20	77.04	73.56	68.60
15	86.14	**90.62**	85.64	81.12	86.04	81.16	84.00	79.42	82.98	77.88

* Cases of the location parameter arrangements are given on page 38

Table 5.51. Percentage of Rejection for k = 5; T- Distribution: Block = 32 and n = 4

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.02	5.12	4.76	4.68	4.70	4.82	4.94	5.04	4.72	4.90
2	33.64	**38.80**	34.62	31.06	35.12	31.92	34.42	32.12	31.46	28.96
3	29.60	**33.54**	28.44	25.48	29.26	26.00	29.00	26.68	31.62	29.68
4	33.52	37.84	32.98	30.02	33.92	30.76	34.78	31.88	**44.28**	40.48
5	24.08	**25.64**	23.76	21.64	24.34	22.14	23.62	21.98	23.18	21.96
6	27.44	**30.88**	27.64	24.38	28.10	25.04	27.40	24.70	27.62	25.74
7	39.28	**43.86**	39.62	35.54	40.80	36.86	41.02	37.14	35.36	32.54
8	46.10	51.56	46.60	41.56	46.72	42.36	46.60	42.72	**53.84**	49.30
9	35.92	**42.80**	37.06	32.86	37.96	34.22	36.82	33.68	40.54	36.76
10	46.30	**51.44**	47.34	42.38	48.18	43.10	47.14	43.04	47.40	43.00
11	21.70	23.82	22.52	20.74	22.90	21.36	23.16	21.40	**26.78**	24.70
12	62.72	69.86	63.38	57.34	64.36	58.76	64.78	59.34	**74.52**	69.56
13	68.24	**74.76**	67.78	61.16	68.86	62.48	66.66	61.08	68.12	62.54
14	38.18	**43.56**	38.52	34.66	39.04	35.26	37.86	34.84	31.28	29.16
15	41.12	**46.30**	42.32	37.66	42.92	38.40	41.46	37.56	39.32	35.60

* Cases of the location parameter arrangements are given on page 38

Table 5.52. Percentage of Rejection for k = 5; Normal Distribution: Block = 32 and n = 8

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.68	4.70	4.80	4.74	5.00	4.58	5.08	4.66	4.78	4.82
2	52.08	47.04	53.64	34.04	**54.14**	34.02	53.58	34.02	48.74	31.10
3	45.66	41.22	45.00	28.98	46.34	29.28	45.62	29.88	**49.54**	31.96
4	51.98	46.62	52.16	33.36	53.10	33.30	54.72	35.14	**66.28**	43.24
5	35.74	31.90	37.14	24.78	**38.24**	24.68	36.76	24.48	34.54	23.46
6	41.94	37.72	42.28	28.58	**43.22**	28.76	41.78	28.08	42.90	28.52
7	59.14	53.36	59.84	38.78	**60.64**	38.82	60.52	39.26	52.86	34.46
8	69.22	61.78	68.12	45.72	69.50	46.08	69.12	45.94	**77.54**	53.78
9	55.26	49.76	55.44	36.74	56.62	37.34	54.68	36.38	**60.02**	39.52
10	**69.30**	61.86	67.90	45.44	69.00	45.40	68.38	45.26	67.96	45.44
11	32.62	29.04	32.84	21.84	33.74	21.98	33.70	22.32	**39.48**	25.60
12	85.80	79.90	85.04	62.76	86.54	62.92	86.54	63.94	**93.44**	74.34
13	89.88	84.58	89.60	67.14	**90.26**	67.68	89.14	66.58	89.54	67.46
14	58.74	53.32	58.76	38.66	**59.74**	38.68	58.62	38.06	49.18	31.66
15	62.74	56.32	63.06	42.12	**64.30**	41.90	62.94	41.32	58.74	38.66

* Cases of the location parameter arrangements are given on page 38

Table 5.53. Percentage of Rejection for $k = 5$; Exponential Distribution: Block = 32 and $n = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.08	5.02	5.14	5.04	5.02	4.84	5.08	4.92	4.96	4.82
2	85.82	80.78	**86.16**	62.54	85.86	61.74	84.56	60.74	81.96	57.14
3	79.30	73.74	79.32	54.60	79.38	54.06	78.32	53.60	**84.48**	58.62
4	81.06	74.96	79.28	54.04	79.92	54.60	81.80	56.84	**93.34**	70.68
5	66.80	61.58	67.20	44.94	**68.52**	44.28	65.82	42.82	64.32	42.22
6	**74.84**	69.34	73.54	50.98	73.94	51.04	72.10	49.78	73.56	51.12
7	90.30	86.12	90.32	69.16	**90.48**	68.16	89.58	67.44	85.48	62.44
8	95.38	92.02	94.68	77.18	94.30	76.08	93.60	75.10	**97.86**	85.40
9	87.46	82.68	86.82	63.64	87.54	63.90	86.22	63.26	**91.20**	68.16
10	95.24	91.62	94.96	76.86	94.80	75.98	94.08	75.00	**95.44**	76.98
11	60.58	54.60	60.26	39.06	60.36	39.12	60.04	39.30	**71.58**	46.46
12	99.12	98.12	99.04	88.76	98.96	87.92	98.86	87.52	**99.94**	96.14
13	99.60	99.02	99.46	92.22	99.62	91.84	99.40	90.76	**99.68**	92.98
14	**89.56**	85.18	88.90	67.26	89.22	66.80	87.52	65.56	80.70	57.10
15	91.98	88.04	**92.32**	71.60	92.24	70.66	91.18	68.88	89.74	66.66

* Cases of the location parameter arrangements are given on page 38

Table 5.54. Percentage of Rejection for $k = 5$; T-Distribution: Block = 32 and $n = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.04	5.08	4.82	4.52	4.90	4.54	4.64	4.64	4.80	4.72
2	40.48	36.26	39.88	26.62	**40.68**	26.50	40.62	26.64	36.28	24.38
3	35.14	31.30	34.96	23.28	35.50	23.12	35.34	23.46	**38.06**	25.64
4	39.84	35.60	39.58	25.34	40.54	25.52	41.08	26.94	**51.84**	33.88
5	27.38	24.72	26.88	19.14	**27.48**	19.18	26.46	18.82	26.02	18.24
6	32.50	29.22	33.56	22.14	**33.96**	21.92	32.82	21.88	33.56	22.36
7	**45.88**	41.10	44.86	28.66	45.32	28.68	44.72	28.82	38.56	25.76
8	53.56	49.00	53.94	34.96	55.16	34.86	54.68	35.28	**61.92**	40.52
9	43.16	38.72	42.62	28.62	43.34	28.74	41.96	28.16	**46.24**	31.14
10	53.54	48.84	53.52	35.96	**54.74**	35.62	54.12	35.14	53.74	35.42
11	25.28	22.78	25.56	16.62	26.20	16.60	26.30	16.38	**30.92**	19.98
12	71.16	65.54	70.58	48.12	72.14	48.32	72.56	49.32	**82.00**	58.46
13	76.38	70.58	74.84	51.16	**76.46**	51.50	75.10	50.92	76.24	51.68
14	**45.58**	41.20	44.56	29.86	45.14	29.96	43.86	29.08	36.90	24.16
15	48.50	43.94	48.94	32.26	**49.88**	32.24	48.22	31.62	45.94	30.06

* Cases of the location parameter arrangements are given on page 38

Table 5.55. Percentage of Rejection for $k = 5$; Normal Distribution: Block = 40 and $n = 5$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.56	4.76	4.62	4.72	4.78	5.00	5.04	4.92	5.02	5.16
2	53.74	**58.14**	51.96	43.72	53.04	44.36	52.88	43.78	49.24	40.52
3	46.74	50.48	45.38	37.50	47.10	38.20	47.22	38.76	**50.54**	41.60
4	53.16	57.04	51.80	42.64	53.12	43.70	54.94	45.54	**67.16**	56.22
5	36.84	**39.70**	35.96	30.22	37.30	31.12	36.32	30.12	34.84	29.12
6	43.68	**46.64**	43.38	36.28	44.30	37.08	42.88	36.50	43.78	36.60
7	60.70	**65.46**	58.80	49.04	59.84	49.44	59.68	49.30	52.92	42.64
8	69.74	74.24	69.14	58.00	70.72	59.16	69.92	58.90	**78.34**	67.82
9	56.68	**61.54**	55.02	46.56	56.48	47.02	54.76	45.76	59.18	49.80
10	69.92	**74.44**	67.90	57.58	69.38	58.00	69.02	58.32	68.38	58.12
11	33.50	36.18	33.18	27.34	33.68	27.48	33.90	28.28	**39.60**	32.58
12	86.12	90.08	86.02	76.28	86.74	77.14	87.02	77.62	**93.68**	86.40
13	90.24	**93.78**	89.92	80.68	90.70	81.94	89.60	80.78	90.62	81.72
14	60.52	**65.52**	58.98	49.32	60.04	50.10	58.72	48.90	48.44	39.84
15	64.06	**68.78**	62.68	52.88	64.18	53.84	62.30	52.42	58.78	49.00

* Cases of the location parameter arrangements are given on page 38

Table 5.56. Percentage of Rejection for $k = 5$; Exponential Distribution: Block = 40 and $n = 5$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.28	5.42	5.12	4.90	4.96	5.10	4.92	5.06	5.04	4.82
2	86.52	**90.18**	85.46	76.42	85.40	75.44	84.10	74.18	82.52	72.20
3	79.42	**84.28**	78.30	68.02	77.74	67.14	76.68	66.62	83.66	73.84
4	81.32	86.02	81.00	70.12	81.82	70.86	83.06	72.52	**93.98**	86.20
5	67.30	**72.88**	67.34	56.90	68.14	57.24	66.04	55.40	64.18	53.52
6	75.36	**80.20**	74.40	64.02	75.34	64.38	73.00	63.00	76.48	65.32
7	90.48	**93.76**	90.28	81.76	90.14	80.94	88.82	80.08	86.12	75.84
8	95.28	97.40	94.54	88.54	94.64	88.02	94.14	86.76	**98.04**	94.14
9	88.34	**91.66**	87.02	78.32	87.66	78.42	86.34	76.58	90.48	82.66
10	95.26	**97.46**	95.04	88.42	94.88	88.14	94.28	87.20	95.64	89.18
11	61.62	66.44	60.56	50.62	61.20	51.66	61.44	51.52	**72.02**	60.46
12	99.30	99.68	99.24	96.56	99.16	95.84	98.92	95.40	**99.86**	99.24
13	99.64	**99.82**	99.74	97.88	99.70	97.80	99.52	97.12	99.76	98.28
14	89.74	**93.34**	89.86	81.54	90.16	81.54	88.52	80.16	82.02	71.76
15	92.26	**95.14**	92.18	84.46	92.26	84.42	91.10	82.84	89.66	81.06

* Cases of the location parameter arrangements are given on page 38

Table 5.57. Percentage of Rejection for k = 5; T- Distribution: Block = 40 and n = 5

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.96	5.06	4.90	4.60	4.64	4.42	4.68	4.62	5.00	4.70
2	40.70	**44.20**	39.58	33.30	40.34	33.60	40.18	33.42	37.14	31.56
3	35.24	**39.20**	35.10	29.50	35.76	29.94	35.76	29.90	38.82	32.78
4	40.32	43.90	39.94	32.80	40.64	33.02	41.40	34.26	**51.28**	42.74
5	27.82	**29.80**	28.48	24.38	28.82	24.10	27.84	23.50	26.48	23.10
6	32.50	**35.72**	31.64	26.34	32.36	26.44	31.14	26.06	31.40	25.92
7	46.22	**50.50**	45.64	37.60	46.34	37.88	46.22	38.28	40.42	33.22
8	54.46	59.38	53.70	44.42	54.80	44.88	54.24	44.56	**61.72**	51.74
9	43.32	**47.48**	43.00	35.40	43.72	35.82	42.20	35.38	46.12	37.64
10	54.14	**59.08**	53.62	44.90	54.78	45.40	54.30	45.02	54.20	45.14
11	25.28	27.68	25.34	21.14	25.42	21.12	25.66	22.06	**30.38**	25.62
12	71.68	76.12	69.94	59.28	71.42	59.92	71.88	60.28	**81.34**	70.82
13	77.78	**81.83**	75.90	66.40	77.62	67.16	75.94	65.72	76.94	66.16
14	46.06	**50.68**	45.48	37.00	46.08	37.44	45.26	37.02	38.18	31.92
15	49.20	**53.14**	48.20	39.88	48.80	40.20	47.64	39.16	44.48	37.18

* Cases of the location parameter arrangements are given on page 38

Table 5.58. Percentage of Rejection for k = 5; Normal Distribution: Block = 40 and n = 10

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.82	4.78	4.88	4.84	5.00	4.74	4.90	4.72	5.46	5.06
2	**61.14**	51.14	59.88	35.14	60.52	35.74	60.08	35.82	54.96	32.22
3	53.52	44.38	54.18	32.34	54.90	32.68	54.82	33.00	**58.06**	34.98
4	60.56	50.56	58.54	36.26	59.74	36.66	61.30	38.30	**74.92**	47.58
5	41.86	35.16	42.32	25.50	**43.24**	26.04	41.82	25.32	40.22	24.64
6	49.66	41.60	49.02	29.68	**50.40**	30.00	49.40	29.18	49.76	29.54
7	68.32	57.86	67.94	43.32	**68.64**	43.18	68.30	43.22	61.02	37.16
8	78.26	67.44	77.60	50.22	78.84	50.58	78.70	50.78	**84.58**	57.90
9	64.64	54.14	63.52	39.80	64.28	40.32	62.56	39.40	**68.02**	43.00
10	78.56	67.28	77.66	51.00	**78.80**	51.48	78.20	51.16	77.48	50.70
11	37.88	32.02	37.42	23.06	37.48	23.02	37.32	23.14	**46.24**	27.32
12	92.46	85.24	91.50	67.26	92.50	67.54	92.64	68.36	**97.10**	78.74
13	**95.10**	89.16	94.32	72.06	94.54	72.10	93.66	71.30	94.58	71.88
14	68.02	58.14	67.22	41.02	**68.40**	41.16	67.12	40.98	56.32	32.80
15	72.26	61.56	71.74	46.52	**73.16**	46.72	71.68	45.74	67.46	42.40

* Cases of the location parameter arrangements are given on page 38

Table 5.59. Percentage of Rejection for k = 5; Exponential Distribution: Block = 40 and n = 10

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.00	4.90	4.84	5.00	4.88	4.96	4.76	5.02	5.16	5.06
2	**92.08**	85.66	91.44	66.92	91.32	66.10	90.24	65.08	89.28	62.60
3	87.46	79.02	86.60	58.16	86.24	57.38	85.10	56.86	**90.60**	64.00
4	89.10	80.16	87.42	58.50	88.14	59.12	89.14	61.34	**97.02**	76.52
5	**76.86**	66.62	74.66	48.10	75.50	47.92	72.94	46.22	71.96	45.18
6	**84.22**	75.18	82.52	55.00	82.80	55.06	81.30	54.12	83.26	55.82
7	**95.22**	89.86	95.10	73.32	95.12	72.12	94.20	71.02	91.90	66.04
8	97.96	94.76	98.10	79.74	97.82	78.18	97.38	77.30	**99.52**	87.54
9	93.34	86.90	92.94	67.64	93.60	67.88	92.32	66.16	**95.42**	72.54
10	97.88	94.64	98.24	81.94	98.20	80.60	97.84	79.34	**98.38**	82.40
11	71.14	60.72	70.50	43.22	70.40	43.48	70.36	43.90	**80.50**	52.06
12	99.74	99.00	99.78	92.10	99.78	90.96	99.76	90.62	**100.00**	97.30
13	99.88	99.28	99.94	94.22	**99.96**	94.14	99.84	93.20	**99.96**	94.68
14	94.36	89.14	94.42	71.90	**94.76**	71.24	93.82	69.96	88.64	61.32
15	**96.18**	91.40	96.02	75.98	96.12	75.06	95.14	73.06	94.44	71.40

* Cases of the location parameter arrangements are given on page 38

Table 5.60. Percentage of Rejection for k = 5; T-Distribution: Block = 40 and n = 10

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.14	5.54	4.66	4.88	4.58	5.04	4.64	5.04	5.34	4.90
2	47.66	40.40	47.44	28.56	**48.56**	28.34	48.26	28.44	43.76	27.10
3	41.68	35.46	39.60	24.52	40.66	24.70	40.70	25.00	**43.56**	26.72
4	46.18	38.98	46.00	27.96	46.92	27.82	48.60	29.18	**58.76**	36.44
5	**33.50**	27.56	32.82	21.38	32.78	21.28	31.92	20.84	30.58	20.10
6	**39.16**	32.92	37.04	23.78	38.44	23.84	37.54	23.50	37.94	23.52
7	**53.70**	45.30	52.38	32.20	53.14	32.02	52.66	32.18	47.26	28.88
8	62.18	53.06	61.16	38.46	62.14	38.98	61.90	39.00	**70.12**	44.26
9	50.94	42.54	48.46	30.38	49.56	30.98	48.26	29.72	**52.74**	32.88
10	62.20	52.86	62.20	38.36	**63.28**	38.62	62.24	37.92	62.70	38.26
11	30.30	25.16	27.88	18.52	29.04	18.64	28.92	18.78	**34.68**	21.30
12	79.30	70.38	79.46	50.42	80.54	50.80	80.64	51.58	**88.72**	61.24
13	83.54	74.72	83.56	57.06	**84.66**	57.24	83.24	55.78	84.38	57.48
14	**53.62**	45.00	52.38	31.64	53.18	31.62	51.74	30.94	44.28	26.26
15	56.86	47.44	56.58	34.44	**57.80**	35.08	56.30	33.94	52.70	31.84

* Cases of the location parameter arrangements are given on page 38

Table 5.61. Percentage of Rejection for k = 5; Normal Distribution: Block = 40 and n = 20

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.14	5.50	4.68	4.70	4.48	4.76	4.70	4.68	4.88	4.72
2	71.72	51.86	71.46	43.54	**72.32**	43.80	71.66	43.86	66.14	40.70
3	63.30	44.98	64.36	38.90	64.70	39.32	64.02	39.26	**69.52**	42.34
4	70.70	50.48	70.64	43.82	71.14	43.94	72.86	45.44	**84.74**	55.66
5	50.92	35.36	50.58	29.30	**51.26**	29.72	50.00	28.96	47.48	27.86
6	59.42	41.70	59.30	35.12	60.36	35.38	59.02	34.68	**60.74**	35.28
7	79.06	58.24	78.58	51.54	**79.30**	51.62	79.04	51.46	71.60	45.14
8	87.06	67.24	86.92	58.66	87.74	58.82	87.08	58.66	**92.42**	67.40
9	75.44	54.94	74.48	48.56	76.12	49.08	74.20	47.62	**78.98**	51.40
10	**87.22**	67.58	86.44	58.22	86.92	58.52	86.68	58.02	86.26	57.66
11	46.34	32.30	45.72	27.66	46.12	27.90	46.24	28.12	**55.20**	32.94
12	97.32	84.96	96.46	77.04	96.74	77.08	96.92	77.40	**99.16**	86.56
13	**98.62**	88.56	97.94	80.96	98.40	81.06	98.00	80.30	98.12	80.66
14	**78.94**	58.28	77.94	50.10	78.72	50.60	77.32	49.70	67.34	41.70
15	**82.18**	61.30	80.76	53.62	81.72	53.82	80.38	52.72	76.58	48.60

* Cases of the location parameter arrangements are given on page 38

Table 5.62. Percentage of Rejection for k = 5; Exponential Distribution: Block = 40 and n = 20

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.58	4.78	5.02	4.90	5.00	4.94	5.14	5.06	4.98	5.10
2	**96.98**	84.50	96.54	76.20	96.50	75.22	96.20	74.40	95.06	71.68
3	93.98	77.66	93.54	68.80	93.26	67.98	92.80	67.50	**96.30**	73.84
4	95.16	78.44	94.60	69.66	94.86	70.18	95.56	72.28	**99.16**	86.48
5	85.14	65.20	85.30	57.06	**85.56**	57.12	83.72	55.38	82.60	53.46
6	91.26	73.26	91.28	64.34	91.68	64.36	90.36	63.00	**92.08**	65.04
7	**98.56**	89.16	98.32	82.20	98.18	81.06	97.90	79.94	96.66	76.72
8	99.54	94.28	99.62	89.46	99.62	88.36	99.50	87.68	**99.88**	94.80
9	97.44	85.72	97.38	78.04	97.70	77.88	96.98	76.48	**98.66**	82.56
10	99.52	94.34	99.58	89.36	99.56	88.50	99.36	87.60	**99.64**	89.42
11	80.36	59.36	79.10	50.24	79.24	50.28	78.68	50.36	**89.26**	60.16
12	99.96	99.14	100.0	97.50	100.0	96.86	100.0	96.56	100.0	99.60
13	99.98	99.38	100.0	98.16	100.0	97.94	100.0	97.44	100.0	98.10
14	**98.28**	88.00	98.12	82.16	98.08	81.68	97.64	80.42	94.92	71.50
15	**98.90**	90.84	98.66	85.02	98.70	84.70	98.24	83.02	97.86	80.68

* Cases of the location parameter arrangements are given on page 38

Table 5.63. Percentage of Rejection for k = 5; T-Distribution: Block = 40 and n = 20

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.14	4.54	4.68	5.04	4.94	5.12	4.90	5.18	4.82	4.90
2	56.28	37.94	56.28	34.22	**57.02**	34.12	56.80	34.28	51.88	31.10
3	48.62	32.28	49.60	30.20	50.08	30.36	49.88	30.44	**54.06**	32.32
4	54.78	36.82	54.04	32.36	54.80	32.28	56.10	33.12	**68.84**	41.42
5	37.80	25.04	38.82	23.56	**39.36**	23.56	37.88	23.08	36.30	21.78
6	45.20	29.66	44.84	26.78	**45.46**	26.66	44.18	26.46	44.82	27.12
7	**63.10**	43.24	62.00	37.12	62.54	37.18	62.60	37.64	55.14	31.98
8	71.10	51.62	70.92	43.42	72.22	43.70	71.42	43.78	**80.38**	52.14
9	58.80	40.56	59.52	35.54	59.82	35.78	58.20	34.62	**63.18**	37.74
10	71.32	51.64	73.26	45.92	**74.26**	46.08	73.64	45.90	73.20	45.84
11	34.54	23.00	35.32	20.80	35.94	20.92	35.96	21.36	**42.52**	24.60
12	88.02	68.90	87.76	61.12	88.58	61.16	88.58	62.26	**94.68**	72.10
13	91.78	74.28	91.86	66.44	**92.50**	66.50	91.46	65.10	92.08	66.44
14	**62.80**	43.06	61.96	38.22	62.62	38.16	61.68	37.42	52.50	31.72
15	65.80	46.26	66.40	40.86	**67.32**	41.20	66.12	40.40	61.64	37.84

* Cases of the location parameter arrangements are given on page 38

5.2.2. Portion of the RCBD is equal to the CRD

The discussion of the results along with the results are present in this section when the proportion of the number of blocks in the *RCBD* portion is equal to the sample size in the *CRD* portion. Under this proportion, it seems that all the proposed methods maintain their type-I error close to 0.05 which is the stated level of significance in this dissertation. This is valid for k = 3, 4 and 5 regardless of the underlying distribution. However, the difference among treatments are present in terms of the estimated powers.

For k = 3, we note that the estimated powers of the proposed methods T_1, T_3, and T_5 are similar to each other and to the estimated powers of C_1 for most of the location parameters arrangements. However, an exception to it occurs when the location parameter arrangements follow the patterns that the first two parameters are equal and the last one is different such as (0.5, 0.5, 1), when the distance among parameters doubles each time such as (0.1, 0.3, 0.7), and finally when all the parameters are different and no pattern for distance among them such as (0, 0.1, 0.8).

For $k = 4$, it can be seen that when there are equal spaces among parameters such as (0, 0.1, 0.2, 0.3), the estimated power of T_1, T_3, T_5 and C_1 are comparable. In addition, when the location parameter arrangements follow the pattern that the first two parameters are qual and the last two parameters are equal such as (0, 0, 0.25, 0.25), the estimated powers of T_1, T_3, T_5, T_7 and C_1 are mostly the same. Moreover, the proposed method T_7 almost has the highest powers among the other methods when the distance between the parameters are doubled each time such as (0, 0.1, 0.3, 0.7) and when the first two parameters are equal and the last two are distinct such as (0, 0, 0.1, 0.6).

For $k = 5$, we note that the proposed method T_7 tends to be more powerful than the other methods including C_1 and C_2 in many cases. For example, cases where the distance among the location parameters doubles each time such as (0, 0.025, 0.075, 0.175, 0.375), cases where the all the parameters are the same except the last one such as (0, 0, 0, 0, 0.5), cases where the first three parameters are the same and the last two parameters are the same such as (0, 0 , 0, 0.35, 0.35), and lastly cases where the all the parameters are the same and the last two are distinct such as (0, 0, 0, 0.1, 0.3). Moreover, the estimated power of T_1, T_3, T_5 and C_1 are the same in several cases. For instance, cases where there are an equal distance among parameters such as (0.05, 0.15, 0.25, 0.35, 0.45), cases where the last two parameters are the same and the distance between the fourth and third parameters is equal to the distance between the third and the second parameters such as (0, 0, 0.125, 0.25, 0.25), cases where the second and the third parameters are equal and the fourth and the fifth parameters are qual such as (0, 0.05, 0.05, 0.3, 0.3), and finally cases where all the parameters the same except the last two parameters such as (0, 0.5, 0.2, 0.4, 0.4).

Table 5.64. Percentage of Rejection for k = 3; Normal Distribution: Block = 10 and n = 10

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.66	4.64	4.76	4.52	4.76	4.70	4.58	4.88	4.96	4.94
2	40.68	33.10	39.78	31.14	40.90	30.86	40.56	31.28	**47.74**	36.42
3	40.74	33.26	40.36	31.06	**40.96**	30.92	40.58	31.50	31.58	24.86
4	35.44	29.24	34.72	27.44	**35.62**	27.20	35.42	27.74	34.42	27.24
5	40.60	33.80	39.50	32.32	**40.76**	31.80	40.64	32.18	37.36	29.34
6	86.36	76.32	85.86	73.30	86.82	73.98	86.80	74.84	**92.50**	81.86
7	86.76	76.48	85.98	73.34	87.02	74.04	**87.14**	74.90	72.72	58.32
8	87.92	77.04	87.36	74.14	**88.00**	73.50	87.56	73.66	85.76	71.38
9	39.74	32.76	39.22	30.42	39.72	30.32	40.04	30.80	**47.04**	35.44
10	40.08	32.70	39.52	30.68	**40.32**	30.76	40.02	31.16	31.32	24.54
11	81.94	70.18	81.50	67.16	**81.98**	66.48	81.62	66.86	80.78	66.06
12	51.78	42.80	51.24	40.68	51.54	40.44	51.02	40.64	**52.88**	41.20
13	**41.08**	33.26	40.66	31.08	41.04	31.10	40.74	31.58	39.58	30.10
14	52.82	43.38	52.24	40.78	**52.84**	40.48	51.96	40.86	50.54	38.98
15	72.80	62.60	71.94	59.26	73.02	59.74	72.94	59.96	**78.38**	64.86

* Cases of the location parameter arrangements are given on page 38

Table 5.65. Percentage of Rejection for k = 3; Exponential Distribution: Block = 10 and n = 10

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.94	5.12	4.94	4.76	4.84	4.62	4.84	4.94	5.10	4.54
2	64.70	54.02	64.02	50.80	64.74	51.20	64.34	52.00	**73.56**	58.60
3	63.58	52.50	62.82	49.62	**63.90**	49.64	63.88	50.22	50.08	38.08
4	**62.26**	52.48	62.00	49.56	61.36	48.60	60.04	48.26	60.98	48.16
5	**68.12**	57.30	67.76	54.46	67.50	53.54	66.02	52.88	64.30	50.32
6	97.26	91.76	97.12	89.74	97.28	89.56	96.88	89.76	**99.38**	95.94
7	95.72	88.60	95.30	86.32	96.12	87.18	**96.16**	88.18	87.92	74.54
8	98.14	94.58	**98.16**	93.36	98.08	92.06	97.62	91.30	97.98	92.46
9	64.96	53.78	64.44	50.72	**65.06**	50.66	64.92	51.32	74.14	59.48
10	64.94	53.66	64.00	50.88	65.12	50.94	**65.24**	51.58	51.36	39.08
11	96.72	90.72	96.74	89.12	96.36	87.72	95.64	87.00	**96.86**	88.76
12	80.90	69.14	81.00	66.88	80.38	65.70	79.20	65.00	**82.26**	67.26
13	69.46	58.04	**69.60**	54.68	68.82	54.02	66.92	53.58	67.98	52.82
14	79.22	68.54	**79.30**	65.44	78.72	64.04	77.44	63.72	77.86	62.92
15	92.50	83.98	92.38	81.24	92.20	80.54	91.18	79.96	**95.58**	86.96

* Cases of the location parameter arrangements are given on page 38

Table 5.66. Percentage of Rejection for k = 3; T-Distribution: Block = 10 and n = 10

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.66	5.16	5.48	5.08	5.64	4.90	5.54	5.14	5.56	4.82
2	30.68	25.18	30.26	23.62	30.88	23.28	30.96	24.06	**35.54**	27.20
3	31.38	26.18	31.30	24.62	**31.52**	24.52	31.04	24.80	24.16	19.86
4	27.28	23.72	27.26	22.40	**27.46**	22.42	27.00	22.86	26.60	21.94
5	30.30	25.04	30.20	23.62	**30.70**	23.52	30.54	24.04	28.88	22.44
6	72.00	60.08	71.14	56.82	72.12	56.84	71.86	57.38	**79.96**	65.12
7	70.86	60.20	69.82	56.52	71.02	56.28	**71.22**	57.18	56.50	43.12
8	**74.26**	62.18	73.40	59.14	74.24	58.94	73.70	59.06	71.28	56.84
9	31.06	25.82	30.76	24.16	31.10	24.10	31.16	24.82	**35.28**	27.56
10	31.38	25.62	31.06	24.10	31.62	24.36	**31.92**	24.76	24.66	19.30
11	**65.74**	55.00	64.56	51.46	65.68	51.38	65.10	51.86	64.40	51.10
12	40.06	32.06	39.84	29.98	40.34	29.72	39.92	30.22	**41.42**	30.56
13	32.16	26.04	31.62	24.36	**32.22**	24.06	31.62	24.44	30.50	23.26
14	38.54	32.38	38.42	30.68	**38.88**	30.56	38.32	30.90	37.50	29.52
15	57.12	46.74	56.94	43.86	57.28	43.66	56.52	44.48	**62.20**	48.56

* Cases of the location parameter arrangements are given on page 38

Table 5.67. Percentage of Rejection for k = 3; Normal Distribution: Block = 20 and n = 20

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.32	4.48	4.32	4.40	4.38	4.36	4.28	4.30	4.56	4.56
2	63.98	49.56	63.18	47.92	64.10	48.34	64.26	48.22	**71.94**	54.80
3	63.32	49.08	**62.98**	47.50	63.28	48.28	62.98	48.16	50.02	37.66
4	56.76	43.54	56.00	42.32	**56.50**	42.46	56.26	42.14	55.46	40.76
5	64.60	49.60	63.84	48.08	**64.76**	48.24	64.24	48.00	59.56	44.12
6	99.26	94.40	99.24	93.44	99.28	93.92	99.18	93.80	**99.78**	97.16
7	99.12	94.08	99.04	93.22	99.14	93.48	**99.18**	93.48	94.78	82.34
8	**99.12**	94.96	99.00	94.18	**99.12**	94.32	99.08	94.24	98.74	93.02
9	64.98	50.08	64.62	48.82	65.00	49.18	64.64	48.80	**72.68**	56.04
10	63.50	48.06	63.18	46.66	63.68	46.96	**63.94**	46.78	49.44	36.00
11	97.74	90.16	97.56	89.10	**97.78**	89.28	97.52	89.16	97.48	88.30
12	78.22	62.62	77.60	60.84	78.22	61.08	77.62	60.54	**79.32**	61.96
13	**64.90**	50.22	64.16	48.62	64.64	49.06	64.66	48.78	62.54	46.52
14	**78.18**	63.18	77.92	61.38	78.10	61.54	78.00	61.06	76.18	59.42
15	93.48	82.74	93.30	80.96	93.58	81.30	93.48	81.06	**96.12**	85.78

* Cases of the location parameter arrangements are given on page 38

Table 5.68. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 20 and $n = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.82	5.16	4.88	5.30	4.82	5.14	4.72	4.98	5.04	5.30
2	90.48	76.72	90.12	74.74	90.26	74.98	89.88	74.70	**95.56**	83.58
3	88.88	75.22	87.96	73.64	**89.14**	74.54	89.12	74.82	77.08	60.52
4	**87.44**	73.46	87.26	71.96	87.10	71.04	86.24	69.82	86.86	70.76
5	92.12	79.34	**92.28**	77.84	91.72	77.14	90.98	76.08	89.78	74.18
6	100.0	99.44	100.0	99.28	100.0	99.22	100.0	99.14	100.0	99.98
7	99.90	98.12	99.90	97.50	99.90	98.00	99.90	98.30	**99.06**	93.18
8	**100.0**	99.66	99.98	99.52	**100.0**	99.48	99.98	99.14	99.96	99.44
9	90.86	77.00	90.62	75.08	90.74	75.34	90.42	74.94	**95.28**	83.58
10	88.02	74.88	87.34	73.34	88.30	74.02	**88.60**	74.42	76.92	60.22
11	99.96	99.32	99.98	99.10	99.96	98.76	99.92	98.36	99.98	98.86
12	97.42	89.74	97.62	88.76	97.28	87.72	96.60	86.90	**98.30**	90.10
13	**92.72**	80.02	92.52	78.60	92.22	78.06	91.62	76.42	91.62	77.50
14	**96.80**	88.78	96.76	87.94	96.58	87.16	95.86	86.02	96.22	86.50
15	99.84	97.62	99.82	97.04	99.76	96.78	99.66	96.12	**99.98**	98.90

* Cases of the location parameter arrangements are given on page 38

Table 5.69. Percentage of Rejection for $k = 3$; T-Distribution: Block = 20 and $n = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.56	4.86	4.58	4.90	4.58	4.92	4.68	4.96	4.80	5.14
2	49.34	37.32	49.14	35.90	49.28	36.50	49.08	36.42	**56.70**	41.60
3	48.26	36.04	47.76	34.98	**48.36**	35.44	48.18	35.50	37.32	27.50
4	**42.76**	32.48	42.08	31.74	**42.74**	31.54	42.68	31.48	42.16	31.32
5	**50.26**	38.66	50.08	37.68	**50.22**	37.92	49.56	37.76	46.66	34.46
6	94.04	81.52	93.58	80.00	94.10	80.40	93.90	80.36	**97.08**	87.10
7	**93.62**	80.90	92.98	79.32	**93.62**	80.08	93.46	80.06	83.56	64.70
8	**93.94**	83.08	93.62	81.48	93.86	81.44	93.42	80.96	92.72	79.56
9	49.08	37.40	48.60	36.38	49.02	36.64	48.62	36.52	**56.02**	42.34
10	**49.68**	37.20	49.04	36.26	49.52	36.44	49.24	36.28	38.36	28.82
11	**89.78**	76.10	89.36	74.50	**89.76**	74.38	89.26	74.00	89.02	73.54
12	62.72	48.22	61.98	46.78	62.78	46.74	62.30	46.40	**63.60**	47.80
13	**49.32**	37.26	48.84	35.62	**49.32**	35.90	48.96	35.64	47.02	34.56
14	**63.02**	48.82	62.48	47.40	62.82	47.50	62.20	47.38	61.10	45.82
15	83.64	67.40	83.18	65.94	83.78	66.22	83.66	66.22	**88.04**	72.10

* Cases of the location parameter arrangements are given on page 38

Table 5.70. Percentage of Rejection for k = 4; Normal Distribution: Block = 10 and n = 10

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.86	5.24	5.14	5.26	4.90	5.18	4.80	5.32	5.30	5.28
2	**23.72**	19.86	23.60	18.50	23.62	18.68	22.84	18.46	22.40	18.00
3	24.26	21.22	23.86	19.60	**24.30**	19.72	23.56	18.86	23.40	18.86
4	**20.12**	17.34	19.62	15.94	20.06	15.98	19.52	15.80	16.52	13.84
5	38.66	31.64	37.84	28.58	38.82	29.04	39.76	29.44	**48.48**	36.34
6	41.36	34.38	40.60	31.50	41.36	31.88	40.46	31.68	**43.10**	33.08
7	48.32	40.64	47.64	37.16	**48.56**	37.32	48.02	36.34	39.46	30.56
8	86.00	76.64	85.04	71.52	86.08	71.92	**86.46**	72.60	81.58	66.78
9	88.64	79.24	88.00	73.78	88.90	74.20	88.22	73.28	89.48	74.74
10	22.92	19.46	22.42	17.76	**23.02**	18.04	22.24	17.28	22.26	17.26
11	66.96	57.80	65.94	52.76	67.00	52.78	67.04	52.38	**70.34**	55.74
12	27.56	23.64	27.60	21.60	28.00	21.54	27.72	21.54	**29.02**	22.76
13	41.28	34.88	40.88	31.46	41.56	31.48	42.12	31.72	**42.34**	31.84
14	22.28	17.84	21.90	16.78	22.44	16.78	22.22	16.90	**25.52**	19.26
15	52.60	44.98	52.72	41.00	52.88	41.60	53.34	41.78	**61.62**	48.68

* Cases of the location parameter arrangements are given on page 38

Table 5.71. Percentage of Rejection for k = 4; Exponential Distribution: Block = 10 and n = 10

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.26	5.00	5.24	4.90	5.18	5.06	5.00	5.08	4.88	5.04
2	**42.36**	35.24	41.86	31.72	42.06	31.72	40.92	31.12	38.36	28.80
3	41.70	35.80	41.38	32.62	**42.22**	33.38	40.78	32.04	40.60	31.66
4	36.12	31.04	35.72	28.64	**36.20**	28.28	35.00	27.60	29.50	23.26
5	62.86	52.34	61.50	47.32	63.44	48.34	64.44	49.44	**76.82**	60.74
6	69.52	60.74	70.22	55.84	69.38	54.84	67.74	53.82	**72.60**	57.36
7	**76.84**	67.42	76.22	61.94	76.58	61.74	75.42	60.56	66.26	51.62
8	**98.08**	94.84	98.18	91.98	97.94	91.14	97.80	90.66	97.32	90.84
9	98.76	96.44	98.72	94.04	98.64	92.92	98.24	91.24	**99.20**	95.48
10	41.64	34.92	40.72	32.20	**41.88**	32.72	40.54	31.52	40.44	31.12
11	92.10	85.46	92.68	80.88	91.86	79.30	90.30	77.68	**94.96**	84.32
12	51.64	43.26	51.20	39.06	51.14	38.52	50.26	38.12	**53.28**	40.66
13	69.10	59.52	68.98	54.96	68.68	54.14	67.90	54.00	**70.60**	54.58
14	39.72	31.58	38.90	28.14	39.44	28.46	39.44	28.70	**46.56**	33.36
15	80.86	70.32	80.60	64.66	80.38	64.28	79.98	63.96	**89.16**	74.68

* Cases of the location parameter arrangements are given on page 38

Table 5.72. Percentage of Rejection for $k = 4$; T-Distribution: Block = 10 and $n = 10$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.72	5.42	4.86	5.40	4.84	5.40	4.76	5.12	4.88	5.22
2	18.94	16.58	18.70	15.04	18.92	15.28	**18.96**	15.46	17.84	14.72
3	**18.96**	16.10	18.78	14.68	18.86	14.94	18.20	14.42	18.52	14.48
4	16.40	14.10	**16.54**	13.00	**16.46**	12.96	16.32	12.70	13.66	10.84
5	29.72	25.08	29.42	22.60	30.02	22.96	30.00	23.40	**37.12**	28.82
6	31.46	26.32	31.38	23.78	31.56	23.68	31.18	23.48	**32.38**	24.04
7	36.60	31.52	36.28	28.18	**36.82**	28.74	35.98	28.16	29.88	23.12
8	71.32	61.44	70.12	56.14	71.22	56.30	**71.60**	56.76	65.56	51.42
9	72.10	61.86	71.82	56.56	71.98	57.06	71.12	56.08	**73.88**	58.56
10	**18.78**	16.46	18.38	15.24	18.70	15.44	18.44	15.06	18.26	15.20
11	52.74	42.76	51.94	38.60	52.44	38.56	51.98	38.20	**55.08**	41.06
12	21.80	18.28	21.54	17.10	21.62	16.86	21.54	16.96	**22.36**	17.48
13	32.00	26.54	31.60	24.02	31.86	24.18	31.68	24.12	**32.46**	25.24
14	17.20	14.56	17.06	13.62	17.18	13.56	17.44	13.62	**19.90**	15.22
15	39.58	33.40	39.48	30.32	39.52	30.20	40.20	30.42	**46.88**	35.44

* Cases of the location parameter arrangements are given on page 38

Table 5.73. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 20 and $n = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.46	5.08	4.42	5.16	4.50	5.14	4.62	5.04	4.68	5.16
2	35.22	27.38	34.86	25.70	**35.26**	25.80	35.06	25.70	32.92	24.40
3	37.24	27.72	36.42	26.38	**37.26**	26.64	35.92	25.70	34.82	25.12
4	**31.24**	24.10	30.92	23.14	31.22	23.30	30.64	22.96	25.74	19.04
5	61.36	46.78	60.80	44.66	61.38	44.74	61.60	45.42	**73.12**	53.98
6	63.34	49.48	62.58	46.62	63.28	46.70	63.06	46.08	**64.60**	47.76
7	73.80	56.50	73.58	53.68	**74.10**	53.76	72.98	53.02	60.36	42.82
8	98.78	93.06	98.66	91.46	98.68	91.24	**98.90**	92.00	97.50	87.28
9	99.10	94.78	99.08	93.12	99.06	93.16	98.92	92.96	**99.40**	94.24
10	**36.48**	28.28	36.08	26.90	36.24	27.40	34.62	26.40	34.80	25.48
11	90.90	78.30	90.30	75.06	91.06	75.28	90.80	75.30	**92.10**	77.94
12	44.28	34.06	43.74	31.94	44.38	32.28	44.14	32.52	**46.22**	33.30
13	63.84	49.10	63.30	46.38	64.14	46.52	64.80	47.20	**65.02**	47.02
14	34.18	25.80	33.56	24.46	34.42	24.58	33.94	24.80	**40.46**	28.96
15	79.74	64.04	79.32	60.58	80.00	61.06	80.04	61.66	**87.98**	70.48

* Cases of the location parameter arrangements are given on page 38

Table 5.74. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 20 and $n = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.66	5.44	4.76	5.34	4.68	5.30	4.78	5.34	4.72	5.04
2	**67.50**	52.86	67.20	50.18	66.98	49.98	65.96	48.90	64.46	46.12
3	66.20	51.08	65.42	48.52	**66.42**	48.86	64.10	47.40	63.74	46.70
4	**58.30**	44.92	57.48	42.70	57.82	42.46	56.44	41.38	46.92	34.68
5	88.44	73.76	87.68	70.26	88.24	70.26	88.26	71.38	**96.24**	83.88
6	92.82	81.48	92.60	79.04	92.30	77.46	90.94	75.84	**94.34**	81.14
7	**95.46**	85.54	95.30	83.12	**95.46**	82.70	94.78	81.78	90.04	72.92
8	**99.98**	99.70	**99.98**	99.52	99.96	99.34	99.94	99.26	99.96	99.20
9	100.0	99.80	100.0	99.70	100.0	99.48	100.0	99.32	100.0	99.84
10	65.86	51.26	65.00	48.46	**66.10**	48.60	64.04	47.32	63.74	46.66
11	99.76	97.34	99.72	96.32	99.74	95.42	99.66	94.60	**99.94**	97.68
12	76.80	61.64	76.70	58.54	76.52	57.84	75.62	57.34	**80.58**	61.48
13	92.66	81.26	92.52	78.30	92.24	77.28	91.72	76.84	**93.88**	79.38
14	62.58	48.46	62.04	45.36	62.38	45.56	61.88	45.64	**71.64**	53.78
15	97.72	90.90	97.48	88.16	97.46	87.38	97.38	87.34	**99.52**	94.64

* Cases of the location parameter arrangements are given on page 38

Table 5.75. Percentage of Rejection for $k = 4$; T-Distribution: Block = 20 and $n = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.14	5.02	4.98	5.20	5.18	5.32	5.38	5.12	5.50	4.92
2	**27.44**	21.42	26.80	20.30	27.38	20.60	27.30	20.64	25.28	19.96
3	**28.72**	22.08	28.28	20.90	28.60	21.06	27.84	20.54	27.40	20.14
4	23.24	19.20	22.88	18.40	**23.40**	18.46	22.96	18.44	19.42	16.36
5	47.40	35.08	47.14	33.34	47.50	33.46	48.24	33.74	**58.54**	40.98
6	49.62	36.84	48.84	34.74	49.60	34.52	48.52	34.22	**50.18**	36.04
7	58.50	45.78	58.26	43.38	**58.76**	43.06	57.64	42.60	47.74	34.70
8	92.84	80.80	92.60	77.48	92.86	77.54	**93.16**	78.34	89.84	73.26
9	94.40	84.48	94.08	81.54	94.28	81.66	93.82	81.10	**95.06**	82.30
10	**28.10**	21.04	27.56	19.84	27.92	20.06	26.94	19.62	27.06	19.38
11	76.82	62.18	76.42	59.68	76.74	59.72	76.38	59.16	**80.26**	61.92
12	33.96	26.42	33.38	25.24	34.16	25.46	33.74	25.60	**36.22**	26.48
13	50.14	38.14	49.54	35.86	50.12	35.98	50.14	36.56	**50.52**	36.40
14	26.54	20.84	26.82	19.64	26.58	19.92	26.60	20.02	**31.54**	22.40
15	64.00	49.44	63.12	46.82	64.24	46.96	64.24	47.02	**72.82**	54.56

* Cases of the location parameter arrangements are given on page 38

Table 5.76. Percentage of Rejection for $k = 5$; Normal Distribution: Block = 10 and $n = 10$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.26	4.82	5.16	4.78	5.34	4.76	5.24	4.68	4.80	4.84
2	36.86	31.66	36.52	27.40	**36.88**	27.08	36.38	27.52	34.60	26.02
3	31.48	27.66	31.32	24.04	31.96	24.30	31.52	24.50	**34.76**	26.44
4	37.30	31.48	36.70	27.92	37.38	27.82	38.42	28.88	**47.14**	34.96
5	**25.12**	21.40	24.52	19.24	24.94	19.36	24.26	19.10	23.48	18.42
6	28.82	25.60	28.72	22.56	28.94	22.68	28.28	22.22	**29.18**	22.16
7	42.32	36.04	41.68	31.98	**42.50**	32.14	42.22	31.88	36.90	28.10
8	49.36	41.44	48.74	36.06	49.62	36.00	49.52	36.20	**56.66**	42.50
9	38.70	32.32	38.40	29.02	38.80	28.82	37.64	28.06	**41.94**	30.94
10	47.54	40.92	46.54	36.22	47.56	36.36	46.66	35.96	**47.78**	35.76
11	23.52	19.96	23.28	17.96	23.34	17.86	23.58	17.94	**27.78**	20.92
12	66.62	57.70	65.60	51.04	66.72	51.02	67.16	51.88	**77.36**	62.14
13	72.14	62.98	71.70	55.42	**72.28**	55.54	71.04	54.52	71.34	55.06
14	**41.26**	36.06	40.68	32.06	41.12	31.92	40.44	31.22	33.48	26.22
15	43.78	37.58	43.26	32.82	**44.08**	32.52	43.10	31.74	40.04	29.56

* Cases of the location parameter arrangements are given on page 38

Table 5.77. Percentage of Rejection for $k = 5$; Exponential Distribution: Block = 10 and $n = 10$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.62	4.98	4.52	5.18	4.52	5.14	4.68	5.12	4.34	5.14
2	**66.54**	58.46	65.98	52.30	65.86	51.16	64.44	50.40	61.30	46.86
3	56.82	48.86	56.68	42.80	56.02	42.08	55.56	41.86	**62.38**	46.58
4	58.70	49.42	57.42	42.38	58.88	42.66	60.68	44.66	**75.54**	57.28
5	**47.54**	40.90	46.84	36.36	47.40	35.52	45.60	34.38	44.10	32.70
6	54.58	47.52	53.90	42.06	**54.68**	41.72	53.42	41.20	54.58	41.40
7	71.88	63.78	**72.12**	56.86	71.06	55.40	70.20	54.38	64.48	50.32
8	78.86	70.56	79.12	62.88	78.56	61.74	77.06	61.54	**86.78**	72.30
9	67.64	57.94	66.58	50.68	67.84	50.74	65.42	49.96	**71.86**	55.16
10	79.72	72.14	79.80	65.22	79.02	63.70	77.76	62.78	**80.72**	64.24
11	42.66	36.24	42.80	31.92	42.74	31.86	43.00	32.18	**51.82**	37.14
12	91.42	84.86	91.34	78.28	90.76	76.78	90.24	76.62	**97.20**	88.44
13	93.54	88.26	93.16	82.30	93.42	81.70	92.28	80.46	**94.20**	82.62
14	**71.62**	62.72	71.18	56.48	71.14	55.66	69.50	54.28	60.74	46.12
15	**73.90**	66.30	73.34	59.54	73.84	58.88	71.90	57.34	69.42	54.26

* Cases of location parameter arrangements are given on page 38

Table 5.78. Percentage of Rejection for k = 5; T-Distribution: Block = 10 and n = 10

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.38	5.28	5.26	5.42	5.52	5.28	5.54	5.24	5.28	5.22
2	**27.36**	24.24	26.64	21.46	**27.34**	21.24	**27.36**	21.32	24.80	19.92
3	23.54	20.42	22.94	18.82	23.80	18.54	23.58	18.72	**25.56**	19.86
4	27.78	23.84	27.20	21.50	27.74	21.54	28.56	22.36	**35.74**	27.08
5	**20.54**	17.66	20.34	15.94	20.32	15.98	20.00	15.42	19.28	14.64
6	23.22	19.94	23.18	17.80	**23.32**	17.60	22.82	17.46	22.60	17.42
7	30.52	26.70	30.30	23.90	**30.58**	23.76	30.44	23.88	26.92	21.24
8	37.46	32.64	37.60	29.06	37.72	28.72	37.44	28.40	**43.86**	33.32
9	30.28	26.02	29.96	22.58	30.50	22.42	29.60	21.82	**31.52**	23.58
10	**38.28**	32.40	37.72	29.02	38.00	28.32	37.78	28.40	36.98	27.22
11	18.16	15.98	17.74	14.94	18.32	14.54	18.74	14.96	**20.12**	16.20
12	50.38	42.62	49.54	37.04	50.24	37.02	51.00	37.56	**60.56**	45.76
13	**55.18**	47.60	54.94	41.46	55.06	41.30	53.78	40.72	55.06	41.62
14	32.38	27.42	31.70	23.70	**32.74**	23.46	31.92	23.04	25.86	19.74
15	35.46	30.14	35.04	26.70	**35.68**	26.74	34.68	26.22	31.56	24.80

* Cases of the location parameter arrangements are given on page 38

Table 5.79. Percentage of Rejection for k = 5; Normal Distribution: Block = 20 and n = 20

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.32	4.98	5.12	5.14	5.28	5.08	5.34	5.08	4.84	4.80
2	**59.24**	45.00	58.18	41.56	59.12	41.44	58.60	41.32	53.30	36.92
3	50.90	39.84	50.38	36.90	50.94	36.76	51.18	36.74	**55.02**	39.08
4	56.84	45.16	56.26	41.60	57.06	41.86	58.58	43.46	**71.54**	54.04
5	40.08	29.94	39.12	27.46	**40.22**	27.58	39.04	26.94	37.64	25.64
6	**47.94**	37.20	47.18	34.26	47.64	34.34	46.46	33.56	47.42	33.60
7	**65.26**	50.52	64.64	46.68	65.18	46.66	65.00	46.50	56.94	40.64
8	74.60	59.98	73.94	55.52	74.64	55.32	74.12	55.16	**81.92**	64.06
9	61.18	46.98	59.84	43.00	61.52	43.38	59.72	42.62	**64.94**	46.24
10	75.36	60.70	74.44	56.26	75.32	56.30	74.76	56.34	**74.78**	55.68
11	36.32	28.62	35.86	26.70	36.34	26.92	36.78	26.90	**42.86**	31.00
12	90.00	76.78	89.44	72.88	90.14	72.90	90.42	73.38	**96.06**	83.52
13	93.86	83.56	93.56	79.60	**93.94**	79.84	93.12	78.68	93.46	79.20
14	66.48	51.44	65.76	47.88	**66.54**	47.98	65.48	47.26	54.50	39.94
15	**68.68**	52.72	67.62	48.38	68.58	48.50	67.24	47.50	62.28	44.36

* Cases of the location parameter arrangements are given on page 38

Table 5.80. Percentage of Rejection for k = 5; Exponential Distribution: Block = 20 and n = 20

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.98	5.02	5.26	5.16	4.92	5.12	4.86	5.06	4.88	5.08
2	**89.94**	78.74	89.66	74.42	89.30	73.28	88.28	72.18	86.86	69.26
3	84.12	70.54	84.04	66.46	83.38	65.32	82.36	64.40	**88.46**	71.38
4	85.62	72.08	85.30	66.80	85.22	66.88	86.62	69.36	**96.28**	84.02
5	**73.28**	58.12	72.58	53.76	72.96	53.44	70.66	51.72	68.92	50.56
6	**80.16**	66.74	79.88	61.72	**80.16**	61.66	78.58	60.80	**80.20**	61.38
7	**94.16**	83.30	94.00	79.32	93.44	77.96	92.68	76.70	90.40	73.44
8	96.98	89.78	97.04	86.34	96.68	85.26	96.06	84.38	**99.20**	92.50
9	91.12	78.86	90.90	74.30	91.20	74.42	90.06	72.78	**93.96**	77.62
10	96.86	89.50	97.06	85.88	96.70	85.08	96.28	84.10	**97.36**	86.82
11	67.72	52.72	66.64	48.16	67.32	47.96	67.08	48.60	**77.74**	57.58
12	99.68	97.08	99.62	95.34	99.56	94.42	99.54	94.34	**99.92**	98.96
13	99.86	98.34	99.86	97.38	99.86	97.12	99.80	96.34	**99.94**	97.90
14	**93.18**	82.42	92.76	78.42	92.92	77.52	92.14	76.28	86.42	67.42
15	**94.70**	84.62	94.18	81.30	94.52	80.54	93.68	78.98	92.42	76.72

* Cases of the location parameter arrangements are given on page 38

Table 5.81. Percentage of Rejection for k = 5; T-Distribution: Block = 20 and n = 20

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.50	5.64	5.36	5.52	5.36	5.48	5.36	5.44	5.32	5.34
2	43.44	33.54	**44.10**	31.08	43.44	30.92	43.38	30.88	40.02	28.28
3	38.64	30.20	38.44	27.88	38.80	27.78	38.62	28.26	**41.68**	30.28
4	43.04	33.82	42.72	31.44	43.14	31.58	44.72	32.52	**56.08**	41.06
5	30.96	23.24	30.46	21.38	**31.04**	21.56	30.06	20.98	28.18	19.80
6	35.66	27.70	35.74	25.50	**35.80**	25.60	34.52	25.26	35.40	25.84
7	**50.74**	39.02	49.76	36.10	**50.76**	35.94	50.06	36.10	44.10	31.90
8	59.42	46.30	59.02	42.46	59.62	42.60	58.96	42.60	**67.66**	48.64
9	47.58	36.26	47.36	33.52	47.96	33.46	46.44	32.80	**52.04**	36.28
10	**59.18**	46.12	58.70	42.46	59.16	42.28	58.88	42.14	59.14	42.64
11	28.06	21.74	27.88	20.14	28.00	20.28	27.90	20.32	**32.68**	23.52
12	76.42	61.68	75.84	57.06	76.64	57.36	76.66	57.94	**85.96**	68.70
13	81.32	67.30	80.82	62.98	81.22	63.10	79.92	61.84	**81.42**	62.22
14	50.58	38.82	50.08	36.16	**50.66**	35.90	49.30	35.46	41.70	30.04
15	**53.02**	40.52	52.48	37.22	52.84	37.36	51.80	36.54	48.38	34.22

* Cases of the location parameter arrangements are given on page 38

5.2.3. Portion of the RCBD is smaller than the CRD

In the previous discussion, the proportions of the number of blocks in the *RCBD* portion to the sample sizes in the *CRD* portion are *greater* or *equal*. Now, we consider cases where the proportions are *smaller*. Here, the performance of the proposed methods is notable in terms of maintaining their levels on borders of the desired level of significance. Regardless of the underlying distribution, this holds for $k = 3$, 4 and 5. However, the estimated powers reveal some significant differences among treatments.

For $k = 3$, we note that when the proportion of the number of blocks in the *RCBD* portion is *one-fourth* the sample sizes in the *CRD* portion (i.e. *Block* = 4, $n = 16$), the proposed methods T_7 and T_8 tend to be significantly more powerful than the others and similar to each other. These situations can be observed when the location parameter arrangements follow the pattern that the first two parameters are the same and the last one is distinct such as (0, 0, 0.5) and when all the parameters are distinct and a large distance between the last two parameters is present such as (0, 0.1, 0.8). Moreover, under this proportion, we note that the proposed methods T_1, T_2, T_3, T_4, T_5, and T_6 including the tests proposed by Magel et al. (2009) have similar estimated powers when the parameters follow the patterns that the last two parameters are the same such as (0, 0.5, 0.5) and when the parameter arrangements follow the pattern of an equal distance among parameters such as (0, 0.5, 1).

Further, when the proportion of the number of blocks in the *RCBD* portion is *one-eighth* the sample sizes in the *CRD* portion (i.e. *Block* = 4, $n = 32$), it can be noted that generally the standardized last methods (T_2, T_4, T_6, and T_8) have higher estimated powers than the standardized first methods (T_1, T_3, T_5, and T_7). This can be seen in Tables 5.88-5.90. However, when the proportion of the number of blocks in the *RCBD* portion is *one-half* the sample sizes in the *CRD*

portion (i.e. $B = 8$, $n = 16$), the proposed method T_7 has higher estimated powers than the others in the following arrangements (0, 0, 0.5), (0.5, 0.5, 1), (0.1, 0.3, 0.7) and (0, 0.1, 0.8). The proposed methods T_1, T_3, and T_5 including C_1 have higher estimated powers compared to other methods under the rest of the parameter arrangements considered.

For $k = 4$, we note that when the proportion of the number of blocks in the *RCBD* is *one-fourth* the sample sizes in the *CRD* portion (i.e. *Block* = 8, $n = 32$), we note that the proposed methods T_7 and T_8 have the highest estimated powers. This occurs when the location parameter arrangements follow the pattern that the first three parameters are the same except the last one such as (0, 0, 0, 0.5) and also occurs when the first two parameters are the same and the last two are distinct such as (0, 0, 0.1, 0.6). Moreover, when the proportion of the number of blocks in the *RCBD* is *one-eighth* the sample size in the *CRD* portion, the proposed method T_8 tends to have higher estimated powers then the others under the following location parameters arrangements: (0, 0, 0, 0.5), (0.05, 0.1, 0.3, 0.5), (0, 0.1, 0.3, 0.7), (0, 0.05, 0.15, 0.35) and (0, 0, 0.05, 0.3). However, T_2 ,T_4 , T_6 and C_2 have similar under the rest of the arrangements considered. Finally, when the proportion of the number of blocks in the *RCBD* is *one-half* the sample sizes in the *CRD* portion, the estimated power of T_7 is the highest among the proposed methods under several location parameters arrangements. For example, when the distance among the parameters doubles each time such as (0, 0.1, 0.3, 0.7) and (0, 0.05, 0.15, 0.35). On the other hand, there are situations where the estimated powers of T_1 ,T_3 and T_5 including C_1 are similar and are considered to be the highest compared to the others. For instance, cases where there are equal distances among parameters such as (0, 0.1, 0.2, 0.3) and also cases where the first two parameters are equal and the last two parameters are equal such as (0, 0, 0.25, 0.25).

For $k = 5$, when the proportion of the number of blocks in the *RCBD* portion is *one-fourth* the sample sizes in the *CRD* portion, the results show that the estimated powers of T_7 and T_8 are mainly comparable and having the highest powers compared to the others. This is applicable under several location parameters arrangements. For instance, when the distance among the parameters is doubled each time such as (0, 0.025, 0.075, 0.175, 0.375), when the first three parameters are the same and the last two are distinct and the distance between the fifth and the fourth parameters is as large as the distance between the fourth and the third parameters such as (0, 0, 0, 0.25, 0.5). The results also indicate that the powers of the proposed methods $T_1, T_2, T_3, T_4, T_5,$ and T_6 including C_1 and C_2 are approximately the same when, for example, the parameters are distinct except the last two parameters such as (0, 0.1, 0.3, 0.4, 0.4). For more cases, see (Tables 5.106-5.108 and Tables 5.115-5.117).

Moreover, when the proportion of the number of blocks in the *RCBD* portion is *one-eighth* the sample size in the *CRD* portion, the results indicate that the proposed method T_8 tends to have higher estimated power in some cases. This can be seen, for example, when the location parameter arrangements follow the pattern that all the location parameters are the same except the last one such as (0, 0, 0, 0, 0.5). However, under this proportion the proposed methods based on standardized second technique are more powerful than those based on standardized first.

Finally, when the proportion of the number of blocks in the *RCBD* portion is *one-half* the sample size in the *CRD* portion, we note that the proposed method T_7 has higher estimated powers than the others when the location parameter arrangements follow the pattern that the all the parameters are the same except the last one such as (0, 0, 0, 0, 0.5), when the first three parameters are not equal while the last two parameters are both equal and not equal such as (0, 0, 0, 0.35, 0.35) and (0, 0, 0, 0.1, 0.3).

Table 5.82. Percentage of Rejection for $k = 3$; Normal Distribution: Block = 4 and $n = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.44	5.72	5.36	5.66	5.30	5.50	5.34	5.46	4.98	5.54
2	39.18	37.78	39.32	37.24	39.18	38.08	38.96	38.44	**44.74**	44.10
3	39.90	38.70	39.32	38.32	**39.98**	38.72	39.82	38.78	31.02	30.56
4	34.46	34.26	**34.52**	33.96	34.00	34.06	33.62	33.90	33.20	33.88
5	39.42	39.02	38.86	38.58	39.34	38.96	**39.72**	39.14	36.16	36.18
6	85.56	85.40	85.04	84.92	85.76	85.66	85.60	86.00	91.56	**91.64**
7	85.28	84.72	84.78	84.24	85.60	84.88	**85.84**	85.00	71.04	70.92
8	87.22	87.36	86.78	86.96	87.08	**87.46**	86.52	87.26	84.94	85.64
9	38.92	39.52	38.68	39.34	38.94	39.78	38.92	39.98	44.80	**46.10**
10	37.86	37.84	37.66	37.62	37.66	38.08	37.68	**38.32**	28.54	29.50
11	**80.36**	80.22	80.02	79.80	80.22	80.06	80.00	80.06	79.06	79.38
12	**51.10**	50.10	50.56	49.66	51.02	50.20	50.70	49.94	**51.10**	51.02
14	**40.64**	40.14	39.98	39.68	40.46	40.00	40.10	40.30	38.90	38.54
13	**51.06**	50.30	50.06	49.70	50.84	50.12	50.88	50.24	48.42	48.48
15	70.78	69.56	70.06	68.98	70.68	69.42	70.80	69.44	**76.10**	75.40

* Cases of the location parameter arrangements are given on page 38

Table 5.83. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 4 and $n = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.60	4.86	4.70	4.90	4.62	5.06	4.56	5.04	4.84	4.96
2	63.86	63.80	63.34	63.18	63.72	64.10	63.58	64.22	73.16	**73.30**
3	64.08	63.04	63.42	62.64	**64.48**	63.50	64.00	63.68	51.08	50.32
4	**59.46**	59.34	58.92	58.98	58.50	58.32	57.52	57.24	57.96	58.30
5	66.84	**66.88**	66.70	66.38	66.02	65.98	65.04	65.38	62.50	63.20
6	96.00	96.60	95.82	96.44	95.98	96.52	95.90	96.24	**99.04**	98.88
7	94.00	94.48	93.58	94.28	94.22	95.20	94.52	**95.58**	85.34	86.20
8	97.96	**98.08**	97.92	98.00	97.74	97.62	97.20	97.12	97.68	97.62
9	63.66	63.46	62.84	63.10	63.56	63.60	63.16	63.86	72.74	**73.34**
10	64.18	63.42	63.18	62.80	64.22	63.64	**64.68**	64.12	50.38	50.26
11	96.16	**96.66**	96.04	96.30	95.64	95.74	94.68	94.86	96.12	96.44
12	77.72	78.14	77.30	77.76	76.78	76.64	75.46	75.62	78.96	**80.18**
13	**67.92**	68.50	67.38	67.92	66.84	67.08	65.88	65.98	65.94	66.54
14	78.72	78.20	**79.36**	77.82	77.68	76.54	76.56	75.54	77.38	76.58
15	91.42	91.86	91.56	91.46	90.92	91.08	90.08	90.78	**95.46**	95.36

* Cases of the location parameter arrangements are given on page 38

Table 5.84. Percentage of Rejection for k = 3; T-Distribution: Block = 4 and n = 16

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.98	4.78	5.16	4.78	5.02	4.86	5.04	4.76	5.18	4.96
2	29.10	28.12	28.86	28.00	28.98	28.12	29.20	28.36	**33.88**	32.50
3	**31.34**	30.68	31.06	30.14	31.12	30.84	31.14	31.04	24.56	24.32
4	26.02	25.38	25.72	24.98	25.96	25.58	**26.22**	25.64	25.46	25.02
5	29.98	29.70	**30.14**	29.32	29.88	29.50	29.76	29.24	28.18	27.30
6	69.86	69.42	69.24	68.92	70.04	69.88	70.16	70.04	**78.30**	78.02
7	**70.32**	69.30	69.44	68.90	**70.30**	69.62	**70.30**	69.90	55.46	55.84
8	71.62	**72.24**	71.24	71.68	71.30	71.74	70.40	71.58	68.78	68.92
9	30.72	28.96	29.92	28.70	30.40	29.20	30.46	29.16	**33.90**	33.50
10	30.94	29.86	30.54	29.48	**31.00**	30.36	30.94	30.56	24.16	23.92
11	**62.84**	62.60	62.74	62.12	62.38	62.30	62.00	62.22	61.94	62.12
12	37.62	37.28	37.14	36.74	37.62	37.22	37.74	37.32	**38.50**	38.10
13	**29.74**	29.42	29.60	29.14	29.28	29.18	29.50	28.98	28.30	28.08
14	38.26	38.12	**38.36**	37.66	38.00	38.06	37.92	38.08	36.20	36.60
15	54.98	55.18	54.52	54.72	54.88	55.02	54.96	55.14	60.20	**60.86**

* Cases of the location parameter arrangements are given on page 38

Table 5.85. Percentage of Rejection for k = 3; Normal Distribution: Block = 8 and n = 16

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.12	4.76	5.18	4.84	5.06	4.84	4.96	4.88	5.20	4.92
2	45.30	39.40	45.24	38.36	45.30	39.06	45.14	39.02	**52.24**	46.26
3	46.56	38.94	46.02	38.04	46.58	38.66	**46.64**	39.32	35.78	30.34
4	**41.80**	36.02	41.62	35.20	41.74	35.52	41.16	35.42	40.52	34.82
5	**46.50**	39.64	46.24	38.82	46.36	39.58	46.40	39.70	42.32	36.32
6	91.20	85.68	91.12	84.92	91.46	85.64	91.38	85.88	**95.96**	91.96
7	92.52	86.90	92.00	86.24	**92.66**	86.78	92.62	87.10	80.80	72.70
8	**92.74**	87.72	92.48	87.08	92.64	87.18	92.40	87.20	91.26	85.42
9	45.48	40.02	44.96	39.12	45.40	39.46	45.32	39.16	**52.34**	45.24
10	46.18	40.16	45.66	39.44	**46.30**	39.88	46.02	40.10	35.88	30.98
11	87.18	81.30	86.80	80.60	**87.28**	80.72	87.14	80.80	86.30	80.42
12	58.74	52.10	58.36	50.96	58.92	51.46	58.30	51.70	**59.64**	52.92
13	46.90	41.16	46.50	40.08	**47.06**	40.12	46.26	40.04	44.78	39.22
14	**59.88**	53.78	59.34	52.86	59.76	53.24	59.36	53.22	56.80	50.68
15	79.00	72.38	78.56	71.16	78.92	71.84	78.42	72.00	**84.34**	77.88

* Cases of the location parameter arrangements are given on page 38

Table 5.86. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 8 and $n = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.06	4.80	5.06	4.64	5.08	4.70	5.22	4.64	4.94	4.68
2	72.54	65.42	72.68	63.90	72.70	64.44	72.52	64.66	**81.98**	73.88
3	71.52	65.12	70.76	63.74	71.98	64.88	**72.02**	65.12	57.88	51.14
4	**70.28**	63.08	69.92	62.16	69.42	61.36	68.26	60.54	69.16	61.62
5	75.80	68.42	**75.94**	67.32	75.20	66.66	73.88	65.90	71.62	63.74
6	98.98	97.68	99.00	97.38	98.96	97.24	98.76	97.02	**99.82**	99.16
7	97.84	95.34	97.44	94.86	98.06	95.86	**98.18**	96.22	91.84	86.06
8	**99.26**	98.28	99.30	98.10	99.10	97.66	98.74	97.16	99.20	98.00
9	72.72	65.06	72.38	63.64	72.84	64.30	72.02	64.54	**81.52**	72.98
10	71.56	64.08	70.82	63.12	**72.06**	64.16	**72.08**	64.44	57.42	50.96
11	98.24	96.52	98.42	96.08	98.06	95.58	97.68	94.98	**98.32**	96.30
12	85.98	80.14	85.96	79.02	85.38	78.38	84.14	77.30	**87.32**	80.54
13	75.90	69.38	**76.16**	68.24	75.30	67.28	74.08	66.28	73.98	66.34
14	**86.84**	81.30	86.78	80.24	86.28	79.52	85.12	78.18	85.92	79.24
15	96.32	93.54	96.36	92.84	95.90	92.22	95.54	91.46	**98.16**	95.90

* Cases of the location parameter arrangements are given on page 38

Table 5.87. Percentage of Rejection for $k = 3$; T-Distribution: Block = 8 and $n = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.20	5.18	5.18	5.08	5.26	5.26	5.28	5.20	5.34	5.12
2	35.10	30.40	34.66	30.04	35.36	30.48	35.32	30.48	**40.00**	34.82
3	35.10	30.54	34.70	29.90	**35.26**	30.58	35.08	30.48	27.96	24.14
4	**31.66**	26.62	31.40	26.04	31.60	26.56	31.24	26.30	30.10	25.72
5	33.98	29.44	33.78	28.74	**34.08**	29.36	33.92	29.36	30.86	27.36
6	77.58	70.64	77.38	69.50	78.04	70.30	77.92	70.32	**85.20**	78.48
7	**77.52**	70.90	77.10	69.76	77.58	70.44	77.50	70.70	63.40	56.64
8	**80.72**	71.90	80.46	70.82	80.62	71.08	79.78	71.06	78.32	69.04
9	34.64	29.84	34.60	29.12	34.72	29.56	34.50	29.76	**39.86**	34.32
10	35.38	30.28	34.74	29.56	35.48	30.04	**35.64**	30.26	27.64	24.28
11	**72.18**	65.14	71.98	64.14	71.92	64.46	71.18	64.02	71.20	63.86
12	44.36	37.72	44.20	36.68	44.40	37.02	44.08	37.14	**44.54**	38.72
13	**33.86**	29.58	33.36	29.12	33.48	29.50	**33.86**	29.60	32.00	28.46
14	**44.20**	39.46	43.92	38.52	44.02	39.00	43.42	39.32	42.46	37.74
15	62.90	56.18	61.96	55.00	63.06	55.74	63.16	55.70	**68.60**	60.70

* Cases of the location parameter arrangements are given on page 38

Table 5.88. Percentage of Rejection for $k = 3$; Normal Distribution: Block = 4 and $n = 32$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.06	4.92	4.90	4.92	5.04	4.98	5.00	4.96	4.78	5.10
2	55.40	62.16	54.84	61.92	55.30	62.10	55.22	62.10	62.60	**70.22**
3	55.54	61.84	55.42	61.74	55.94	**61.86**	55.28	61.80	43.40	48.52
4	50.12	55.28	49.68	55.14	49.94	**55.34**	50.12	55.04	49.02	53.18
5	55.54	61.48	55.44	61.36	55.34	**61.64**	54.86	61.46	51.76	57.14
6	96.60	98.78	96.66	98.76	96.70	98.92	96.78	99.00	98.70	**99.70**
7	96.68	98.26	96.46	98.22	96.80	**98.32**	96.82	**98.34**	88.18	93.04
8	97.10	**98.70**	97.00	98.66	97.02	**98.70**	96.56	98.62	95.94	98.22
9	56.06	60.74	55.70	60.72	56.08	61.16	56.26	61.30	63.16	**68.90**
10	56.38	61.06	55.94	60.86	56.52	61.32	56.56	**61.40**	44.34	47.74
11	94.12	96.94	93.88	96.86	94.18	96.88	94.04	**97.08**	93.30	96.56
12	68.02	74.22	67.52	74.12	67.86	74.08	67.64	74.14	69.62	**75.58**
13	54.60	**61.74**	54.22	61.60	54.62	61.48	54.50	61.46	52.80	59.54
14	70.16	**75.80**	69.66	75.62	70.16	75.62	69.66	75.64	67.74	73.86
15	88.12	92.70	88.08	92.60	88.18	92.82	88.12	92.92	92.18	**95.64**

* Cases of the location parameter arrangements are given on page 38

Table 5.89. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 4 and $n = 32$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.82	4.92	4.88	4.94	4.82	4.88	4.92	4.94	4.78	4.86
2	82.44	88.04	82.86	87.98	82.50	87.88	82.24	87.24	90.00	**94.02**
3	81.00	84.88	80.38	84.80	81.42	85.46	81.72	**86.22**	67.92	72.74
4	79.84	**85.90**	80.04	85.84	78.96	85.04	77.78	84.16	79.10	85.06
5	84.56	**90.18**	84.60	90.00	83.70	89.44	83.02	88.72	81.36	87.28
6	99.86	99.96	99.88	99.96	99.84	99.94	99.76	99.94	99.96	100.0
7	99.34	99.86	99.38	99.86	99.50	99.88	99.58	99.90	97.10	98.72
8	99.92	99.98	99.96	99.98	99.88	99.96	99.76	99.94	99.82	99.96
9	83.12	88.94	82.64	88.80	83.04	88.54	82.80	88.12	90.72	**94.36**
10	80.94	86.18	80.38	86.02	81.28	86.64	81.62	**87.00**	67.92	73.66
11	99.66	**99.92**	99.64	**99.92**	99.54	99.82	99.40	99.78	99.74	**99.94**
12	93.50	96.70	93.70	96.64	92.98	96.42	91.76	95.78	94.42	**97.16**
13	84.68	**89.64**	84.62	89.54	83.92	88.70	82.76	88.02	83.22	88.60
14	93.06	96.58	93.30	96.56	92.50	96.14	91.70	95.56	92.18	**96.02**
15	98.40	99.46	98.46	99.44	98.12	99.24	97.86	99.06	99.46	**99.80**

* Cases of the location parameter arrangements are given on page 38

Table 5.90. Percentage of Rejection for $k = 3$; T-Distribution: Block = 4 and $n = 32$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.44	5.66	5.48	5.68	5.46	5.72	5.46	5.74	5.44	5.96
2	42.48	46.40	42.22	46.30	42.18	46.68	42.64	46.68	48.92	**54.02**
3	43.24	**47.92**	42.82	47.88	43.32	47.82	43.48	47.92	33.18	38.06
4	38.00	**42.60**	38.16	42.56	38.04	42.44	37.84	42.22	37.04	41.60
5	42.50	**47.46**	41.94	47.44	42.64	47.36	42.42	47.26	39.50	44.32
6	87.98	92.44	87.88	92.36	88.08	92.62	87.96	92.74	93.50	**96.20**
7	88.10	**91.94**	87.96	91.88	88.32	91.88	88.12	91.84	74.92	81.18
8	88.00	**93.38**	87.72	**93.26**	87.78	**93.30**	87.30	93.00	86.22	91.58
9	41.96	46.08	42.32	46.02	41.96	46.38	42.08	46.50	48.26	**53.66**
10	40.86	**47.02**	40.62	46.96	40.88	**47.06**	40.84	**47.10**	32.12	36.32
11	82.16	**87.96**	81.82	87.78	81.92	87.50	81.68	87.38	81.06	86.86
12	53.28	58.94	52.96	58.78	53.38	58.50	53.02	58.38	54.82	**60.46**
13	41.98	**47.04**	41.80	46.94	42.10	46.92	42.16	46.66	39.80	44.68
14	53.42	**60.42**	53.56	60.16	53.32	60.18	53.18	60.00	51.46	57.90
15	73.84	80.78	73.68	80.58	73.82	80.80	73.62	80.56	78.46	**85.32**

* Cases of the location parameter arrangements are given on page 38

Table 5.91. Percentage of Rejection for $k = 3$; Normal Distribution: Block = 8 and $n = 32$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.22	5.04	5.08	5.02	5.36	4.98	5.32	5.06	5.46	5.36
2	61.74	60.80	61.24	60.66	61.76	60.54	61.80	60.52	**69.62**	68.94
3	62.18	**62.84**	61.80	62.64	62.42	62.66	62.44	62.80	49.04	49.50
4	54.98	54.48	54.62	54.22	54.96	54.38	54.64	54.20	53.72	52.72
5	62.24	**62.88**	62.00	62.56	62.12	62.68	61.90	62.62	57.50	58.10
6	98.76	98.60	98.62	98.54	98.80	98.64	98.80	98.72	**99.64**	99.58
7	98.46	98.50	98.46	98.50	98.58	98.60	98.60	**98.62**	93.66	93.48
8	**98.90**	98.86	98.84	98.80	98.86	**98.90**	98.86	98.88	98.66	98.50
9	61.62	61.00	60.98	60.70	61.62	60.78	61.28	60.78	68.68	**69.04**
10	**63.36**	62.34	62.98	62.08	63.30	62.14	**63.38**	62.22	49.32	49.12
11	96.80	96.46	96.64	96.38	**96.86**	96.38	96.78	96.52	96.34	95.94
12	75.44	75.28	75.78	75.00	75.64	74.92	75.04	74.98	**77.06**	76.70
13	62.70	**63.78**	62.84	63.56	62.66	63.56	62.48	63.14	60.82	61.28
14	76.96	**77.36**	76.26	77.02	76.66	77.02	76.64	76.66	74.42	75.16
15	93.38	92.96	93.34	92.88	93.32	92.84	93.26	92.98	**95.96**	95.68

* Cases of the location parameter arrangements are given on page 38

Table 5.92. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 8 and $n = 32$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.88	5.06	5.16	5.08	4.90	5.04	5.04	4.90	5.06	5.38
2	89.42	89.10	89.04	88.82	89.34	88.50	89.10	88.34	**94.52**	94.32
3	86.50	86.12	85.70	86.02	86.70	86.44	**87.18**	87.00	75.12	74.84
4	85.74	**85.80**	86.20	85.58	85.06	84.74	83.76	83.84	85.68	85.18
5	90.22	**90.36**	90.30	90.14	89.88	89.50	88.64	89.04	88.10	87.48
6	99.94	99.98	99.94	99.98	99.94	99.96	99.96	99.96	100.0	100.0
7	99.76	99.84	99.74	99.76	99.82	99.88	99.82	99.92	**98.98**	98.58
8	99.94	99.96	99.94	99.96	99.94	99.94	99.90	99.92	99.96	99.96
9	88.32	89.08	88.00	88.92	88.28	88.62	88.00	88.20	94.42	**94.84**
10	86.58	85.88	86.40	85.66	87.08	86.30	**87.10**	86.74	74.84	73.96
11	99.92	99.88	99.94	99.88	99.92	99.86	99.92	99.82	**99.96**	99.90
12	96.66	96.88	96.56	96.84	96.42	96.24	96.04	95.80	97.30	**97.58**
13	90.40	90.40	**90.46**	90.16	89.62	89.50	88.96	88.82	89.50	88.92
14	96.16	**95.92**	96.00	95.80	95.62	95.24	95.40	94.94	95.60	95.58
15	99.56	99.54	99.54	99.54	99.48	99.42	99.32	99.36	99.80	**99.86**

* Cases of the location parameter arrangements are given on page 38

Table 5.93. Percentage of Rejection for $k = 3$; T-Distribution: Block = 8 and $n = 32$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.08	4.82	5.10	4.82	5.04	4.84	4.94	4.76	4.94	4.76
2	47.60	47.72	47.66	47.48	47.76	47.72	47.46	47.58	**54.34**	53.90
3	46.66	46.32	46.38	46.20	46.90	46.70	**46.90**	46.74	36.28	36.00
4	**41.08**	40.86	40.94	40.70	40.92	40.80	40.74	40.60	40.16	39.92
5	48.08	**48.12**	47.82	47.94	48.04	47.86	47.38	47.90	43.30	43.54
6	91.70	92.34	91.60	92.22	91.80	92.38	91.88	92.44	95.86	**96.02**
7	92.40	**92.52**	92.20	92.32	92.68	92.40	**92.52**	92.48	81.96	81.30
8	92.94	**93.44**	92.70	93.36	92.84	93.10	92.66	93.00	91.92	91.76
9	48.16	47.20	47.42	46.94	48.32	47.34	47.64	47.42	**54.60**	53.92
10	**48.80**	46.68	48.46	46.34	48.76	46.54	48.74	46.64	38.16	36.50
11	**88.86**	87.96	88.52	87.76	**88.88**	87.74	88.56	87.70	87.74	86.56
12	60.44	61.08	60.50	60.74	60.58	60.84	60.40	60.56	62.34	**61.70**
13	48.28	**49.34**	47.74	49.06	48.18	48.68	47.90	48.42	45.58	46.34
14	59.52	59.38	59.24	59.20	**59.56**	59.12	59.32	59.02	57.20	56.48
15	81.00	80.60	80.76	80.22	80.92	80.58	80.82	80.46	**85.86**	85.70

* Cases of the location parameter arrangements are given on page 38

Table 5.94. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 4 and $n = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.04	5.34	4.92	5.42	5.00	5.24	5.12	5.16	4.72	4.76
2	22.56	21.90	**22.66**	21.54	22.50	21.54	22.48	21.60	21.76	20.52
3	22.80	22.88	22.72	22.42	**22.90**	22.48	22.38	22.08	22.32	21.96
4	18.78	**18.98**	18.38	18.62	18.88	18.86	18.94	18.66	16.12	15.64
5	37.22	36.82	36.58	36.10	36.98	36.14	37.74	37.34	**46.16**	46.08
6	38.36	37.84	38.24	37.02	38.26	37.42	37.50	37.12	**40.36**	38.76
7	45.82	**45.94**	45.24	45.12	**45.92**	45.62	45.12	45.12	37.22	36.20
8	83.78	83.82	83.50	82.86	83.78	82.72	**84.52**	83.88	78.52	77.48
9	86.56	86.42	85.94	85.50	86.38	85.66	85.80	85.24	**87.10**	86.68
10	**22.88**	21.90	22.56	21.66	22.98	21.58	22.38	21.12	21.84	21.06
11	64.80	65.20	64.30	64.00	64.80	63.90	64.66	63.86	**68.18**	67.16
12	26.94	26.50	26.34	25.82	26.88	25.90	26.64	26.30	**28.52**	27.86
13	39.92	40.34	39.28	39.48	40.18	39.62	40.48	39.86	**40.62**	39.76
14	20.72	22.16	20.40	21.86	20.76	21.84	20.96	21.96	24.36	**24.82**
15	50.90	50.40	51.02	49.04	50.70	49.40	50.98	50.08	**59.62**	58.90

* Cases of the location parameter arrangements are given on page 38

Table 5.95. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 4 and $n = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.66	4.56	4.58	4.56	4.64	4.66	4.80	4.64	4.84	4.58
2	41.40	**42.22**	40.84	41.34	41.18	40.66	40.40	39.96	37.82	38.02
3	40.22	40.38	40.16	39.72	**40.78**	40.14	39.36	39.26	38.58	38.38
4	**35.36**	34.82	35.32	34.06	35.28	33.56	34.64	32.86	28.22	26.60
5	59.64	59.54	59.08	58.52	59.94	58.88	60.72	60.28	**73.28**	72.54
6	68.22	68.78	67.82	67.58	67.32	66.06	65.52	64.70	**69.58**	69.54
7	73.22	**74.14**	72.82	73.12	72.74	72.86	71.72	72.04	62.18	62.06
8	97.20	**97.54**	97.28	97.26	96.84	96.82	96.56	96.78	96.98	96.76
9	98.60	98.48	98.76	98.34	98.20	97.86	97.54	97.18	**99.04**	98.66
10	41.54	40.92	40.64	40.00	**41.72**	40.22	40.20	39.66	39.30	38.52
11	90.26	91.38	90.32	90.54	89.38	89.46	88.30	88.58	92.62	**93.34**
12	49.22	50.28	48.86	49.28	48.82	48.68	48.44	48.54	**51.54**	50.82
13	66.86	67.58	66.88	66.74	66.28	65.72	65.82	65.32	**69.18**	67.94
14	37.08	36.74	36.14	35.84	37.16	35.94	37.62	36.16	**42.56**	42.42
15	78.34	79.02	77.84	78.14	77.70	77.02	77.70	76.60	**87.52**	87.32

* Cases of the location parameter arrangements are given on page 38

Table 5.96. Percentage of Rejection for $k = 4$; T-Distribution: Block = 4 and $n = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.10	4.90	5.10	4.78	5.14	4.86	5.26	4.82	4.72	4.62
2	17.60	17.14	17.58	17.00	**17.72**	16.96	17.44	17.08	17.16	16.32
3	17.94	17.70	18.14	17.40	**18.44**	17.46	17.80	17.30	17.88	17.12
4	15.30	**15.78**	15.30	15.46	15.34	15.50	15.30	15.46	13.28	13.38
5	27.08	27.40	27.20	26.76	26.88	26.90	27.28	27.46	**33.92**	**34.00**
6	29.66	29.92	29.14	29.20	29.58	28.94	29.30	28.62	**30.54**	29.88
7	34.14	**35.82**	33.84	35.10	34.32	35.24	34.08	34.78	27.72	28.34
8	67.78	68.46	67.34	67.60	67.58	67.48	68.32	68.22	63.44	62.54
9	70.80	71.08	70.62	70.30	70.96	70.44	69.96	70.06	71.86	**72.04**
10	17.18	**17.54**	16.92	17.14	17.18	17.18	16.66	17.08	16.50	16.70
11	49.98	49.72	49.92	48.78	50.06	48.56	49.56	48.52	**52.54**	51.06
12	21.10	20.52	21.06	20.10	21.16	20.00	20.94	20.36	**21.96**	21.62
13	29.30	28.74	29.00	28.22	**29.60**	28.44	29.50	29.08	29.30	29.42
14	18.28	16.92	17.72	16.52	18.24	16.40	18.00	16.84	**19.80**	19.10
15	38.02	38.38	37.78	37.54	38.40	37.42	39.12	37.50	**45.40**	44.32

* Cases of the location parameter arrangements are given on page 38

Table 5.97. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 8 and $n = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.08	4.68	5.18	4.64	4.98	4.62	4.68	4.62	4.78	4.78
2	**25.88**	23.50	25.64	22.50	25.74	22.74	25.76	22.88	24.20	21.44
3	26.64	24.36	**26.72**	23.40	26.62	23.48	25.84	22.88	25.50	22.42
4	22.42	20.80	22.18	20.14	**22.54**	20.14	22.46	20.18	19.54	17.28
5	42.88	38.68	42.10	37.24	42.90	37.30	43.92	38.24	**53.56**	46.20
6	45.94	40.86	45.52	39.42	46.02	39.52	45.44	39.40	**46.90**	40.26
7	**54.62**	47.98	53.92	45.80	54.20	45.94	54.14	45.84	43.84	37.00
8	91.32	86.18	91.04	84.36	91.46	84.52	**92.10**	85.52	87.80	79.70
9	92.96	87.92	92.22	86.26	93.08	86.26	92.78	85.98	**93.56**	87.76
10	25.72	22.50	25.30	21.46	**25.92**	21.80	24.80	21.36	24.24	21.06
11	74.46	67.70	73.84	65.76	74.42	65.78	74.04	65.52	**76.96**	68.28
12	31.80	27.90	31.30	26.48	31.96	26.70	31.90	26.96	**33.52**	28.80
13	46.90	41.70	45.94	40.22	47.02	40.48	**47.32**	41.04	47.00	40.32
14	24.34	22.24	24.54	21.28	24.38	21.36	24.22	21.62	**28.76**	24.44
15	59.16	52.00	58.50	49.94	59.02	50.18	59.50	50.80	**68.84**	59.66

* Cases of the location parameter arrangements are given on page 38

Table 5.98. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 8 and $n = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.00	4.72	4.68	4.60	4.78	4.58	4.62	4.60	4.68	4.50
2	49.48	44.84	**49.60**	42.86	48.98	42.76	48.38	42.30	46.14	39.62
3	**47.62**	42.34	47.28	41.00	**47.60**	41.14	46.16	39.76	44.96	39.12
4	**40.94**	36.76	40.46	35.32	40.76	35.02	39.86	34.10	32.36	27.86
5	69.84	62.88	69.52	60.70	70.04	60.96	71.08	62.78	**83.86**	75.62
6	77.68	70.96	77.66	68.66	77.04	67.70	75.16	66.22	**79.70**	70.98
7	**83.06**	76.72	82.82	74.74	82.92	74.38	81.68	73.62	72.40	64.06
8	**99.40**	98.22	99.34	97.80	99.24	97.42	99.20	97.44	99.08	96.88
9	99.58	98.90	99.74	98.72	99.48	98.32	99.08	97.84	**99.88**	99.14
10	46.10	41.28	45.68	39.78	**46.18**	40.04	44.78	38.70	43.28	37.70
11	95.84	92.14	95.84	90.76	95.40	89.46	94.56	88.52	**97.44**	93.56
12	56.50	50.82	56.26	48.68	56.12	48.10	55.26	48.18	**59.92**	50.76
13	76.32	70.08	76.78	67.96	75.90	67.18	74.76	67.18	**78.42**	69.04
14	43.66	37.30	43.50	35.84	43.44	36.06	43.56	36.50	**51.80**	42.40
15	86.58	81.58	86.22	79.54	86.18	78.28	85.64	78.00	**93.80**	88.44

* Cases of the location parameter arrangements are given on page 38

Table 5.99. Percentage of Rejection for $k = 4$; T-Distribution: Block = 8 and $n = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.00	5.18	5.32	4.98	4.92	4.88	4.96	4.82	5.34	4.92
2	**21.16**	19.32	20.96	18.62	**21.16**	18.66	20.94	18.84	19.92	17.28
3	20.56	18.52	**20.68**	17.88	20.50	17.84	19.56	17.60	19.44	17.50
4	17.22	15.10	17.06	14.66	**17.38**	14.74	16.96	14.78	14.46	12.62
5	33.08	28.16	32.86	27.04	33.06	27.30	33.84	28.32	**40.10**	34.00
6	34.40	31.46	34.50	30.22	34.16	30.30	33.66	30.16	**35.34**	30.34
7	41.98	37.40	41.88	36.16	**42.18**	36.10	41.26	35.52	34.16	29.72
8	77.44	70.76	76.90	68.70	77.34	68.28	**78.10**	69.12	72.48	63.16
9	79.48	73.64	78.94	71.28	79.46	71.32	78.64	70.70	80.48	72.28
10	**21.20**	18.18	20.98	17.68	21.24	17.66	20.14	17.40	19.94	17.14
11	59.14	52.36	58.32	50.62	59.04	50.76	58.88	50.58	**62.26**	53.50
12	23.80	21.10	23.08	20.26	23.78	19.94	23.76	20.08	**24.90**	21.14
13	34.42	31.22	33.82	29.94	34.30	29.92	35.30	30.40	**35.22**	30.42
14	20.08	17.36	19.78	16.38	20.12	16.50	20.24	16.92	**22.94**	19.62
15	45.80	41.58	45.60	39.74	46.10	39.76	46.54	40.42	**54.08**	47.06

* Cases of the location parameter arrangements are given on page 38

Table 5.100. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 4 and $n = 32$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.76	4.84	4.88	4.86	4.72	4.86	4.68	4.96	5.26	5.16
2	31.10	**34.60**	30.46	34.28	31.16	34.36	31.20	**34.62**	29.88	32.32
3	31.20	34.04	30.46	33.98	31.38	**34.44**	30.24	33.22	29.90	32.24
4	25.58	27.62	25.52	27.50	25.74	27.80	25.20	**27.86**	21.04	23.26
5	52.04	56.78	51.84	56.52	52.28	56.88	53.38	58.10	63.36	**68.78**
6	54.36	59.78	53.40	59.48	54.18	59.66	53.68	59.08	55.38	**61.34**
7	64.84	**69.18**	64.42	68.78	64.48	68.98	63.96	68.62	52.80	56.84
8	96.50	97.80	96.26	97.70	96.42	97.78	96.56	**98.00**	93.68	96.46
9	97.08	98.46	96.94	98.42	97.06	98.42	96.84	98.32	97.34	**98.60**
10	30.42	34.58	29.98	34.40	30.56	**35.02**	29.94	34.00	29.54	32.88
11	84.74	88.54	84.20	88.34	84.52	88.40	84.12	88.48	86.80	**90.86**
12	36.52	41.76	36.92	41.58	36.64	41.84	36.00	41.52	39.52	**43.92**
13	54.80	61.02	54.12	60.58	54.80	60.74	55.18	61.20	55.30	**61.34**
14	29.58	31.78	29.42	31.68	29.46	31.68	29.70	32.02	35.20	**37.54**
15	69.60	75.26	68.84	74.94	69.84	75.04	70.10	75.52	78.96	**83.08**

* Cases of the location parameter arrangements are given on page 38

Table 5.101. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 4 and $n = 32$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.30	4.96	5.42	4.94	5.24	4.96	5.14	4.88	4.78	5.02
2	58.56	**64.76**	58.30	64.50	58.12	63.80	57.12	62.98	54.12	60.22
3	58.32	62.60	57.58	62.34	58.24	**62.74**	56.18	60.94	55.00	60.26
4	48.08	**53.60**	47.64	53.34	47.42	52.98	46.12	52.20	39.34	42.44
5	79.94	86.26	80.04	85.98	79.76	85.64	79.94	86.00	91.14	**94.74**
6	85.48	89.86	85.50	89.68	84.60	88.50	83.92	87.70	87.12	**91.56**
7	90.74	**94.04**	90.70	93.86	90.74	93.72	89.88	93.26	82.74	87.28
8	99.88	100.0	99.84	100.0	99.84	100.0	99.78	99.96	99.90	99.96
9	99.96	100.0	99.94	100.0	99.92	99.98	99.88	99.98	99.98	100.0
10	56.66	63.36	55.86	63.16	56.58	**63.50**	54.94	61.60	54.62	60.90
11	98.78	99.50	98.82	99.50	98.44	99.20	98.00	99.04	99.50	**99.76**
12	67.04	73.36	66.66	73.00	66.32	71.72	65.44	71.08	69.68	**76.52**
13	86.10	90.84	86.66	90.78	85.10	89.68	84.94	89.32	87.72	**92.10**
14	51.42	58.12	51.36	57.84	51.12	57.56	50.66	57.76	61.46	**67.38**
15	93.84	96.44	93.82	96.44	93.24	95.90	92.64	95.58	97.78	**98.86**

* Cases of the location parameter arrangements are given on page 38

Table 5.102. Percentage of Rejection for k = 4; T-Distribution: Block = 4 and n = 32

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.68	5.06	5.06	5.00	4.70	4.94	4.64	4.96	4.90	5.18
2	24.18	**27.64**	24.36	27.48	24.18	27.58	23.94	27.22	23.48	26.22
3	23.82	**25.56**	23.60	25.38	23.86	25.50	23.40	24.90	22.88	24.38
4	20.16	**21.78**	20.00	**21.78**	20.16	21.64	19.92	21.46	17.44	18.42
5	39.58	43.32	39.38	43.08	39.80	43.58	40.40	44.54	48.94	**54.04**
6	40.64	46.42	40.40	46.14	40.58	46.22	40.82	45.78	42.42	**47.52**
7	48.72	**54.76**	48.52	54.56	48.66	54.72	48.38	54.18	39.18	44.14
8	85.98	90.62	85.72	90.48	85.80	90.66	86.64	**91.28**	81.30	86.94
9	87.48	92.38	87.42	92.22	87.44	92.18	86.84	91.94	88.34	**93.06**
10	23.48	26.50	23.24	26.40	23.52	**26.60**	23.06	26.02	22.94	25.22
11	67.66	72.22	67.30	71.82	67.42	71.76	67.36	71.74	70.82	**75.08**
12	28.68	31.54	28.30	31.40	28.56	31.48	28.78	31.22	30.06	**33.68**
13	40.10	45.52	39.32	45.40	40.10	45.52	41.08	**46.44**	41.28	46.12
14	22.38	25.14	21.82	25.04	22.30	25.24	22.74	25.32	26.56	**28.72**
15	53.86	60.22	53.42	59.96	54.06	60.22	54.50	60.82	62.56	**69.28**

* Cases of the location parameter arrangements are given on page 38

Table 5.103. Percentage of Rejection for k = 4; Normal Distribution: Block = 8 and n = 32

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.72	5.04	4.80	5.06	4.80	5.10	4.76	5.10	4.68	4.80
2	**35.50**	34.82	34.78	34.38	35.48	**34.50**	35.34	34.32	32.56	32.06
3	**34.54**	34.48	34.46	34.00	**34.56**	33.96	33.26	32.82	33.28	32.84
4	**29.76**	29.04	29.54	28.70	**29.76**	28.98	29.52	28.52	24.50	23.48
5	59.30	58.92	58.56	58.38	59.34	58.72	60.62	59.58	**71.56**	69.90
6	63.20	61.50	62.96	61.00	63.32	61.22	62.94	60.98	**64.02**	62.00
7	**71.20**	70.40	70.40	69.92	**71.22**	70.08	70.20	69.50	59.16	57.42
8	98.30	97.82	98.16	97.72	98.30	97.78	**98.36**	98.02	96.74	96.44
9	98.96	98.48	98.88	98.38	98.90	98.40	98.84	98.32	**99.12**	98.86
10	35.94	35.78	35.10	35.28	35.86	35.14	34.92	34.14	33.88	**34.08**
11	89.50	89.16	88.80	88.70	89.24	88.98	89.02	89.02	90.58	**90.88**
12	42.12	42.78	41.70	42.32	41.90	42.42	41.72	42.22	44.26	**44.42**
13	62.80	61.60	61.88	61.12	62.68	61.32	62.64	62.00	**63.08**	61.80
14	32.38	31.14	32.54	30.94	32.40	31.34	32.78	31.66	**37.80**	37.10
15	75.52	76.20	75.42	75.60	75.80	75.78	76.34	76.26	**84.32**	84.14

* Cases of the location parameter arrangements are given on page 38

Table 5.104. Percentage of Rejection for k = 4; Exponential Distribution: Block = 8 and n = 32

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.98	5.36	5.10	5.38	5.00	5.38	5.22	5.20	4.92	5.42
2	**65.38**	64.94	65.34	64.36	64.82	63.48	63.72	62.58	61.96	61.48
3	**63.32**	63.10	63.06	62.62	**63.32**	63.06	61.06	61.24	60.38	59.80
4	**55.04**	55.02	54.90	54.46	54.76	53.88	53.58	53.26	44.96	45.10
5	86.96	87.20	86.58	86.68	86.78	86.50	87.00	87.18	**95.84**	94.90
6	92.16	91.50	92.14	91.16	91.42	90.22	90.22	88.96	**93.44**	92.24
7	**95.02**	94.14	94.74	93.84	**95.02**	93.56	94.24	93.20	88.28	87.12
8	100.0	99.94	100.0	99.92	100.0	99.92	99.98	99.90	99.96	99.98
9	99.98	100.0	99.98	100.0	99.98	99.96	99.96	99.96	100.0	100.0
10	**64.32**	63.34	63.92	62.78	64.24	63.22	62.28	61.42	62.58	60.34
11	99.56	99.56	99.52	99.52	99.38	99.32	99.18	98.98	**99.78**	99.76
12	74.06	74.50	73.84	73.84	73.28	72.96	72.48	72.16	77.06	**77.10**
13	91.04	91.16	90.80	90.80	90.60	89.82	90.46	89.16	**92.38**	91.60
14	59.66	59.22	58.96	58.62	59.34	58.06	59.26	58.36	**69.00**	67.74
15	96.48	96.34	96.34	96.16	96.16	95.66	95.78	95.38	**99.14**	99.02

* Cases of the location parameter arrangements are given on page 38

Table 5.105. Percentage of Rejection for k = 4; T-Distribution: Block = 8 and n = 32

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.82	5.36	5.02	5.38	4.78	5.32	4.78	5.26	5.02	5.20
2	**26.48**	26.18	26.36	25.92	26.36	25.90	26.26	25.76	24.64	23.96
3	27.66	26.78	27.26	26.42	**27.74**	26.66	26.84	25.64	26.46	24.84
4	**23.96**	23.70	23.66	23.30	23.92	23.38	23.80	23.36	20.46	19.60
5	45.52	44.62	45.12	44.26	45.66	44.66	46.26	45.24	55.72	**54.32**
6	48.62	47.86	47.98	47.68	48.52	47.72	47.54	47.12	48.82	**49.14**
7	56.86	54.94	56.16	54.22	**56.98**	54.56	55.60	54.28	45.74	44.82
8	90.56	90.70	90.34	90.38	90.46	90.46	90.82	**91.14**	87.20	87.10
9	92.94	93.00	92.76	92.68	92.96	92.70	92.66	92.36	**93.94**	93.36
10	**26.94**	26.48	26.58	26.22	27.10	26.36	25.94	25.86	25.18	25.04
11	75.34	74.84	74.88	74.28	75.24	74.30	74.98	74.10	**77.70**	77.16
12	32.30	32.42	31.92	32.10	32.38	31.84	32.32	31.76	**33.62**	33.42
13	46.58	47.06	46.90	46.66	46.68	46.56	**47.00**	46.82	46.92	46.82
14	25.18	24.68	24.74	24.36	25.04	24.48	24.96	24.80	**29.32**	28.52
15	59.90	59.32	59.18	58.90	60.08	59.14	60.70	59.56	**69.20**	68.32

* Cases of the location parameter arrangements are given on page 38

Table 5.106. Percentage of Rejection for k = 5; Normal Distribution: Block = 4 and n = 16

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.22	5.08	5.12	5.20	5.20	5.06	5.12	5.08	5.08	4.90
2	33.38	33.22	33.26	32.44	33.46	32.54	**33.66**	32.38	30.68	29.50
3	30.56	29.80	30.50	29.28	30.80	29.28	31.04	29.38	**33.40**	31.82
4	34.24	34.36	33.78	33.32	34.44	33.36	35.26	34.50	**44.38**	42.94
5	**23.58**	23.18	23.28	22.66	23.36	22.84	22.64	22.12	20.82	21.50
6	**28.52**	28.02	28.26	27.60	28.40	27.52	28.10	26.60	28.32	27.58
7	**39.56**	38.64	39.46	37.82	39.42	37.74	39.18	37.90	35.86	33.26
8	45.86	47.90	45.32	46.74	46.00	46.84	45.72	46.50	54.28	**54.82**
9	37.42	36.64	36.94	35.90	37.30	36.06	36.24	34.96	**39.26**	38.30
10	47.14	46.74	46.78	45.68	**47.12**	45.88	46.54	45.82	46.24	45.78
11	22.72	22.82	22.24	22.72	22.68	22.60	22.98	22.70	26.40	**26.60**
12	65.14	64.66	63.98	63.18	65.02	63.44	65.84	64.02	**75.52**	73.48
13	67.98	67.92	68.00	66.68	68.36	67.06	66.90	65.76	**68.28**	67.22
14	39.10	**39.46**	38.74	38.34	39.28	38.56	38.62	38.06	32.08	31.34
15	43.02	**43.24**	42.00	41.96	43.04	42.12	42.10	41.06	38.56	38.24

* Cases of the location parameter arrangements are given on page 38

Table 5.107. Percentage of Rejection for k = 5; Exponential Distribution: Block = 4 and n = 16

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.40	5.46	5.60	5.28	5.42	5.36	5.44	5.50	5.56	5.68
2	**64.46**	64.14	64.22	62.46	63.76	61.58	62.64	60.56	58.66	58.38
3	56.76	56.96	56.52	55.54	56.36	54.82	55.48	54.04	**61.04**	60.06
4	55.78	56.34	55.02	55.06	55.98	55.32	57.52	57.26	71.62	**71.70**
5	44.12	**45.56**	43.90	44.32	44.08	43.92	42.24	42.28	41.00	40.44
6	51.42	51.36	51.08	50.32	51.06	50.00	49.82	48.66	**52.14**	51.80
7	**70.72**	70.64	70.68	69.54	69.98	68.34	68.82	67.38	63.20	61.44
8	77.26	78.70	77.22	77.46	76.44	76.00	75.14	74.90	**85.86**	85.10
9	64.32	64.98	64.02	63.44	64.66	63.50	62.92	61.66	**68.34**	68.00
10	77.68	**79.24**	77.56	77.78	77.00	76.46	75.90	75.52	77.74	77.20
11	39.84	40.20	39.40	38.98	39.84	38.92	40.26	39.12	**47.96**	47.76
12	89.38	89.38	88.98	88.40	88.50	86.90	87.68	86.58	**96.48**	95.94
13	92.50	92.72	92.60	91.84	92.36	91.82	90.96	90.18	**92.92**	92.38
14	69.80	**70.24**	69.94	68.92	69.48	68.26	68.50	67.18	57.90	57.06
15	71.72	**72.12**	71.24	70.62	71.10	70.36	68.90	68.28	66.38	65.60

* Cases of the location parameter arrangements are given on page 38

Table 5.108. Percentage of Rejection for k = 5; T-Distribution: Block = 4 and n = 16

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.22	5.22	5.36	5.20	5.30	5.18	5.10	5.10	4.92	4.92
2	26.84	**27.18**	26.90	26.90	26.66	26.78	26.32	26.40	24.58	24.48
3	23.46	23.04	23.24	22.66	23.26	22.74	23.32	22.78	**26.00**	24.58
4	25.76	25.98	25.46	25.60	25.90	25.66	26.68	26.54	**33.28**	33.02
5	18.60	**19.42**	18.62	19.18	18.34	19.20	17.84	18.94	17.44	17.88
6	**21.78**	21.48	21.76	21.42	**21.78**	21.44	21.20	21.14	21.74	21.46
7	30.42	**30.66**	30.54	29.74	30.34	29.74	30.24	29.50	26.84	26.60
8	36.58	36.72	36.36	36.12	36.78	35.86	36.50	35.54	**42.00**	41.74
9	28.24	28.06	28.00	27.58	28.38	27.64	27.70	26.78	**30.54**	29.34
10	35.12	**36.00**	34.94	35.16	35.14	35.18	35.22	35.20	35.54	35.46
11	17.80	17.90	17.70	17.66	17.78	17.26	17.66	17.52	**21.10**	20.54
12	48.80	48.22	48.22	47.16	48.46	47.06	48.32	47.18	**57.34**	56.50
13	53.80	53.68	52.98	52.22	53.94	52.42	53.02	51.50	**54.58**	52.32
14	**31.14**	29.82	30.62	29.04	30.92	28.94	30.18	28.10	24.80	23.46
15	32.68	**33.00**	32.20	32.24	32.56	32.50	32.00	31.80	29.06	29.18

* Cases of the location parameter arrangements are given on page 38

Table 5.109. Percentage of Rejection for k = 5; Normal Distribution: Block = 8 and n = 16

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.64	4.80	5.00	4.76	4.76	4.68	4.74	4.84	4.92	4.94
2	**41.72**	35.74	**41.74**	34.10	41.64	33.92	41.38	33.94	37.40	31.84
3	35.68	31.22	35.26	30.18	35.44	30.02	35.28	29.88	**38.16**	32.94
4	40.66	36.40	39.96	35.18	40.78	34.88	41.80	36.18	**53.48**	45.54
5	28.64	25.64	28.08	24.72	**28.94**	24.96	28.14	24.36	26.70	23.26
6	**33.14**	29.32	32.96	28.28	33.02	27.86	31.96	27.32	32.52	27.24
7	**46.34**	41.20	45.58	39.36	46.12	39.60	**46.32**	39.78	40.60	34.32
8	54.82	48.54	54.42	46.52	54.82	46.36	55.00	46.42	**63.06**	53.68
9	43.54	39.10	43.36	37.32	43.76	37.16	42.74	36.52	**46.88**	39.18
10	55.34	50.14	54.60	47.70	**55.70**	47.92	55.28	47.82	55.52	47.50
11	26.56	22.94	26.24	21.88	26.76	21.94	27.02	22.16	**31.46**	26.08
12	72.44	65.78	72.06	62.98	72.72	63.02	73.08	63.90	**83.22**	74.32
13	78.56	71.24	77.52	68.72	**78.72**	68.74	77.74	67.18	78.32	69.04
14	46.72	41.34	46.22	39.54	46.86	39.60	46.08	39.00	38.48	32.68
15	50.26	43.62	49.50	41.70	**50.54**	41.72	49.14	41.02	45.78	38.58

* Cases of the location parameter arrangements are given on page 38

Table 5.110. Percentage of Rejection for k = 5; Exponential Distribution: Block = 8 and n = 16

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.36	5.50	5.38	5.62	5.32	5.68	5.34	5.76	5.26	5.66
2	**72.70**	65.86	72.38	63.20	71.86	61.88	70.64	60.44	67.66	57.70
3	65.24	58.00	65.00	55.34	64.62	54.18	63.38	53.88	**70.02**	60.02
4	65.20	57.94	64.30	55.16	64.94	55.60	67.08	58.12	**81.52**	72.82
5	53.64	47.36	**53.72**	45.56	53.38	45.12	51.04	43.54	49.82	41.76
6	60.44	56.08	60.00	53.46	60.46	53.12	59.16	51.90	**61.16**	53.02
7	**78.74**	71.48	78.40	69.32	77.94	68.16	77.14	67.26	71.78	62.18
8	85.32	79.98	85.52	77.56	84.76	76.42	83.82	75.82	**92.36**	85.36
9	74.96	67.50	74.44	64.78	74.82	64.78	72.90	63.32	**78.88**	68.60
10	86.72	80.92	86.88	78.28	86.30	77.14	84.86	76.30	**87.16**	79.00
11	46.32	41.10	45.54	39.38	46.08	39.42	45.96	39.58	**55.14**	47.02
12	94.38	91.44	94.44	89.62	94.10	88.34	93.62	87.96	**98.62**	96.12
13	97.06	94.18	96.62	92.74	96.82	92.32	96.00	91.06	**97.18**	92.54
14	78.12	72.00	**78.24**	69.76	77.76	69.04	76.34	67.80	68.16	59.12
15	**81.22**	74.66	81.02	72.08	81.04	71.14	78.86	69.58	76.86	67.16

* Cases of the location parameter arrangements are given on page 38

Table 5.111. Percentage of Rejection for k = 5; T-Distribution: Block = 8 and n = 16

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.28	5.14	5.40	5.22	5.36	5.04	5.40	5.26	5.32	4.90
2	**30.70**	27.22	30.46	26.58	30.60	26.04	30.66	26.28	27.52	24.64
3	27.88	25.34	27.06	24.38	27.68	24.36	27.82	24.42	**29.68**	25.90
4	31.14	28.40	30.66	27.30	31.12	26.82	32.30	27.72	**39.48**	34.36
5	22.98	20.32	22.66	19.50	**23.30**	19.48	22.72	19.14	21.30	18.56
6	25.92	23.30	25.74	22.30	**26.12**	22.28	25.68	21.92	25.84	22.34
7	35.42	32.58	35.28	30.98	**35.62**	31.14	35.42	31.28	31.54	27.54
8	41.46	36.60	40.76	34.96	41.54	35.08	41.64	35.04	**48.32**	41.12
9	32.68	29.04	32.76	27.64	32.72	27.82	31.94	26.94	**34.64**	29.36
10	42.18	37.40	41.84	36.16	**42.32**	35.94	41.86	35.48	41.80	35.54
11	19.54	17.86	19.38	17.38	19.72	17.36	19.84	17.24	**22.60**	20.10
12	57.34	51.18	56.84	49.26	57.44	49.06	57.26	49.84	**68.40**	59.12
13	62.66	55.58	61.82	53.38	**62.74**	53.52	61.26	52.30	61.64	53.18
14	36.38	31.78	**36.52**	30.56	36.38	30.28	35.72	30.08	29.12	24.68
15	**38.08**	33.94	37.34	32.60	37.96	32.24	36.88	31.62	34.30	29.50

* Cases of the location parameter arrangements are given on page 38

Table 5.112. Percentage of Rejection for k = 5; Normal Distribution: Block = 4 and n = 32

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.98	4.94	4.92	4.90	4.92	4.90	5.02	4.94	5.10	5.04
2	49.26	**53.58**	48.36	53.36	49.26	53.48	49.06	53.50	45.20	48.38
3	43.12	48.22	43.20	48.18	43.12	48.26	42.88	48.30	46.28	**51.40**
4	48.12	52.98	48.24	52.72	48.50	53.18	49.94	55.12	61.96	**67.50**
5	33.16	37.46	32.98	37.26	33.14	**37.76**	32.32	36.32	30.34	34.30
6	39.16	**44.06**	39.58	43.78	39.60	43.98	38.76	43.02	39.88	43.64
7	56.18	**61.44**	55.90	61.24	56.22	61.00	55.82	61.34	50.10	54.22
8	65.18	70.76	64.90	70.36	65.30	70.54	64.64	70.32	72.52	**78.52**
9	53.30	57.58	52.70	57.38	53.34	57.30	51.58	56.34	56.12	**60.58**
10	65.10	**70.64**	64.30	70.18	64.92	70.32	64.88	70.24	64.62	69.50
11	29.86	33.30	30.08	33.32	29.92	33.24	29.92	33.52	35.74	**40.44**
12	82.48	86.96	81.90	86.70	82.64	86.84	82.98	87.38	90.58	**94.00**
13	86.86	**91.32**	86.70	91.08	86.86	91.06	85.72	90.44	87.04	91.26
14	57.12	**62.12**	56.24	61.86	57.14	61.84	55.72	61.14	46.34	50.70
15	59.50	**65.20**	59.32	64.96	59.80	64.94	58.64	63.72	54.44	60.24

* Cases of the location parameter arrangements are given on page 38

Table 5.113. Percentage of Rejection for k = 5; Exponential Distribution: Block = 4 and n = 32

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.50	5.02	5.34	5.06	5.52	5.10	5.24	4.86	5.22	5.10
2	82.96	**87.14**	82.78	86.90	82.18	85.80	81.12	84.98	78.94	83.48
3	75.66	81.78	74.86	81.50	74.56	80.64	74.04	79.94	79.44	**85.92**
4	76.22	81.62	75.86	81.42	76.14	81.08	77.92	82.92	90.14	**93.88**
5	61.82	**67.52**	62.04	67.12	61.32	67.08	59.48	65.28	57.66	62.70
6	72.00	**77.36**	71.68	77.10	71.76	76.48	70.10	75.22	71.72	76.22
7	86.92	**91.08**	87.12	90.84	86.28	89.86	85.26	89.14	81.58	86.70
8	92.64	96.18	92.94	96.04	91.86	95.10	91.38	94.44	97.22	**98.70**
9	83.28	88.36	83.26	88.26	83.38	88.28	81.80	87.14	87.28	**91.12**
10	92.66	95.92	92.68	95.74	92.06	95.44	91.00	94.96	93.52	**96.16**
11	56.32	62.42	55.98	62.04	55.90	60.76	55.90	61.02	66.32	**73.06**
12	98.54	99.50	98.88	99.46	98.26	99.24	98.06	99.24	99.76	**99.94**
13	98.86	99.50	98.90	99.50	98.78	99.50	98.52	99.32	99.10	**99.64**
14	86.34	**90.00**	85.76	89.78	85.74	89.42	84.44	88.48	76.86	81.90
15	89.50	**92.34**	89.26	92.20	89.02	91.82	87.42	90.94	85.58	89.66

* Cases of the location parameter arrangements are given on page 38

Table 5.114. Percentage of Rejection for k = 5; T-Distribution: Block = 4 and n = 32

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.72	5.08	4.72	5.12	4.70	5.00	4.62	4.94	5.24	4.88
2	37.36	**40.74**	36.84	40.68	37.22	40.30	36.90	40.20	34.52	37.70
3	34.16	36.34	33.46	36.16	34.04	36.08	34.22	36.56	36.42	**39.10**
4	37.02	40.20	36.22	40.04	37.00	40.00	38.56	41.32	47.36	**51.48**
5	25.48	**28.38**	25.34	28.22	25.66	28.24	24.80	27.58	23.98	26.58
6	29.72	**33.26**	29.54	33.06	29.74	33.40	29.24	32.50	29.84	33.04
7	42.22	46.92	41.86	46.52	42.08	46.70	42.00	**47.06**	37.00	40.48
8	50.10	53.60	49.98	53.36	49.94	53.56	49.68	53.40	57.80	**61.62**
9	40.18	44.30	39.66	44.10	40.08	44.44	39.16	43.14	42.26	**47.06**
10	50.96	**53.84**	50.00	53.46	50.92	53.54	50.60	53.30	49.88	53.38
11	23.12	26.04	23.60	26.04	23.18	25.98	23.30	26.26	27.42	**30.88**
12	67.10	72.08	66.36	71.66	67.02	71.52	67.32	72.08	77.22	**82.20**
13	71.98	77.24	72.08	76.96	72.08	**77.32**	71.00	76.10	71.48	77.44
14	41.54	**46.86**	40.70	46.64	41.40	46.80	40.62	45.94	34.58	38.12
15	46.06	**48.88**	45.82	48.72	45.92	48.84	44.52	48.06	41.62	44.88

* Cases of the location parameter arrangements are given on page 38

Table 5.115. Percentage of Rejection for k = 5; Normal Distribution: Block = 8 and n = 32

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.68	4.66	4.66	4.70	4.66	4.58	4.66	4.70	4.64	4.82
2	56.44	55.36	56.22	54.62	**56.58**	54.76	56.36	54.52	51.56	50.12
3	49.14	47.68	48.88	46.96	49.08	46.86	48.50	46.78	**52.78**	51.36
4	55.26	54.66	54.86	53.96	55.48	54.40	57.24	56.40	**70.52**	68.82
5	**38.00**	36.72	37.48	36.22	37.68	36.16	36.86	34.96	35.44	33.80
6	**45.12**	43.26	44.10	42.78	45.02	42.86	43.56	42.10	44.46	42.72
7	62.44	61.24	62.24	60.44	**62.56**	60.60	61.92	60.66	53.76	53.44
8	73.06	71.90	72.48	70.82	72.86	70.90	72.56	71.12	**80.74**	79.10
9	59.02	58.26	58.30	57.46	59.18	57.66	57.54	56.62	**62.16**	60.90
10	71.94	**72.04**	71.72	71.44	72.04	71.36	71.62	71.32	71.54	70.04
11	33.30	33.88	32.94	33.56	33.28	33.70	33.60	33.86	39.74	**39.84**
12	88.44	87.78	88.20	87.28	88.54	87.24	88.90	88.14	**94.72**	93.92
13	91.36	90.92	91.06	90.60	91.38	90.54	90.60	89.98	**91.42**	90.24
14	62.46	60.86	62.16	60.44	**62.64**	60.54	61.32	59.32	51.06	50.24
15	**66.30**	64.90	65.90	64.10	66.18	64.14	65.08	62.72	60.34	59.28

* Cases of the location parameter arrangements are given on page 38

Table 5.116. Percentage of Rejection for k = 5; Exponential Distribution: Block = 8 and n = 32

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.06	4.94	5.14	5.02	5.12	5.04	5.12	4.94	5.14	5.36
2	**88.66**	86.90	88.26	86.32	87.76	85.68	86.92	84.96	84.94	82.88
3	82.10	82.32	81.78	81.54	81.12	80.30	80.12	79.78	**86.86**	86.18
4	82.56	82.94	82.28	82.38	82.60	82.04	84.44	83.50	**94.78**	94.50
5	**69.42**	68.66	68.74	68.00	68.90	67.42	67.18	65.70	64.54	64.36
6	77.30	76.46	76.76	75.68	77.20	75.36	75.42	74.02	**77.84**	75.86
7	**92.40**	91.74	92.62	91.38	91.82	90.38	91.14	89.90	88.36	87.24
8	96.60	96.40	96.60	96.08	96.22	95.32	95.72	94.96	**99.06**	98.70
9	89.58	89.24	89.18	88.78	89.38	88.64	88.10	87.26	**91.94**	91.62
10	96.10	96.18	96.08	95.86	95.82	95.20	95.24	94.64	**96.36**	96.26
11	62.54	63.02	62.14	62.38	62.08	61.62	62.00	61.84	**74.10**	72.88
12	99.20	99.22	99.18	99.14	99.00	98.74	98.98	98.68	**99.96**	99.94
13	99.60	99.58	99.62	99.58	99.58	99.50	99.50	99.34	**99.72**	99.56
14	**91.88**	91.36	91.64	90.88	91.52	90.58	90.52	89.74	84.88	82.70
15	**94.20**	94.10	93.94	93.78	93.94	93.04	92.76	92.08	91.26	90.74

* Cases of the location parameter arrangements are given on page 38

Table 5.117. Percentage of Rejection for k = 5; T-Distribution: Block = 8 and n = 32

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.54	5.14	4.62	5.06	4.54	5.30	4.64	5.26	5.06	5.14
2	**43.44**	42.46	42.64	42.06	43.34	41.92	42.94	41.54	39.22	38.42
3	36.18	35.96	35.64	35.52	36.00	35.70	36.28	35.98	**39.24**	38.34
4	41.04	41.14	40.80	40.44	41.22	40.40	42.18	42.00	**53.74**	52.92
5	28.82	28.14	28.46	27.78	**29.02**	28.02	28.46	27.18	26.98	25.58
6	33.46	33.46	32.94	32.98	33.50	32.96	32.74	32.50	**33.62**	33.00
7	**46.38**	46.36	46.28	45.72	46.18	46.06	46.28	46.30	40.14	40.02
8	56.16	54.76	55.96	54.16	56.02	54.04	55.64	54.22	**64.40**	62.94
9	43.82	43.76	43.52	43.22	43.94	43.64	42.64	42.62	**47.44**	46.42
10	**57.38**	55.68	56.96	55.14	57.46	54.88	56.94	55.12	55.94	54.60
11	26.92	26.70	26.86	26.36	26.90	26.50	26.78	27.20	**31.94**	31.92
12	73.98	72.86	73.40	72.14	74.22	72.10	74.62	72.60	**84.24**	81.70
13	**79.50**	77.80	79.30	77.10	79.48	77.00	78.26	75.80	78.70	76.88
14	**48.96**	47.32	48.10	46.64	48.86	46.46	47.64	45.84	40.04	38.12
15	**51.96**	51.20	51.06	50.60	51.86	50.60	50.48	49.48	46.74	45.50

* Cases of the location parameter arrangements are given on page 38

5.3. Unequal Sample Sizes for the CRD

Throughout the previous sections we have discussed the performance of our proposed methods when we have equal sample sizes in the *CRD* portion. In this section, we discuss the results of the simulation study with various sample sizes in the *CRD* portion. The results are presented in different sections based on the proportions of the *RCBD* portion to the *CRD* portion.

Table 5.118 through Table 5.126 represent the results of the proposed methods in terms of the estimated levels of significance and the estimated powers for the normal, exponential, and student's t distributions for three treatments ($k = 3$) when the proportion of the *RCBD* portion is *larger* than the *CRD* portion. Similarly, Table 5.127 though Table 5.144 represent the results for four treatments ($k = 4$) and Table 5.145 though Table 5.162 represent the results for five treatments ($k = 5$). Moreover, In Sec. 5.3.2, Table 5.163 through Table 5.171 represent the estimated powers along with the levels of significance of the proposed methods for three treatments ($k = 3$) for the three underlying distributions when the proportion of the *RCBD* portion is *equal* to the *CRD* portion. Similarly, Table 5.172 though Table 5.180 represent the results for four treatments ($k = 4$) and Table 5.181 though Table 5.189 represent the results for five treatments ($k = 5$).

In Sec. 5.3.3, the estimated powers along with the levels of significance for the proposed methods are presented when the number of blocks in *RCBD* portion is *smaller* than the sample size in the *CRD* portion. Results are given in Table 5.190 through Table 5.198 for three treatments ($k = 3$). Table 5.199 through Table 5.207 give the results for four treatments ($k = 4$). Table 5.208 through Table 5.216 give the results for five treatments ($k = 5$). For each treatment combination, the number of blocks in the *RCBD* portion are 8, 16, and 32. The corresponding sample sizes for the *CRD* portion vary from 4 to 20. In addition, the proportion among the sample sizes are 1/5, 1/4, and 1/2.

5.3.1. Portion of the RCBD is larger than the CRD

Since our proposed methods are new, it is a common practice to examine their performance considering the power of each method along with the corresponding level of significance. Here, we discuss in detail the results of the simulation study when the proportion of the number of blocks in the *RCBD* portion is *larger* than the sample size in the *CRD* portion. In terms of the level of significance (α), all the proposed methods maintain their type-I error. This is valid for k = 3, 4 and 5 regardless of the underlying distribution. However, the estimated powers reveal some differences among the test statistics.

For k = 3, the results show that when the sample sizes follow nonincreasing pattern (e.g., n_1 = 8 and $n_2 = n_3$ = 4), the proposed methods T_1, T_3, T_5, T_7 including C_1 have approximately the same estimated powers. This occurs in many cases such as (0.05, 0.25, 0.5), (0, 0.5, 1) and (0.2, 0.5, 0.8). However, when the last two location parameters have the same shift such as (0, 0.5, 0.5), the results show that the proposed methods T_1, T_3, T_5 including C_1 are comparable. Otherwise, T_7 has the highest estimated powers. Further, these results are also applicable when the sample sizes follow umbrella and nondecreasing patterns. It is of note that the proposed methods tend be more powerful under the nondecreasing pattern for the sample sizes in the *CRD* portion.

For k = 4, the results also indicate that T_1, T_3, T_5, and T_7 have approximately the same estimated powers when the sample sizes follow nonincreasing pattern. More specifically, this can be seen when the first two parameters have no shift and the last two parameters have the same equal shift such as (0, 0, 0.25, 0.25) and when the distance doubles each time such as (0, 0.05, 0.15, 0.35). However, when the last two parameters are equal and the first two are different such as (0, 0.25, 0.5, 0.5) and when the parameters are equally distant such as (0, 0.1, 0.2, 0.3), T_7 becomes less powerful (see Tables 5.127-5.144). Other than that, T_7 has the highest estimated

powers. The results are applicable when the sample sizes follow nondecreasing pattern as well. However, an exception arises regarding the umbrella pattern. An exception occurs when the location parameter arrangements are equally distant, T_7 turns out to have approximately the same estimated powers with T_1, T_3, T_5 and C_1.

For $k = 5$, when the location parameter arrangements follow a nonincreasing pattern (e.g., *Block* = 16, $n_1 = 8$ and $n_2 = n_3 = n_4 = n_5 = 4$), we observe that T_1, T_3, T_5, T_7, C_1 and C_2 are equivalent in terms of the estimated powers. For example, when the 2nd and the 3rd parameters have the same shifts and the 3rd and the 4th also have the same shifts parameters such as (0, 0.05, 0.05, 0.3, 0.3).We also note that under almost half of the location parameter arrangements considered, T_7 is significantly higher than the others, for example, when the first three parameters are the same and the last two are distinct such as (0, 0, 0, 0.25, 0.5). However, when we doubled the number of blocks in the *RCBD* portion (e.g., *Block* = 32, $n_1 = 8$ and $n_2 = n_3 = n_4 = n_5 = 4$), we notice that both T_7 and C_2 are considerably more powerful than others (see Tables 5.154-5.156). The same results are applicable to the umbrella and the nondecreasing patterns for the sample sizes in the *CRD* portion.

Table 5.118. Percentage of Rejection for $k = 3$; Normal Distribution: Block = 16, $n_1 = 8$ and $n_2 = n_3 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.86	5.04	5.04	5.52	5.04	4.78	4.92	4.80	4.70	4.24
2	36.34	30.30	35.88	27.92	38.10	29.22	38.82	29.88	43.88	34.00
3	43.32	37.30	42.32	35.82	42.38	33.88	41.28	32.46	33.98	29.48
4	34.28	28.94	33.80	27.10	34.58	27.08	34.96	26.76	35.08	28.28
5	39.90	33.22	39.40	31.74	39.90	30.30	39.28	29.78	36.86	30.22
6	80.90	70.76	79.84	63.96	83.52	66.98	84.08	68.92	89.06	76.86
7	89.08	83.46	88.78	79.12	88.44	76.36	87.20	73.66	77.24	67.16
8	86.90	79.50	86.12	73.92	87.28	73.06	86.86	72.10	85.68	73.54
9	36.24	29.48	35.32	27.48	37.80	28.54	38.52	28.64	42.68	33.22
10	43.96	38.20	43.52	36.40	43.28	34.40	42.08	33.20	35.08	30.56
11	79.36	70.58	79.02	65.86	79.82	64.96	79.12	64.50	79.30	66.26
12	48.94	41.18	48.42	38.14	49.78	38.34	49.58	38.06	51.00	41.50
13	39.84	33.88	39.24	32.06	40.00	31.24	40.04	31.04	38.78	31.88
14	49.60	42.34	49.20	39.94	50.48	38.86	49.62	37.98	48.48	39.42
15	67.68	56.86	67.32	51.66	69.58	53.08	69.72	53.76	74.42	59.76

* Cases of the location parameter arrangements are given on page 38

Table 5.119. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 16, $n_1 = 8$ and $n_2 = n_3 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.06	4.56	4.94	5.10	5.22	5.08	5.06	5.10	5.14	5.26
2	58.74	48.02	57.44	42.66	60.90	44.32	61.56	45.64	**68.70**	53.56
3	**66.90**	60.26	66.02	57.14	65.84	54.10	64.64	51.76	54.02	46.72
4	60.44	52.02	**61.12**	48.64	60.44	46.88	59.32	45.14	60.64	48.22
5	67.92	59.34	**68.22**	55.50	67.74	53.02	65.90	50.78	64.90	51.96
6	95.16	88.42	94.86	82.88	96.18	85.58	96.46	87.06	**98.74**	93.60
7	**97.10**	94.66	96.84	92.76	97.06	91.22	96.96	90.12	91.18	84.04
8	97.82	95.68	**98.04**	93.42	97.74	91.96	97.32	91.00	97.98	93.74
9	58.24	48.10	57.84	43.44	60.66	45.38	61.72	46.84	**69.88**	54.08
10	**67.94**	61.32	67.78	58.06	66.70	55.24	65.78	52.72	55.82	47.58
11	96.12	91.58	96.16	88.66	96.18	87.26	95.70	85.90	**96.70**	89.14
12	77.52	68.10	77.82	63.16	78.42	61.64	76.66	60.72	**80.16**	66.70
13	67.12	58.90	**67.50**	54.66	67.42	52.90	66.30	51.36	66.18	54.50
14	79.56	71.36	**79.88**	67.02	79.68	65.02	78.10	62.84	78.72	66.24
15	90.00	81.76	89.78	75.34	90.90	76.66	90.96	77.00	**94.68**	84.46

* Cases of the location parameter arrangements are given on page 38

Table 5.120. Percentage of Rejection for $k = 3$; T-Distribution: Block = 16, $n_1 = 8$ and $n_2 = n_3 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.68	4.16	4.80	4.86	4.76	4.62	4.80	4.64	4.88	4.66
2	28.00	22.84	28.08	21.66	29.60	22.02	29.70	22.26	**32.90**	25.78
3	**31.86**	27.48	31.42	27.10	31.22	25.26	30.22	24.14	24.50	22.36
4	25.82	21.08	25.82	20.48	25.80	20.00	25.50	20.00	**25.86**	21.30
5	**31.14**	26.74	31.02	25.48	31.06	24.74	30.64	24.60	29.92	25.28
6	65.48	55.08	64.50	50.34	67.80	52.64	68.98	53.52	**74.44**	60.52
7	**73.78**	65.86	72.96	61.94	72.64	58.70	70.76	56.70	59.80	51.00
8	70.68	62.42	70.52	57.96	**71.24**	57.40	70.14	56.38	69.24	57.62
9	27.90	22.78	27.14	21.40	28.78	21.78	29.36	22.46	**31.78**	25.84
10	**32.26**	28.08	31.90	27.84	31.66	26.14	30.96	24.72	25.88	23.32
11	62.54	53.48	62.32	49.64	**63.00**	48.84	62.48	47.90	62.04	49.88
12	37.42	30.58	36.68	28.86	38.00	28.20	37.76	28.42	**38.28**	29.92
13	**38.20**	32.30	37.96	31.28	38.02	30.20	37.36	29.60	37.28	30.22
14	30.94	25.58	30.66	24.48	**31.04**	23.50	30.48	22.96	29.48	23.74
15	50.64	42.56	50.04	39.52	52.36	40.24	52.16	40.56	**57.08**	45.42

* Cases of the location parameter arrangements are given on page 38

Table 5.121. Percentage of Rejection for $k = 3$; Normal Distribution: Block = 16, $n_1 = n_3 = 4$ and $n_2 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.02	4.70	5.12	5.44	5.08	4.84	5.06	5.18	5.18	5.60
2	35.86	28.94	35.34	27.56	36.08	27.00	35.94	29.62	**42.86**	32.50
3	35.54	29.34	35.36	27.56	**35.86**	26.62	35.24	29.10	26.78	20.94
4	**32.68**	26.78	32.58	25.28	32.54	24.60	32.32	26.94	32.04	25.02
5	36.00	29.64	35.54	28.20	**36.08**	27.30	35.78	29.94	33.14	25.94
6	81.52	71.22	80.50	65.04	81.88	66.26	81.76	70.32	**89.46**	76.46
7	81.44	71.40	80.82	64.42	**81.84**	65.94	81.72	70.08	64.10	48.04
8	82.52	72.66	82.44	66.76	**82.68**	67.34	81.80	70.36	80.62	65.26
9	37.28	30.52	36.54	28.50	37.62	28.04	37.86	31.16	**43.60**	34.30
10	**36.68**	29.68	36.54	28.12	36.60	27.66	36.40	29.82	28.28	21.98
11	75.26	64.60	74.68	58.74	**75.52**	59.14	75.08	63.34	74.00	58.72
12	47.50	38.84	46.92	35.48	47.54	35.44	47.14	38.80	**48.60**	36.98
13	**36.88**	30.02	36.22	28.44	36.68	27.72	35.92	30.12	35.46	27.00
14	46.26	38.86	46.32	35.58	**46.84**	35.48	46.08	38.78	44.84	34.64
15	66.14	54.82	65.44	50.30	66.34	50.30	65.96	54.18	**72.98**	57.60

* Cases of the location parameter arrangements are given on page 38

Table 5.122. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 16, $n_1 = n_3 = 4$ and $n_2 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.30	5.16	5.36	5.66	5.14	5.36	5.26	5.52	5.00	5.34
2	59.48	48.34	58.06	43.76	59.74	44.32	60.10	49.16	**69.60**	53.78
3	59.24	49.70	58.32	45.56	**59.58**	45.46	59.36	48.90	44.28	33.80
4	**55.68**	46.96	55.44	43.30	55.34	42.46	54.40	45.22	54.80	42.42
5	64.30	54.52	**64.50**	50.56	64.08	49.78	62.68	52.22	60.38	46.18
6	94.52	88.40	93.92	82.20	94.74	83.72	94.36	86.70	**98.60**	93.08
7	91.66	84.16	90.66	78.06	92.44	79.96	**92.84**	84.28	79.28	62.48
8	96.82	92.10	**96.86**	88.16	96.68	87.66	95.86	88.42	96.52	87.82
9	59.24	48.44	58.36	43.20	59.82	44.02	59.56	48.58	**69.96**	54.10
10	59.28	49.46	58.46	44.94	59.54	44.98	**59.68**	48.86	44.58	32.90
11	94.22	87.98	94.44	83.70	93.98	83.52	93.20	84.76	**95.00**	84.26
12	74.80	64.76	75.54	59.98	74.48	59.28	72.90	61.72	**77.82**	62.30
13	74.22	64.46	**74.40**	59.32	73.96	58.80	72.38	61.10	72.94	57.36
14	62.90	52.62	**63.16**	48.20	62.66	47.02	61.12	49.70	61.08	46.80
15	88.26	79.76	88.36	73.20	88.44	73.84	87.44	76.88	**94.12**	82.94

* Cases of the location parameter arrangements are given on page 38

Table 5.123. Percentage of Rejection for $k = 3$; T-Distribution: Block = 16, $n_1 = n_3 = 4$ and $n_2 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.36	4.70	5.36	5.24	5.60	4.54	5.46	5.12	5.52	5.38
2	28.20	23.46	28.20	22.62	28.10	22.26	27.84	24.56	**33.38**	27.14
3	26.74	22.16	26.56	21.40	26.92	20.34	**26.98**	22.74	21.14	16.84
4	24.72	19.94	24.54	19.48	**24.86**	18.42	24.10	19.96	23.98	19.18
5	26.66	21.62	**27.04**	20.74	26.90	19.86	27.02	22.34	24.32	19.70
6	65.14	54.02	64.14	49.52	65.28	49.38	65.02	53.84	**74.88**	59.36
7	65.72	54.76	64.68	49.88	**66.26**	50.18	66.04	54.24	49.20	37.20
8	**66.42**	56.76	65.86	51.82	**66.42**	51.38	65.96	55.14	64.04	49.96
9	28.60	24.16	28.22	23.00	28.96	22.76	29.24	25.26	**32.92**	27.32
10	27.50	21.96	27.12	21.42	27.74	20.34	**27.80**	22.84	20.80	16.90
11	58.68	49.46	58.52	45.02	**58.92**	44.70	57.86	48.06	57.32	43.94
12	35.10	28.88	35.32	26.98	35.70	26.36	35.56	28.92	**36.70**	28.22
13	35.16	28.76	34.94	26.46	35.38	26.10	**35.58**	28.54	34.12	25.98
14	**27.64**	23.16	26.98	22.62	**27.64**	21.58	27.44	23.70	26.02	21.92
15	50.62	41.70	50.22	38.52	50.74	38.02	50.46	41.76	**56.04**	44.38

* Cases of the location parameter arrangements are given on page 38

Table 5.124. Percentage of Rejection for $k = 3$; Normal Distribution: Block = 16, $n_1 = n_2 = 4$ and $n_3 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.18	4.88	5.34	5.54	5.16	5.22	5.34	5.20	5.08	5.20
2	42.04	36.24	41.94	34.66	41.36	33.08	40.28	31.40	**47.06**	36.84
3	37.44	29.98	36.74	27.90	38.72	28.74	**38.98**	29.76	29.18	22.20
4	**34.86**	29.20	34.62	27.52	34.82	26.78	34.72	26.02	34.58	26.48
5	38.54	32.22	38.22	30.52	**38.84**	30.02	38.46	30.10	35.70	27.68
6	88.96	83.26	88.76	78.94	88.30	76.30	87.14	73.80	**93.02**	83.06
7	81.06	71.00	80.58	63.46	83.36	66.62	**84.02**	68.28	67.76	49.78
8	85.64	78.02	85.10	73.16	**86.02**	72.52	85.58	71.26	83.38	69.74
9	43.68	37.54	43.38	35.70	43.16	34.10	41.74	32.62	**47.98**	38.34
10	36.44	29.48	36.04	27.70	37.64	28.54	**38.14**	29.36	28.74	22.06
11	80.04	71.76	79.66	67.04	**80.28**	65.70	79.14	64.64	78.74	63.84
12	51.52	44.72	51.54	42.16	51.16	40.82	50.62	39.74	**52.38**	41.02
13	39.90	33.42	39.82	31.68	**39.94**	30.84	39.14	30.82	38.16	29.44
14	51.32	43.40	51.14	40.36	**51.44**	39.64	50.66	38.90	48.92	37.56
15	74.32	67.12	73.32	63.04	73.48	60.32	72.24	57.70	**78.28**	64.74

* Cases of the location parameter arrangements are given on page 38

Table 5.125. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 16, $n_1 = n_2 = 4$ and $n_3 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.44	5.28	5.56	6.00	5.36	5.74	5.12	5.62	5.46	5.86
2	67.16	59.62	66.58	56.36	66.24	53.18	65.00	51.16	**73.72**	59.76
3	57.80	49.04	56.72	44.94	60.06	46.34	**60.98**	47.68	45.66	34.42
4	**59.80**	51.92	59.72	49.02	59.62	47.28	58.24	46.54	59.18	46.48
5	65.78	57.12	**66.30**	53.78	66.26	52.72	64.92	51.58	62.26	48.56
6	97.54	95.22	97.28	92.64	97.18	90.06	96.36	87.68	**98.94**	94.98
7	92.42	84.00	91.38	77.88	93.80	80.48	**94.52**	81.84	82.44	65.52
8	97.40	93.78	**97.48**	91.02	97.22	89.48	96.50	87.12	97.20	88.28
9	68.12	60.12	67.30	56.66	66.92	53.72	65.24	51.68	**74.52**	60.08
10	58.70	48.58	58.26	44.42	60.62	46.18	**61.70**	47.60	47.44	34.72
11	94.88	89.76	**95.16**	86.16	94.70	84.36	93.64	82.48	94.72	84.16
12	78.40	69.90	78.78	66.12	77.72	62.70	75.78	60.62	**79.72**	64.80
13	66.08	57.96	**66.54**	53.82	66.38	52.90	64.68	51.28	64.00	50.02
14	77.70	69.34	**77.92**	65.18	77.40	63.44	75.94	62.52	75.76	61.56
15	92.76	87.48	92.50	83.82	91.42	80.46	90.24	77.72	**94.76**	85.36

* Cases of the location parameter arrangements are given on page 38

Table 5.126. Percentage of Rejection for $k = 3$; T-Distribution: Block = 16, $n_1 = n_2 = 4$ and $n_3 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.72	4.36	4.72	5.18	4.66	4.80	4.46	4.70	4.60	5.12
2	32.76	27.66	32.04	27.20	32.18	25.42	31.20	24.62	**37.10**	28.26
3	27.80	23.14	27.50	22.56	28.80	22.92	**29.52**	23.68	21.76	19.00
4	**27.82**	23.74	27.52	22.98	27.78	22.00	27.42	21.58	27.72	21.90
5	29.92	25.40	29.94	24.28	**30.58**	23.54	30.30	23.44	27.82	22.32
6	73.86	66.56	72.88	62.96	72.76	59.94	71.30	57.54	**79.54**	65.72
7	64.82	54.10	63.84	48.86	67.22	50.88	**67.98**	52.62	51.76	38.48
8	71.20	62.96	70.52	58.30	71.36	57.30	70.96	56.00	**68.94**	54.24
9	32.46	27.94	32.08	27.34	31.44	26.18	31.02	24.96	**35.80**	28.66
10	28.20	23.26	28.02	22.30	29.02	22.90	**29.60**	23.42	23.02	18.60
11	65.06	56.66	64.78	53.20	**65.38**	51.50	64.56	50.56	63.76	50.04
12	38.46	32.80	38.52	31.50	38.88	30.22	38.32	29.48	**39.50**	30.50
13	**30.34**	25.42	**30.34**	24.70	30.74	24.20	30.34	24.44	29.10	23.60
14	**39.68**	33.62	39.18	32.14	39.56	31.64	39.20	31.00	38.94	29.90
15	57.82	50.60	56.80	47.34	57.02	45.28	55.40	43.74	**61.26**	49.26

* Cases of the location parameter arrangements are given on page 38

Table 5.127. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 16, $n_1 = 8$ and $n_2 = n_3 = n_4 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.78	5.00	4.90	5.10	4.84	4.38	4.78	4.66	4.88	4.80
2	23.24	22.36	22.54	19.26	23.30	18.16	**23.34**	18.28	21.94	17.56
3	21.82	20.92	21.46	18.02	**22.30**	17.00	21.88	17.00	21.86	17.80
4	19.86	19.52	19.28	17.34	**20.10**	16.00	19.72	15.66	17.18	14.96
5	33.62	31.76	32.46	25.94	34.58	25.72	35.88	27.22	**42.70**	32.86
6	39.34	37.58	38.66	30.28	40.40	30.12	40.64	30.32	**41.68**	32.46
7	**48.22**	46.48	47.18	39.54	48.04	37.16	46.58	36.02	39.66	32.88
8	86.36	84.72	85.82	74.80	86.32	72.90	**86.68**	72.88	82.46	71.02
9	84.96	82.80	83.82	70.54	**85.74**	70.38	85.46	70.44	87.04	74.68
10	21.62	20.70	21.38	18.06	**22.08**	17.36	21.26	16.98	21.34	17.30
11	63.30	60.50	61.70	48.82	63.92	47.34	64.02	47.64	**66.56**	52.28
12	27.44	26.84	27.56	22.86	28.16	21.94	28.42	22.12	**29.32**	23.54
13	38.58	36.72	38.02	30.54	38.72	29.50	38.64	29.88	**39.16**	31.30
14	19.66	19.46	19.14	16.90	20.22	16.12	20.30	16.32	**23.12**	19.04
15	47.28	45.84	46.58	35.68	49.02	36.00	50.04	37.02	**57.14**	44.28

* Cases of the location parameter arrangements are given on page 38

Table 5.128. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 16, $n_1 = 8$ and $n_2 = n_3 = n_4 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.66	4.86	4.46	5.14	4.52	4.80	4.62	4.78	4.90	4.64
2	**42.12**	40.40	41.78	34.70	42.04	32.36	41.28	31.32	39.74	31.36
3	39.72	37.50	38.62	30.84	**40.30**	29.96	38.82	29.24	38.74	30.72
4	**35.90**	35.50	35.38	30.02	35.24	27.58	34.12	26.52	30.00	24.36
5	54.96	51.76	53.74	40.00	57.18	40.36	59.04	42.36	**69.94**	53.54
6	65.54	62.56	65.14	51.14	66.20	49.50	64.88	48.56	**69.36**	54.60
7	**78.48**	76.32	77.12	66.24	77.78	63.66	76.28	60.94	67.70	56.38
8	**97.82**	97.24	97.80	92.82	97.80	91.16	97.62	90.26	97.36	91.64
9	98.16	97.60	98.10	92.82	98.10	91.72	97.78	90.70	**98.98**	95.34
10	**40.44**	38.56	39.86	31.96	41.08	30.48	39.22	29.62	39.82	31.28
11	89.66	87.72	89.36	77.30	90.14	75.28	88.92	74.56	**92.98**	82.08
12	47.64	45.64	47.16	37.24	48.24	35.68	48.24	35.52	**50.52**	38.76
13	67.86	65.34	67.40	54.26	68.06	51.96	67.52	51.44	**69.30**	55.68
14	35.56	34.24	34.66	26.70	36.78	26.18	37.08	26.86	**42.62**	31.40
15	73.92	71.10	73.26	58.10	75.32	57.74	75.42	58.74	**85.10**	69.92

* Cases of the location parameter arrangements are given on page 38

Table 5.129. Percentage of Rejection for $k = 4$; T-Distribution: Block = 16, $n_1 = 8$ and $n_2 = n_3 = n_4 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.96	5.22	5.04	5.50	4.94	4.98	4.88	5.18	4.94	5.18
2	18.22	17.78	17.98	14.96	**18.46**	13.92	18.36	14.16	17.68	14.56
3	18.06	17.72	17.94	16.22	**18.46**	15.16	18.06	14.96	17.38	15.12
4	15.36	15.70	15.42	14.16	**15.48**	13.56	15.44	13.38	14.04	12.64
5	27.00	25.88	26.54	21.84	27.76	20.78	28.54	21.42	**33.04**	26.08
6	28.30	27.22	27.62	22.80	28.90	21.58	29.00	21.66	**29.82**	22.84
7	35.66	34.66	34.92	29.74	**35.70**	27.60	34.82	27.14	28.88	24.24
8	**70.62**	68.40	69.30	58.40	70.06	55.88	69.92	56.06	65.72	53.96
9	69.40	67.26	68.60	55.54	70.80	54.96	70.56	54.44	**72.38**	59.10
10	17.08	16.68	16.90	14.82	**17.34**	14.12	16.84	13.84	17.18	14.34
11	49.88	47.96	49.00	38.16	50.56	37.32	50.68	37.82	**52.80**	41.54
12	20.78	20.30	20.56	17.38	20.74	16.54	20.72	16.78	**21.66**	18.08
13	30.34	29.64	29.58	24.80	30.80	24.10	**30.74**	24.74	30.62	25.08
14	15.60	15.00	14.54	13.12	15.58	12.84	16.08	13.20	**18.08**	14.42
15	36.12	34.32	35.00	26.82	36.88	26.88	37.54	27.74	**43.36**	32.84

* Cases of the location parameter arrangements are given on page 38

Table 5.130. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 16, $n_1 = n_3 = n_4 = 4$ and $n_2 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.02	5.12	4.74	5.28	5.00	5.08	5.06	5.16	4.84	5.00
2	**21.62**	21.18	21.10	18.36	21.60	17.60	21.48	18.52	20.04	16.08
3	**21.88**	21.10	21.52	17.90	21.74	17.82	21.06	18.18	20.98	16.72
4	**18.30**	18.00	18.02	15.80	17.94	15.16	17.78	15.62	15.80	13.02
5	33.66	32.10	32.88	25.86	35.10	27.56	36.18	29.66	**43.48**	32.78
6	36.92	35.12	36.34	28.42	37.34	28.46	37.04	29.36	**38.72**	28.82
7	**42.38**	40.66	41.54	32.38	41.70	32.02	40.86	33.08	33.86	25.74
8	80.20	77.24	79.26	63.36	80.58	65.36	**81.28**	68.16	74.76	57.48
9	83.24	80.64	82.26	68.86	84.00	70.62	83.56	71.80	**85.12**	71.44
10	**20.08**	19.46	19.88	16.70	19.78	16.54	19.42	16.48	19.52	15.96
11	63.06	60.04	61.94	48.62	63.62	50.32	63.64	52.30	**66.10**	51.68
12	24.44	23.18	24.18	19.30	24.80	19.16	24.74	20.16	**26.48**	19.66
13	36.50	34.64	35.58	28.38	37.08	29.18	**37.42**	30.48	36.92	28.18
14	20.42	19.70	19.68	16.34	20.64	16.64	20.82	18.14	**24.34**	18.02
15	47.72	45.28	46.86	36.06	48.90	37.52	49.52	40.34	**57.48**	43.42

* Cases of the location parameter arrangements are given on page 38

Table 5.131. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 16, $n_1 = n_3 = n_4 = 4$ and $n_2 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.06	4.96	5.04	5.14	4.94	4.78	4.98	4.94	5.18	4.72
2	**39.82**	38.06	39.58	31.26	39.36	30.54	38.42	31.38	37.14	26.80
3	39.90	38.06	39.30	31.08	**40.02**	31.10	38.80	31.18	38.36	28.64
4	**33.74**	32.18	33.36	26.76	32.64	25.30	31.68	25.50	26.90	20.14
5	56.78	53.70	55.14	41.66	59.50	45.46	60.50	50.00	**71.40**	54.46
6	66.34	63.92	65.26	53.00	66.64	53.26	65.52	53.58	**68.68**	53.44
7	**73.00**	70.40	72.26	59.00	72.00	57.32	70.44	57.24	60.86	46.16
8	95.96	94.72	96.04	86.84	**96.34**	87.60	96.16	88.92	95.54	84.08
9	98.14	97.34	98.26	91.76	98.00	92.00	97.46	91.76	99.10	93.90
10	40.40	39.10	39.98	31.16	**40.60**	31.06	39.10	31.08	39.00	29.68
11	88.80	86.76	88.94	75.72	89.38	76.58	88.28	77.18	**92.36**	78.80
12	45.32	43.22	44.54	35.06	45.90	35.30	45.52	36.30	**48.52**	35.50
13	64.18	61.60	63.88	49.50	64.72	50.16	64.34	52.24	**65.52**	49.12
14	34.92	33.62	34.16	27.32	35.92	28.34	36.44	30.04	**41.32**	30.94
15	73.94	70.92	73.34	58.16	75.70	60.82	75.74	63.60	**85.28**	68.90

* Cases of the location parameter arrangements are given on page 38

Table 5.132. Percentage of Rejection for $k = 4$; T-Distribution: Block = 16, $n_1 = n_3 = n_4 = 4$ and $n_2 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.38	5.30	5.26	5.40	5.32	5.02	5.60	5.22	5.06	4.98
2	16.72	16.34	16.28	13.78	**17.12**	13.68	17.04	14.22	15.94	12.50
3	17.56	17.28	16.86	15.24	17.14	14.82	16.58	14.82	**16.80**	14.42
4	**15.10**	14.68	14.48	12.86	14.88	12.50	14.36	12.62	12.70	10.54
5	25.92	25.14	25.02	20.84	26.96	21.66	27.98	23.22	**33.20**	25.46
6	27.86	27.04	27.74	22.44	28.14	21.90	28.04	22.60	**29.08**	21.96
7	33.26	31.76	**32.60**	26.52	32.48	26.24	31.82	26.34	26.36	21.70
8	65.06	62.54	64.02	49.60	65.28	50.48	**65.92**	52.42	58.72	44.04
9	68.90	65.62	68.06	54.06	69.10	54.70	67.60	56.04	**70.28**	55.08
10	18.36	17.92	18.22	15.76	**18.40**	15.46	18.00	15.72	17.46	14.72
11	46.90	44.70	45.84	35.92	47.80	37.12	47.90	38.46	**50.34**	38.04
12	20.36	19.70	19.80	16.62	**20.68**	16.58	20.08	17.24	20.64	16.54
13	26.82	25.74	26.24	21.84	27.18	21.64	**27.60**	23.04	27.48	21.20
14	16.92	16.24	16.48	14.16	16.98	13.94	17.64	14.76	**19.72**	15.50
15	36.68	35.44	36.28	28.74	38.18	29.82	38.44	31.72	**44.18**	33.38

* Cases of the location parameter arrangements are given on page 38

Table 5.133. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 16, $n_1 = n_2 = n_3 = 4$ and $n_4 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.60	4.70	4.58	4.96	4.72	4.26	4.72	4.44	4.72	4.74
2	23.32	22.36	22.42	18.98	**23.62**	18.00	23.28	18.06	21.94	17.26
3	22.46	22.18	21.90	18.72	**22.92**	17.90	22.06	17.52	21.72	16.86
4	19.66	19.14	19.00	16.68	**19.78**	15.76	**19.78**	15.94	16.70	13.26
5	42.08	41.08	40.64	36.00	40.92	32.72	40.36	31.76	**50.14**	39.16
6	41.44	39.96	40.26	33.26	41.24	31.36	40.36	30.78	**42.10**	31.72
7	43.64	41.64	42.68	33.84	**45.22**	33.82	44.70	34.32	34.92	26.34
8	**85.38**	83.62	84.22	73.66	85.08	71.42	85.30	71.44	80.18	66.14
9	87.84	86.12	87.22	76.98	88.04	74.56	86.98	73.10	**88.66**	75.80
10	22.54	21.88	21.68	19.00	**22.72**	18.08	22.14	17.52	21.82	17.18
11	69.42	67.38	68.58	56.42	68.92	53.58	67.70	52.56	**70.84**	54.96
12	27.54	26.78	27.02	23.38	27.22	21.78	26.82	21.56	**28.68**	22.04
13	**42.06**	40.58	41.18	34.24	41.64	32.44	41.80	32.58	41.68	32.10
14	22.78	22.32	22.24	20.08	22.44	18.60	22.04	18.60	**25.78**	20.98
15	56.26	55.06	55.22	47.92	54.84	44.32	53.62	42.40	**62.74**	50.82

* Cases of the location parameter arrangements are given on page 38

Table 5.134. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 16, $n_1 = n_2 = n_3 = 4$ and $n_4 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.74	4.94	5.02	5.44	4.72	4.88	4.62	5.04	4.94	4.92
2	42.40	41.10	42.20	34.72	**42.64**	33.66	41.88	33.16	39.04	29.98
3	40.08	38.16	39.38	31.34	**40.62**	30.86	39.66	30.28	38.12	27.88
4	34.88	33.38	34.24	27.34	35.20	26.72	**35.26**	26.88	28.26	21.90
5	69.58	68.32	68.54	60.22	67.16	55.60	66.38	53.70	**78.82**	66.18
6	68.34	66.02	68.12	56.12	67.88	52.82	65.86	51.24	**69.52**	53.48
7	71.58	68.74	70.70	58.04	**72.84**	56.92	72.44	56.28	60.64	46.14
8	97.58	96.86	**97.72**	92.00	97.32	89.46	96.68	88.04	97.10	88.18
9	98.56	97.82	98.62	93.88	98.26	91.62	97.34	89.30	**98.72**	93.26
10	38.10	36.40	36.92	29.94	**39.08**	29.70	38.22	29.48	35.52	27.00
11	91.86	90.86	92.28	83.40	91.04	78.96	89.32	76.14	**93.80**	82.76
12	51.66	50.50	51.56	43.18	51.20	40.44	50.04	39.28	**53.64**	41.48
13	69.92	68.04	69.70	60.10	69.24	56.38	67.74	54.76	**70.70**	56.88
14	40.42	39.16	39.70	34.00	39.02	31.24	38.38	30.52	**45.56**	36.24
15	82.96	81.52	82.70	73.56	81.56	69.20	79.54	66.76	**89.08**	77.44

* Cases of the location parameter arrangements are given on page 38

Table 5.135. Percentage of Rejection for $k = 4$; T-Distribution: Block = 16, $n_1 = n_2 = n_3 = 4$ and $n_4 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.94	4.92	4.72	5.32	4.86	4.78	4.60	4.78	5.06	4.80
2	**18.54**	17.94	17.90	15.80	18.32	14.90	18.18	14.84	17.12	13.90
3	17.76	16.96	17.24	14.74	**17.90**	14.30	17.58	13.88	16.90	13.56
4	16.36	15.88	15.96	14.10	**16.44**	13.88	16.30	13.74	13.98	11.96
5	30.56	30.02	29.64	26.12	29.78	24.02	29.16	23.26	**36.12**	29.00
6	31.22	30.06	30.56	25.40	30.56	24.22	30.10	24.06	**31.84**	24.38
7	33.62	32.22	32.74	26.88	33.82	26.10	**34.26**	25.90	26.80	20.50
8	71.00	69.30	70.58	59.46	70.96	56.80	**71.46**	56.80	66.54	52.24
9	72.62	71.22	71.96	61.48	72.50	58.60	71.36	56.84	**73.20**	58.58
10	19.08	18.40	18.24	15.74	**19.32**	15.10	18.92	15.04	18.24	14.34
11	54.76	52.70	53.30	44.76	54.02	42.00	52.90	40.68	**55.32**	42.86
12	22.44	22.08	21.74	19.96	22.24	18.36	22.18	18.50	**23.58**	18.58
13	**32.78**	31.82	32.74	26.48	32.46	24.86	32.36	24.80	32.62	24.60
14	17.94	17.96	17.84	16.36	18.02	14.98	17.98	15.14	**20.14**	16.52
15	42.00	41.38	41.62	35.72	41.64	32.94	40.50	32.00	**48.10**	37.36

* Cases of the location parameter arrangements are given on page 38

Table 5.136. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 32, $n_1 = 8$ and $n_2 = n_3 = n_4 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.20	5.00	4.94	5.06	4.98	5.04	5.08	5.06	4.96	4.36
2	30.22	**30.24**	30.20	25.02	29.78	24.64	29.46	23.88	28.18	24.14
3	29.66	**29.84**	29.36	24.98	30.28	24.32	29.10	23.46	29.22	24.98
4	26.00	**26.20**	25.58	22.46	26.18	21.76	25.94	21.30	21.58	18.54
5	46.74	47.70	45.32	36.38	48.44	36.50	50.36	38.26	**58.52**	48.50
6	51.98	52.48	51.20	42.80	53.02	42.42	52.68	41.96	**54.38**	45.68
7	**64.72**	65.04	64.26	54.84	64.36	53.40	62.72	51.10	53.60	45.78
8	96.42	**96.72**	96.00	90.32	96.28	89.36	96.38	88.80	93.84	88.06
9	96.24	96.48	95.60	89.44	96.44	89.20	95.76	88.18	**96.74**	91.86
10	30.32	30.38	30.08	25.08	**30.92**	24.88	29.72	24.02	29.84	25.08
11	80.88	81.64	79.78	68.34	81.60	68.58	81.98	68.10	**83.86**	74.20
12	35.66	35.84	35.08	29.42	36.50	29.44	36.20	29.62	**37.76**	32.32
13	51.46	52.04	51.32	42.64	51.84	41.98	52.42	42.72	**53.14**	45.46
14	26.26	26.50	25.64	21.72	27.12	21.52	27.12	21.38	**31.00**	25.54
15	64.44	65.54	63.64	52.16	66.02	52.94	67.00	53.42	**75.08**	64.56

* Cases of the location parameter arrangements are given on page 38

Table 5.137. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 32, $n_1 = 8$ and $n_2 = n_3 = n_4 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.86	4.76	4.96	4.92	4.82	4.64	4.86	4.60	4.76	4.76
2	56.48	57.26	56.56	47.24	**56.74**	45.22	55.56	43.02	53.34	45.00
3	53.08	53.84	52.04	43.28	**54.24**	43.06	52.54	41.02	51.66	43.22
4	49.58	**50.02**	49.26	41.38	49.24	39.72	47.74	37.96	40.78	35.22
5	75.56	76.74	74.44	61.10	77.36	62.30	79.14	64.10	**88.46**	78.50
6	83.78	84.40	83.58	72.64	84.12	71.40	83.26	69.40	**86.32**	77.60
7	90.12	**90.58**	89.50	82.20	90.02	80.68	88.88	78.34	82.44	74.18
8	99.80	99.80	99.74	98.92	99.72	98.62	99.74	98.36	**99.76**	99.12
9	99.80	99.84	99.78	99.04	99.80	98.78	99.76	98.28	**99.96**	99.64
10	55.40	56.00	53.82	44.72	**56.10**	44.94	54.40	42.96	52.64	44.76
11	97.74	97.92	97.68	92.86	97.76	91.60	97.42	90.54	**98.92**	96.06
12	64.14	64.90	63.84	53.58	64.66	52.14	63.54	50.98	**68.02**	58.38
13	84.04	85.02	84.28	73.70	84.32	71.58	83.80	70.14	**86.22**	76.86
14	46.76	47.58	45.80	37.04	48.08	36.90	49.12	36.84	**56.66**	46.40
15	90.10	90.96	89.92	79.56	90.96	79.50	90.86	79.56	**96.50**	91.30

* Cases of the location parameter arrangements are given on page 38

Table 5.138. Percentage of Rejection for $k = 4$; T-Distribution: Block = 32, $n_1 = 8$ and $n_2 = n_3 = n_4 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.58	5.44	5.82	5.64	5.46	5.28	5.44	5.32	5.40	5.40
2	23.14	23.28	23.34	20.08	**23.40**	19.36	23.00	19.32	21.82	19.02
3	23.94	**23.96**	23.52	20.34	**23.96**	20.28	23.36	19.52	23.24	20.02
4	**21.06**	20.66	20.84	18.50	20.86	17.84	20.62	17.42	17.48	16.14
5	35.32	36.04	35.04	29.04	36.66	29.52	37.60	29.92	**45.52**	37.74
6	41.08	41.20	40.62	33.86	41.26	32.86	41.06	32.10	**42.62**	35.92
7	48.76	**48.94**	47.52	40.98	48.38	39.84	47.84	38.84	40.24	34.32
8	85.90	**86.44**	85.34	76.20	85.72	74.74	85.96	74.12	81.96	72.96
9	86.28	86.94	85.46	75.84	86.84	75.28	86.50	73.56	88.04	79.96
10	23.68	23.78	23.36	19.94	**24.48**	19.86	23.72	19.26	23.68	19.80
11	65.84	66.72	64.28	53.92	66.48	53.32	66.06	53.26	**68.38**	58.60
12	26.90	26.92	26.50	22.30	27.08	21.76	26.70	21.58	**28.14**	23.68
13	42.72	42.76	41.66	35.34	42.94	34.22	43.20	34.02	**43.28**	36.56
14	21.04	21.02	20.42	17.36	21.16	17.26	20.88	17.44	**23.74**	20.46
15	51.62	52.08	50.60	41.02	52.86	41.70	53.50	42.10	**60.20**	50.76

* Cases of the location parameter arrangements are given on page 38

Table 5.139. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 32, $n_1 = n_3 = n_4 = 4$ and $n_2 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.10	4.94	5.04	5.28	5.00	5.20	4.94	4.82	5.00	4.76
2	29.38	29.58	28.76	24.56	**29.62**	25.58	29.56	25.84	27.56	22.46
3	29.36	29.46	28.74	23.48	**29.50**	24.82	28.06	24.26	28.28	22.74
4	**24.38**	24.48	24.06	20.72	24.32	21.44	24.04	20.94	20.78	17.32
5	46.26	46.84	45.40	36.06	47.82	39.86	48.86	42.20	**59.12**	47.26
6	51.56	52.38	51.16	41.62	52.26	44.14	51.78	44.68	**53.68**	43.26
7	59.68	**60.74**	58.84	48.12	59.38	49.06	57.52	49.20	47.34	37.92
8	94.18	**94.98**	93.42	84.88	94.62	87.34	94.84	88.94	91.20	80.56
9	95.58	96.10	95.14	87.90	95.86	90.00	95.70	90.64	**96.20**	89.68
10	30.14	**30.22**	29.76	24.50	29.86	25.36	28.46	24.64	28.44	23.10
11	79.68	80.92	78.96	67.06	80.58	70.64	80.62	71.64	**82.54**	70.76
12	34.66	35.06	34.12	28.58	35.16	29.80	35.04	30.28	**36.56**	29.66
13	50.78	51.34	50.04	41.10	51.42	43.42	**52.08**	44.46	52.02	41.44
14	26.74	27.06	26.68	22.26	27.78	23.82	27.80	24.30	**31.74**	25.86
15	64.62	65.60	63.56	52.84	66.28	56.84	66.72	58.44	**74.32**	62.82

* Cases of the location parameter arrangements are given on page 38

Table 5.140. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 32, $n_1 = n_3 = n_4 = 4$ and $n_2 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.96	4.92	4.82	5.26	5.14	5.36	5.14	5.44	4.98	5.02
2	53.60	**54.10**	53.28	42.86	53.38	44.90	52.18	44.62	50.36	39.42
3	54.12	**54.80**	52.92	44.38	54.20	46.30	52.56	45.66	52.52	43.00
4	46.90	**47.52**	46.18	37.92	46.34	39.12	44.70	38.34	37.80	30.12
5	76.04	76.98	74.62	60.86	78.16	67.46	78.92	70.88	**89.10**	77.54
6	82.98	83.86	82.82	71.56	83.30	73.68	81.58	73.42	**86.56**	74.46
7	87.42	**88.08**	87.24	77.60	87.18	78.76	85.56	78.32	78.12	67.32
8	99.60	**99.70**	99.58	97.72	99.66	98.24	99.56	98.36	99.46	97.10
9	99.94	99.94	99.94	99.14	99.90	99.38	99.84	99.20	99.98	99.40
10	54.54	55.18	53.36	43.54	**54.56**	45.44	52.76	44.84	53.14	42.78
11	97.82	98.04	97.70	92.62	98.00	93.80	97.60	93.74	**99.04**	95.50
12	63.42	64.48	62.82	51.82	63.64	54.34	62.96	54.98	**67.40**	54.88
13	81.40	82.56	81.26	69.20	81.92	71.98	81.50	73.00	**84.14**	71.66
14	48.48	49.12	47.80	38.36	49.82	41.98	49.76	43.28	**58.04**	46.44
15	90.78	91.52	90.28	79.88	91.68	83.16	91.44	84.56	**97.06**	90.52

* Cases of the location parameter arrangements are given on page 38

Table 5.141. Percentage of Rejection for $k = 4$; T-Distribution: Block = 32, $n_1 = n_3 = n_4 = 4$ and $n_2 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.18	5.04	4.96	5.20	5.14	5.32	5.40	5.18	5.18	5.10
2	21.90	21.86	21.68	18.68	22.14	19.48	**22.32**	19.28	20.66	16.74
3	22.46	22.62	22.34	19.84	**22.96**	20.18	22.06	19.68	22.76	18.94
4	19.02	18.90	18.86	16.26	**19.04**	16.82	18.42	16.74	15.62	13.56
5	36.32	36.60	35.72	29.68	37.32	32.12	38.24	33.40	**45.38**	36.62
6	38.54	38.84	37.92	30.82	39.04	32.98	38.62	33.40	**40.80**	32.68
7	47.44	**47.88**	46.82	38.86	46.96	39.86	45.68	39.54	37.90	31.20
8	82.02	**82.70**	81.36	69.88	82.24	72.54	82.32	74.22	77.04	64.06
9	85.22	86.00	84.54	73.48	85.62	76.56	84.80	77.14	**86.68**	75.70
10	23.30	23.28	23.28	20.20	**23.58**	20.42	22.64	20.06	22.34	18.92
11	64.12	65.00	62.98	51.68	65.06	54.94	64.34	55.96	**66.98**	54.92
12	24.54	24.72	24.22	20.38	24.72	21.36	24.92	21.56	**26.26**	21.16
13	38.22	38.56	37.62	31.18	38.82	33.54	39.02	34.08	**39.56**	31.90
14	21.38	21.38	21.20	18.10	21.92	19.52	22.00	19.94	**24.50**	19.60
15	49.06	49.92	48.02	38.90	50.12	41.96	50.76	43.66	**58.48**	46.52

* Cases of the location parameter arrangements are given on page 38

Table 5.142. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 32, $n_1 = n_2 = n_3 = 4$ and $n_4 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.76	4.54	4.76	4.88	4.62	4.68	4.46	4.66	4.64	4.88
2	29.90	29.88	29.64	24.58	**30.02**	23.84	29.68	23.58	27.76	22.94
3	30.90	31.16	30.52	25.44	**31.32**	25.36	30.12	24.36	29.32	23.84
4	25.26	25.12	24.76	21.30	**25.68**	21.16	25.08	21.02	21.32	18.02
5	56.92	57.52	56.16	48.50	56.14	45.94	55.30	44.72	**66.82**	55.68
6	55.42	56.02	54.64	46.36	55.32	45.62	54.28	43.90	**56.32**	44.86
7	61.04	**62.00**	59.92	48.94	62.14	48.86	61.22	48.44	50.02	38.82
8	96.20	**96.50**	95.54	89.80	96.14	88.46	96.00	88.04	93.72	84.40
9	96.86	97.28	96.68	91.88	97.06	90.94	96.54	89.50	**97.36**	91.28
10	**29.38**	29.34	28.20	23.62	29.36	23.28	28.26	22.66	27.36	22.48
11	84.20	84.88	83.38	73.78	83.76	72.16	82.52	70.68	**85.36**	73.84
12	37.80	37.68	36.90	31.60	37.64	30.14	37.04	29.58	**39.26**	31.84
13	55.68	55.64	54.42	47.12	55.24	45.76	54.82	44.72	**55.70**	45.20
14	30.68	30.70	30.48	26.46	30.38	24.96	29.84	24.16	**34.88**	28.84
15	73.84	74.50	73.02	64.28	73.24	61.88	72.32	60.34	**80.50**	68.72

* Cases of the location parameter arrangements are given on page 38

Table 5.143. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 32, $n_1 = n_2 = n_3 = 4$ and $n_4 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.98	4.72	4.92	5.14	5.10	4.70	5.00	4.86	4.94	5.14
2	57.78	**58.40**	57.20	48.34	58.00	46.72	56.72	45.82	53.76	43.18
3	54.64	**55.24**	53.50	44.18	55.22	43.80	53.46	42.04	51.98	40.30
4	46.56	47.36	46.66	38.14	**47.60**	38.06	46.60	37.68	37.82	30.08
5	84.94	85.02	83.70	76.50	83.30	73.20	82.38	70.84	**91.94**	83.34
6	84.96	85.76	84.70	75.46	84.42	72.80	82.60	70.16	**86.26**	73.56
7	86.76	**87.56**	86.48	75.78	87.22	75.42	86.72	73.96	77.26	63.58
8	99.78	**99.86**	99.84	98.78	99.76	98.18	99.72	97.52	99.76	97.66
9	99.86	99.90	99.88	99.36	99.84	98.72	99.76	97.86	**99.98**	99.16
10	55.14	56.08	54.18	45.36	**56.06**	44.92	53.96	43.14	52.40	41.60
11	98.44	98.72	98.32	95.36	98.28	93.56	97.58	91.02	**98.90**	95.32
12	67.90	68.40	67.96	57.98	67.56	55.32	65.54	53.06	**70.04**	57.78
13	86.30	86.78	86.00	77.36	85.28	74.76	84.46	72.36	**86.90**	75.52
14	55.02	55.38	54.08	46.88	54.16	44.40	53.20	43.60	**62.52**	50.92
15	94.64	94.96	94.34	88.64	93.58	85.52	92.54	82.52	**97.66**	91.80

* Cases of the location parameter arrangements are given on page 38

Table 5.144. Percentage of Rejection for $k = 4$; T-Distribution: Block = 32, $n_1 = n_2 = n_3 = 4$ and $n_4 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.20	4.92	4.92	5.10	5.04	5.20	5.08	5.36	4.92	5.12
2	22.72	23.06	22.78	19.72	23.08	19.12	**23.20**	19.06	21.56	17.90
3	**23.76**	23.60	23.02	19.90	**23.76**	19.46	22.66	18.62	22.58	18.42
4	18.98	18.96	18.62	15.82	**19.50**	15.74	18.62	15.78	15.96	13.56
5	42.82	42.98	42.08	36.16	42.10	34.62	41.70	33.78	**50.62**	40.86
6	40.30	40.78	39.92	34.44	40.68	33.08	39.52	32.12	41.76	33.12
7	47.80	48.42	46.92	38.46	**48.68**	37.58	47.74	36.82	39.08	30.20
8	**86.30**	87.12	85.70	76.10	86.28	74.74	86.00	74.10	81.86	69.94
9	88.10	88.86	87.44	78.38	87.94	77.20	87.00	75.20	**88.58**	77.32
10	23.12	23.14	22.68	19.16	**23.26**	18.94	22.36	18.34	21.98	17.74
11	69.50	70.24	68.34	58.48	69.16	56.68	67.58	55.04	**71.54**	58.62
12	28.80	28.68	28.46	24.92	28.86	24.32	28.36	23.82	**29.60**	24.50
13	42.46	**42.66**	41.00	34.74	41.94	33.78	42.00	33.24	42.46	34.28
14	23.36	23.38	23.16	19.48	23.32	18.44	22.88	18.00	**26.12**	21.04
15	56.58	57.32	56.04	48.46	55.70	45.86	54.76	44.12	**63.96**	53.02

* Cases of the location parameter arrangements are given on page 38

Table 5.145. Percentage of Rejection for $k = 5$; Normal Distribution: Block = 16, $n_1 = 8$ and $n_2 = n_3 = n_4 = n_5 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.96	5.20	5.04	4.98	5.04	4.80	5.00	4.94	4.94	4.60
2	36.06	**36.74**	35.42	28.14	36.22	27.20	35.66	26.96	32.80	26.74
3	30.00	30.70	29.36	24.10	30.24	23.58	30.80	23.42	**32.82**	26.44
4	31.96	32.78	31.88	24.60	33.06	24.64	34.94	26.40	**42.04**	33.70
5	24.36	**24.98**	23.94	19.88	24.40	19.24	24.02	18.76	23.10	19.06
6	28.84	**29.42**	28.02	22.60	29.26	22.32	28.46	22.00	29.10	23.52
7	41.12	**41.88**	41.32	33.08	41.58	31.56	41.24	31.20	36.18	29.10
8	43.92	44.78	43.12	32.38	45.22	32.64	45.32	32.86	**51.04**	40.48
9	36.00	37.06	35.44	27.50	36.52	26.98	35.86	26.98	**39.36**	31.34
10	45.76	46.60	45.50	35.72	46.56	35.00	46.04	34.58	**46.62**	37.48
11	20.78	21.52	20.46	16.78	21.46	16.30	21.84	16.50	**24.72**	19.40
12	60.54	61.30	59.62	45.24	62.12	45.78	63.48	47.00	**72.62**	59.08
13	68.60	**69.28**	67.36	54.08	68.78	53.04	67.64	52.00	68.06	55.92
14	39.72	**40.70**	39.20	32.08	40.16	31.40	38.82	30.50	33.24	27.26
15	42.94	**44.04**	42.68	34.00	43.34	33.32	41.82	32.74	40.18	32.62

* Cases of the location parameter arrangements are given on page 38

Table 5.146. Percentage of Rejection for $k = 5$; Exponential Distribution: Block = 16, $n_1 = 8$ and $n_2 = n_3 = n_4 = n_5 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.80	4.88	4.76	4.96	4.74	4.78	4.62	4.80	4.62	4.70
2	62.70	**63.68**	62.74	50.90	62.62	48.84	61.76	47.62	59.16	47.86
3	53.84	54.62	53.22	41.06	54.24	39.46	53.96	39.20	**58.32**	45.48
4	53.14	54.22	51.72	38.02	54.62	39.10	57.24	41.18	**70.16**	55.78
5	44.62	**45.44**	44.22	35.12	45.22	34.34	43.36	32.90	41.72	32.84
6	50.86	51.60	50.18	38.82	**51.64**	38.14	50.12	37.46	51.58	40.80
7	71.34	**71.78**	71.06	58.36	70.80	55.82	69.80	54.36	65.14	54.08
8	72.90	73.68	72.60	56.98	74.18	56.18	73.62	55.98	**83.84**	69.62
9	62.64	63.60	61.50	47.34	63.80	47.42	62.44	47.12	**67.36**	54.48
10	76.68	77.24	76.38	62.42	76.76	60.78	75.79	59.64	**77.78**	65.58
11	36.88	37.78	36.72	27.54	37.90	27.50	38.52	28.04	**45.78**	34.54
12	85.98	86.54	86.12	70.96	86.64	69.84	87.02	70.60	**95.06**	86.36
13	93.08	**93.42**	92.44	81.72	93.24	80.70	92.34	79.06	**93.42**	84.44
14	71.58	**72.28**	71.10	58.78	71.38	56.48	69.50	54.40	60.58	50.42
15	73.44	**74.16**	73.32	60.06	73.46	58.40	71.36	55.92	68.94	57.48

* Cases of the location parameter arrangements are given on page 38

Table 5.147. Percentage of Rejection for $k = 5$; T-Distribution: Block = 16, $n_1 = 8$ and $n_2 = n_3 = n_4 = n_5 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.06	5.14	5.12	5.14	4.94	5.10	5.26	5.20	4.92	5.16
2	27.32	**28.16**	27.18	22.74	27.66	21.46	27.48	21.68	25.92	21.26
3	23.44	24.08	23.40	18.76	23.84	18.34	23.58	18.46	**25.54**	20.32
4	25.04	25.44	24.94	19.48	25.60	19.44	26.42	20.64	**32.66**	25.46
5	19.14	**19.72**	18.88	16.34	19.22	15.50	18.88	15.28	18.94	15.84
6	21.44	**22.14**	21.62	18.26	21.82	17.54	21.64	17.34	**22.14**	18.38
7	31.88	**32.46**	31.60	25.92	31.76	24.52	31.54	24.50	27.76	23.60
8	32.70	33.56	32.44	25.20	33.56	24.92	34.24	25.52	**40.38**	32.26
9	27.38	28.08	26.96	21.64	27.82	21.46	27.30	21.50	**29.54**	24.46
10	35.02	**35.82**	34.34	27.52	35.58	27.30	35.12	27.02	34.46	29.08
11	17.58	18.30	17.28	14.06	17.98	14.02	18.18	14.44	**20.06**	16.60
12	45.82	46.68	44.76	34.60	46.72	34.56	47.80	35.72	**56.20**	44.54
13	53.08	53.76	52.42	41.80	53.72	41.14	52.16	40.42	**53.96**	43.68
14	31.28	**32.20**	30.98	25.16	31.76	24.68	30.50	24.00	26.52	21.60
15	32.82	**33.38**	32.00	25.72	33.08	25.34	32.32	24.30	29.56	23.76

* Cases of the location parameter arrangements are given on page 38

Table 5.148. Percentage of Rejection for $k = 5$; Normal Distribution: Block = 16, $n_1 = n_2 = n_4 = n_5 = 4$ and $n_3 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.42	4.40	4.46	4.28	4.34	4.66	4.32	4.60	4.60	4.84
2	33.52	33.34	32.82	23.40	**34.16**	25.98	33.82	26.36	30.44	23.08
3	27.70	27.56	28.02	20.40	28.54	22.28	28.46	22.88	**31.24**	24.34
4	31.22	31.08	30.74	21.98	32.50	24.60	33.60	25.84	**41.80**	32.06
5	22.26	22.16	22.28	16.90	**22.40**	18.18	21.96	17.90	21.50	16.84
6	27.96	27.90	27.64	20.38	**28.34**	22.52	27.42	21.98	27.80	21.60
7	37.66	37.56	37.18	27.20	38.34	29.52	**38.38**	30.10	32.82	25.06
8	43.34	43.22	43.02	31.20	44.46	34.10	44.14	35.26	**51.46**	40.42
9	36.40	36.24	35.82	25.86	36.36	27.86	35.58	27.92	**39.82**	30.42
10	45.00	44.90	44.24	32.56	**45.68**	35.56	45.00	36.00	43.68	33.06
11	19.80	19.74	19.36	15.24	20.52	16.96	20.58	17.54	**24.66**	19.68
12	60.68	60.56	60.16	44.94	61.54	48.58	62.02	49.86	**72.08**	58.32
13	66.40	66.28	64.98	48.38	**66.48**	51.92	65.12	52.22	66.22	52.08
14	38.52	38.34	38.16	28.10	**38.82**	30.12	37.38	30.02	30.40	23.46
15	40.04	39.94	39.34	29.36	**40.56**	31.30	39.12	31.18	37.02	28.26

* Cases of the location parameter arrangements are given on page 38

Table 5.149. Percentage of Rejection for $k = 5$; Exponential Distribution: Block = 16, $n_1 = n_2 = n_4 = n_5 = 4$ and $n_3 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.04	5.02	5.42	4.66	5.34	5.24	5.50	5.34	5.38	5.10
2	60.80	60.72	60.92	45.52	**61.24**	48.02	59.18	47.74	55.88	42.50
3	50.62	50.54	51.06	36.46	50.94	39.64	50.22	40.32	**56.40**	42.10
4	52.40	52.28	51.06	36.62	54.00	41.96	56.02	44.96	**69.84**	54.06
5	43.62	43.54	43.36	32.28	**43.72**	34.14	42.02	33.44	39.60	30.16
6	48.64	48.52	47.76	35.50	49.08	38.08	47.42	38.30	**49.14**	37.20
7	66.74	66.68	66.60	51.06	**67.04**	53.60	65.42	52.82	60.08	45.40
8	73.22	73.18	72.52	54.34	73.04	57.64	71.78	58.06	**83.28**	68.64
9	61.18	61.00	60.74	45.54	61.62	48.42	59.74	48.52	**66.78**	53.06
10	74.76	74.72	74.60	57.80	**74.90**	60.68	73.80	61.08	73.88	58.36
11	36.44	36.38	35.50	24.84	37.40	28.22	37.46	29.54	**44.94**	33.72
12	86.88	86.84	86.62	69.58	87.02	73.14	86.62	74.00	**95.36**	85.18
13	91.22	91.20	90.46	76.82	90.72	78.94	88.68	77.68	**92.38**	81.62
14	**67.22**	67.10	66.38	51.44	67.16	53.86	65.04	53.24	56.42	43.12
15	69.00	68.94	**69.62**	53.22	69.12	55.16	66.50	54.14	64.44	49.74

* Cases of the location parameter arrangements are given on page 38

Table 5.150. Percentage of Rejection for $k = 5$; T-Distribution: Block = 16, $n_1 = n_2 = n_4 = n_5 = 4$ and $n_3 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.74	4.72	5.12	4.84	5.04	5.44	4.94	5.04	4.86	5.32
2	25.46	25.40	25.34	19.02	**26.22**	21.02	25.96	21.50	23.62	19.46
3	22.20	22.10	21.92	16.82	22.80	18.38	22.38	18.64	**24.02**	18.96
4	23.54	23.44	23.26	17.60	24.30	20.04	25.06	20.94	**31.50**	24.00
5	18.00	17.88	18.56	14.64	**18.62**	15.82	18.46	15.60	17.32	13.92
6	20.34	20.20	19.90	16.08	20.50	17.20	20.64	17.44	**20.80**	17.28
7	28.32	28.22	28.34	21.52	29.04	23.46	**28.98**	23.84	25.86	20.80
8	32.58	32.42	32.20	23.96	32.88	26.90	32.72	27.12	**39.56**	31.06
9	26.56	26.48	26.46	20.24	27.04	21.64	26.24	21.48	**29.22**	23.46
10	35.04	34.82	34.34	24.86	**35.56**	27.50	35.06	27.72	34.44	26.22
11	16.84	16.70	17.20	13.20	17.60	15.02	17.58	15.40	**19.14**	15.90
12	46.50	46.32	45.76	33.20	47.26	36.74	47.28	37.80	**57.30**	44.02
13	49.54	49.44	49.02	35.74	49.92	38.76	48.06	38.20	**50.80**	39.18
14	29.02	28.92	28.24	21.30	**29.58**	23.28	28.76	23.28	23.44	18.70
15	**29.24**	29.12	28.48	22.48	29.50	24.20	28.74	23.84	27.32	21.24

* Cases of the location parameter arrangements are given on page 38

Table 5.151. Percentage of Rejection for $k = 5$; Normal Distribution: Block = 16, $n_1 = n_2 = n_3 = n_4 = 4$ and $n_5 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.92	5.04	4.84	4.96	4.72	4.68	4.68	4.72	5.54	5.12
2	36.92	**37.74**	36.36	29.18	37.14	28.40	36.82	28.20	33.54	25.68
3	33.42	34.24	33.16	27.52	32.72	26.20	32.48	25.06	**35.78**	27.80
4	40.10	40.98	39.76	35.36	39.14	32.76	39.04	32.72	**50.10**	40.94
5	23.98	**24.54**	23.84	18.70	24.20	18.50	23.54	18.22	22.04	17.52
6	29.26	**30.16**	28.90	23.52	29.42	23.32	28.74	22.50	29.26	22.88
7	40.70	**41.38**	40.16	31.94	40.78	31.10	40.30	31.46	35.44	27.34
8	51.14	51.96	50.32	41.98	51.04	40.00	49.70	38.68	**57.18**	45.76
9	37.18	38.06	36.76	29.30	37.86	28.48	36.66	27.52	**39.10**	29.40
10	**50.28**	51.12	49.44	40.40	50.18	39.06	49.32	38.00	49.08	37.58
11	24.08	24.76	24.20	20.88	23.58	19.92	23.28	19.44	**27.16**	22.26
12	70.46	71.24	69.74	60.18	69.32	56.72	68.20	54.92	**79.52**	66.50
13	**68.74**	69.72	67.92	54.90	69.58	54.36	67.50	52.50	68.40	52.40
14	39.02	**39.66**	38.24	31.12	39.58	30.52	38.96	30.40	32.22	24.68
15	40.88	**41.84**	39.88	31.24	41.50	31.06	40.76	30.20	37.10	27.42

* Cases of the location parameter arrangements are given on page 38

Table 5.152. Percentage of Rejection for k = 5; Exponential Distribution: Block = 16, $n_1 = n_2 = n_3 = n_4 = 4$ and $n_5 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.14	5.36	5.32	5.54	5.22	5.26	5.36	5.38	4.54	4.96
2	64.38	**65.26**	64.04	52.84	64.48	50.26	62.88	49.12	59.16	45.14
3	59.70	60.32	59.40	48.62	58.32	46.22	56.94	44.86	**63.72**	50.28
4	67.70	68.58	65.70	58.56	65.88	54.74	65.36	54.02	**79.36**	67.58
5	44.66	45.44	44.36	35.00	**45.52**	34.36	43.82	33.70	41.50	30.56
6	52.48	**53.18**	51.84	42.60	52.90	40.90	51.26	39.36	52.44	40.10
7	69.44	**70.40**	69.14	55.96	69.42	53.84	68.36	53.10	62.30	48.26
8	80.70	81.40	81.10	70.68	79.72	66.28	77.54	63.32	**87.86**	74.70
9	65.82	66.66	64.80	52.60	66.00	51.68	64.26	49.18	**68.72**	53.16
10	79.74	**80.44**	79.58	67.62	78.88	64.36	77.32	62.62	79.90	64.06
11	43.44	44.38	43.42	36.10	42.62	34.24	41.58	33.16	**50.80**	39.20
12	93.16	93.46	93.22	86.38	91.94	82.64	90.44	79.90	**97.40**	90.62
13	92.20	92.68	91.88	81.94	92.46	80.86	90.92	78.60	**92.90**	80.32
14	67.22	68.20	66.62	53.78	**68.48**	52.30	66.88	50.64	57.34	42.50
15	70.78	**71.46**	69.98	57.04	71.00	55.02	69.54	53.44	65.74	50.84

* Cases of the location parameter arrangements are given on page 38

Table 5.153. Percentage of Rejection for k = 5; T-Distribution: Block = 16, $n_1 = n_2 = n_3 = n_4 = 4$ and $n_5 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.72	6.08	5.68	5.60	5.72	5.56	5.86	5.62	5.86	5.72
2	27.62	**28.34**	27.48	22.52	27.84	21.78	27.50	21.60	25.74	20.26
3	25.10	25.82	24.68	20.84	25.22	19.88	24.70	19.66	**26.22**	20.86
4	31.24	31.88	30.88	27.00	30.52	25.20	30.54	24.60	**37.22**	30.78
5	19.10	**19.54**	18.98	15.82	18.98	14.92	18.44	14.70	17.98	14.78
6	21.44	**22.02**	21.06	18.08	21.94	17.48	21.36	17.20	21.26	17.08
7	31.16	**31.98**	30.78	25.04	31.48	24.46	31.26	24.62	26.86	21.22
8	39.04	39.76	38.12	31.50	37.92	30.04	37.30	29.50	**43.44**	33.58
9	28.48	29.16	27.82	23.22	28.56	22.24	27.82	21.60	**29.90**	23.46
10	38.62	**39.44**	38.30	31.62	38.46	29.80	38.00	29.22	38.56	29.72
11	20.16	20.86	20.02	17.86	19.58	16.02	19.28	15.80	**22.50**	18.46
12	54.92	55.80	54.14	46.36	53.86	43.22	52.80	41.66	**62.96**	51.30
13	53.70	**54.66**	52.64	42.74	54.14	41.80	53.08	40.80	52.68	40.42
14	29.50	**30.20**	28.80	23.24	29.86	22.30	29.42	22.30	24.46	18.76
15	30.06	**30.76**	29.40	23.40	30.12	22.68	29.52	22.56	27.84	21.34

* Cases of the location parameter arrangements are given on page 38

Table 5.154. Percentage of Rejection for k = 5; Normal Distribution: Block = 32, n_1 = 8 and $n_2 = n_3 = n_4 = n_5 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.04	4.86	5.00	4.96	5.04	5.14	4.82	5.04	4.46	4.94
2	49.62	**53.48**	48.72	40.44	49.72	40.16	49.44	38.72	44.62	38.54
3	38.92	42.14	37.74	31.28	39.30	31.92	39.22	30.86	**42.96**	36.64
4	44.52	49.30	43.90	34.54	45.36	35.90	47.20	37.04	**58.26**	49.30
5	32.40	**34.90**	32.12	25.50	32.92	25.90	31.30	24.78	30.94	26.42
6	38.44	**41.12**	37.62	30.52	39.30	30.54	37.96	29.20	38.54	32.24
7	54.36	**58.16**	53.70	45.28	54.62	44.86	53.52	43.56	47.20	41.00
8	61.86	65.90	60.92	49.36	62.86	50.40	62.66	50.32	**70.44**	61.36
9	50.18	**54.24**	49.06	39.62	51.34	40.44	50.02	38.94	53.60	46.08
10	62.96	**67.54**	61.62	51.08	63.58	51.16	62.66	49.66	62.28	53.60
11	29.58	32.48	28.56	23.20	30.14	23.68	30.70	23.60	**35.56**	30.34
12	78.38	83.42	77.56	65.74	79.94	66.40	80.68	66.48	**87.92**	80.54
13	84.30	**88.06**	83.32	73.80	85.06	74.38	84.44	72.24	85.06	77.24
14	54.56	**58.44**	53.08	45.04	54.72	44.58	53.56	42.30	44.28	38.16
15	57.92	**61.82**	56.94	47.32	58.04	47.38	56.42	44.80	53.16	45.96

* Cases of the location parameter arrangements are given on page 38

Table 5.155. Percentage of Rejection for k = 5; Exponential Distribution: Block = 32, n_1 = 8 and $n_2 = n_3 = n_4 = n_5 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.74	4.70	4.70	4.96	4.50	5.06	4.52	4.82	4.74	4.60
2	82.38	**85.42**	81.78	72.26	82.30	71.20	81.14	68.60	78.42	70.70
3	71.82	76.60	71.44	59.80	72.24	59.22	71.94	57.62	**78.04**	68.20
4	71.82	76.80	70.40	57.00	73.34	58.36	75.18	59.72	**87.46**	78.86
5	59.88	**63.78**	59.08	48.94	60.42	48.66	59.00	45.72	56.68	48.32
6	68.06	**72.42**	67.22	56.04	68.64	56.02	67.34	53.78	69.08	59.56
7	86.96	**89.88**	86.92	78.38	86.92	77.06	85.94	74.82	82.40	74.52
8	90.30	93.06	90.12	79.98	90.68	79.14	90.40	77.82	**95.74**	90.92
9	82.46	85.84	81.64	69.14	83.22	70.06	81.36	67.82	**86.48**	78.52
10	91.44	**93.94**	91.24	82.32	91.60	81.58	90.88	79.44	92.76	86.40
11	52.70	57.64	52.04	41.30	53.66	41.84	53.86	41.74	**64.26**	53.86
12	97.36	98.34	97.32	91.54	97.50	91.04	97.56	90.60	**99.70**	98.60
13	98.82	**99.28**	98.62	95.50	98.84	95.30	98.54	94.02	98.84	97.00
14	87.04	**89.34**	86.46	77.90	87.08	76.48	85.20	73.42	78.52	70.56
15	87.88	**90.66**	87.68	78.20	88.00	77.22	86.22	74.72	84.82	77.14

* Cases of the location parameter arrangements are given on page 38

Table 5.156. Percentage of Rejection for $k = 5$; T-Distribution: Block = 32, $n_1 = 8$ and $n_2 = n_3 = n_4 = n_5 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.22	5.32	5.14	5.06	5.08	4.94	5.18	4.84	5.18	5.02
2	37.50	**40.44**	36.86	30.14	37.54	30.42	36.74	29.50	33.66	29.14
3	30.96	33.94	30.54	24.84	31.30	25.50	31.46	25.04	**34.16**	29.02
4	33.02	36.02	32.50	26.34	33.88	26.78	35.42	27.44	**43.82**	37.26
5	25.06	**26.96**	25.02	20.84	25.42	21.30	24.58	20.18	24.50	21.32
6	30.00	**31.72**	29.06	24.40	29.86	24.78	29.56	23.62	29.72	25.82
7	43.32	**46.88**	41.90	34.90	43.32	34.86	42.76	33.68	38.30	33.10
8	45.64	49.92	44.62	35.78	46.52	36.34	46.78	35.80	**54.12**	45.78
9	37.10	39.92	36.28	29.86	37.68	30.82	36.64	29.56	**40.28**	34.48
10	48.56	**52.50**	47.20	38.68	48.86	39.18	48.84	38.44	48.10	41.26
11	22.50	24.14	22.30	18.28	22.58	18.88	22.58	18.68	**26.48**	22.58
12	63.34	68.06	62.28	50.82	64.52	52.64	65.18	52.16	**75.00**	66.16
13	70.28	**74.68**	69.52	57.70	71.14	58.70	69.92	56.82	70.22	61.78
14	42.82	**45.72**	42.38	34.94	43.36	35.14	42.08	33.72	35.14	30.66
15	43.62	**47.32**	42.74	34.84	44.18	35.04	43.16	33.18	40.02	34.18

* Cases of the location parameter arrangements are given on page 38

Table 5.157. Percentage of Rejection for $k = 5$; Normal Distribution: Block = 32, $n_1 = n_2 = n_4 = n_5 = 4$ and $n_3 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.38	4.46	4.46	4.62	4.54	4.54	4.54	4.66	4.86	4.96
2	46.24	**50.24**	45.32	37.20	46.56	39.12	46.24	40.18	42.44	34.52
3	39.52	43.56	39.34	31.44	39.80	33.36	39.08	34.16	**44.14**	35.68
4	44.18	48.46	43.48	35.24	45.02	37.96	46.48	40.84	**57.92**	48.16
5	32.30	**35.42**	31.32	25.58	31.78	26.96	30.92	26.98	29.34	24.62
6	36.76	**40.14**	35.98	29.22	36.84	30.74	35.70	30.76	37.30	30.82
7	51.28	**55.98**	49.96	40.44	51.52	43.44	51.10	44.60	44.68	35.70
8	60.94	65.68	59.14	49.28	60.96	51.50	60.24	52.72	**69.24**	57.94
9	49.54	**53.72**	48.76	40.26	49.48	41.76	47.88	42.00	53.56	44.56
10	60.40	**65.06**	59.22	48.86	61.16	51.26	60.66	53.44	59.56	48.72
11	28.02	30.10	27.48	21.88	28.64	23.42	28.72	24.72	**34.28**	27.92
12	78.02	82.68	77.08	65.18	79.02	68.60	79.36	70.60	**88.58**	79.62
13	83.88	**87.66**	83.14	71.94	84.14	74.34	82.48	74.94	84.14	74.24
14	51.76	**56.14**	51.16	41.30	52.14	43.00	50.94	43.48	41.34	33.32
15	55.00	**60.04**	54.34	44.44	55.16	46.48	53.82	46.80	49.90	40.40

* Cases of the location parameter arrangements are given on page 38

Table 5.158. Percentage of Rejection for $k = 5$; Exponential Distribution: Block = 32, $n_1 = n_2 = n_4 = n_5 = 4$ and $n_3 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.14	5.22	5.24	5.08	5.32	5.40	5.42	5.44	5.32	5.02
2	78.04	**82.44**	78.24	66.44	77.74	67.62	75.80	68.66	74.02	61.92
3	71.12	75.82	70.80	58.96	71.54	60.74	70.02	61.52	**76.80**	64.72
4	70.70	76.06	69.54	56.50	72.24	61.74	74.42	65.92	**88.00**	77.28
5	59.12	**63.60**	58.08	48.02	58.66	48.92	56.58	48.64	55.12	45.42
6	67.02	**72.02**	66.30	54.64	66.76	56.78	64.84	57.18	68.30	57.28
7	84.22	**88.02**	84.18	73.24	84.28	74.80	83.06	75.42	78.90	67.50
8	90.08	93.06	90.12	80.28	90.08	81.58	88.70	82.10	**96.12**	90.02
9	79.72	84.48	79.24	67.26	79.18	69.76	77.20	70.04	**84.50**	73.78
10	90.54	**93.26**	90.72	80.18	90.44	82.04	89.32	82.86	90.82	80.62
11	53.54	57.86	52.42	42.16	54.00	45.20	53.52	46.48	**63.78**	52.86
12	97.14	98.24	97.12	91.40	97.06	92.50	96.84	93.30	**99.62**	97.92
13	98.56	**99.30**	98.42	94.48	98.44	95.22	97.76	94.66	98.92	95.94
14	84.06	**88.20**	83.92	72.80	84.10	74.42	82.38	74.48	73.38	61.30
15	85.88	**89.26**	85.30	75.34	85.28	76.82	83.32	76.62	82.46	71.36

* Cases of the location parameter arrangements are given on page 38

Table 5.159. Percentage of Rejection for $k = 5$; T-Distribution: Block = 32, $n_1 = n_2 = n_4 = n_5 = 4$ and $n_3 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.18	5.18	5.16	5.38	5.20	5.26	4.96	5.20	5.36	5.72
2	34.80	**38.12**	34.46	28.06	34.90	29.44	34.70	30.36	31.46	26.22
3	30.46	33.12	29.54	23.92	31.14	25.64	30.96	26.68	**33.92**	27.48
4	33.96	37.30	33.26	26.72	34.70	29.40	35.70	31.26	**45.18**	36.80
5	24.98	**27.20**	24.16	20.16	24.74	20.58	24.32	20.64	22.98	19.70
6	28.70	**30.86**	28.26	22.76	29.06	24.56	28.62	25.14	29.30	25.06
7	39.18	**43.18**	38.38	31.16	39.92	32.96	39.46	33.86	33.62	27.62
8	46.78	51.26	46.18	37.36	47.42	39.42	46.86	40.54	**54.34**	45.14
9	36.72	**40.10**	35.82	29.60	36.64	30.66	35.04	30.70	39.84	32.56
10	45.74	**50.08**	45.14	36.48	45.84	38.34	45.20	39.08	45.56	36.24
11	21.72	23.74	21.58	18.42	22.06	18.92	21.64	19.74	**26.46**	22.14
12	61.52	66.44	60.66	49.28	62.52	52.52	63.00	55.46	**73.62**	62.06
13	67.78	**72.42**	66.42	55.84	67.62	57.86	65.98	57.92	68.12	57.10
14	39.96	**43.72**	38.88	31.82	40.32	33.60	39.34	34.36	31.86	26.22
15	40.86	**44.46**	40.16	32.78	41.28	34.34	39.78	34.88	37.38	30.56

* Cases of the location parameter arrangements are given on page 38

Table 5.160. Percentage of Rejection for $k = 5$; Normal Distribution: Block = 32, $n_1 = n_2 = n_3 = n_4 = 4$ and $n_5 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.76	4.70	4.64	4.44	4.84	4.74	4.72	4.70	4.74	4.92
2	48.50	**52.06**	47.38	39.66	48.70	39.64	48.64	38.44	43.86	35.10
3	44.92	**48.14**	44.64	37.46	44.72	37.12	44.30	35.08	47.74	37.78
4	55.18	57.42	54.28	46.72	53.98	44.74	54.24	43.64	**65.56**	54.38
5	32.60	**34.96**	31.96	26.36	32.98	26.42	31.58	25.06	30.92	24.54
6	39.44	**42.72**	38.66	31.34	39.58	31.76	38.06	30.10	39.54	31.04
7	54.90	**59.06**	54.04	44.38	55.02	44.84	54.22	43.92	47.50	37.72
8	66.96	70.52	66.20	57.50	66.60	56.96	65.52	54.84	**74.06**	63.46
9	52.60	**55.92**	51.46	43.42	52.20	44.14	50.30	41.02	55.40	43.86
10	66.12	**70.02**	65.14	55.22	66.14	55.28	65.28	53.06	64.68	53.16
11	32.42	34.58	31.90	26.60	32.16	26.28	31.78	25.56	**37.62**	30.34
12	85.40	88.18	84.46	75.82	84.84	74.88	84.32	73.12	**91.90**	82.70
13	84.92	**88.38**	83.92	74.28	85.24	74.38	83.94	71.40	84.64	72.28
14	53.70	**57.38**	52.92	43.34	54.08	44.18	53.56	42.70	43.54	34.50
15	57.84	**62.48**	56.68	46.94	58.46	47.68	57.02	45.50	52.78	41.18

* Cases of the location parameter arrangements are given on page 38

Table 5.161. Percentage of Rejection for $k = 5$; Exponential Distribution: Block = 32, $n_1 = n_2 = n_3 = n_4 = 4$ and $n_5 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.54	4.40	4.66	4.68	4.72	4.80	4.80	5.12	4.72	4.60
2	80.38	**83.78**	79.94	69.50	79.84	68.02	78.44	65.66	75.86	63.18
3	75.70	79.02	75.58	66.30	75.26	64.16	73.58	61.18	**79.52**	67.00
4	82.62	84.94	82.02	73.92	80.76	71.30	80.70	69.70	**92.46**	83.24
5	60.78	**65.32**	59.70	49.78	60.82	50.14	58.72	47.32	56.70	45.08
6	69.94	**74.16**	69.20	58.22	69.90	57.76	67.94	55.10	69.98	55.82
7	85.96	**89.58**	86.16	76.06	86.04	74.64	84.42	71.88	80.74	67.10
8	93.20	94.60	92.86	86.82	92.26	84.52	90.94	81.50	**96.84**	90.04
9	81.72	**85.60**	81.02	70.98	81.70	70.20	79.72	66.74	85.14	72.32
10	92.30	**94.40**	92.24	85.30	91.94	83.22	90.66	80.34	92.62	83.08
11	59.02	62.14	58.66	51.06	58.34	49.82	57.48	48.20	**68.38**	56.42
12	99.10	99.36	99.06	96.82	98.76	95.10	98.50	93.00	**99.84**	98.30
13	99.02	**99.54**	98.94	95.34	98.98	94.56	98.40	92.62	99.14	94.46
14	82.96	**86.92**	82.76	72.38	83.80	72.32	82.36	69.96	73.60	59.74
15	87.38	**90.56**	86.90	77.32	87.38	76.60	85.60	73.58	83.52	70.62

* Cases of the location parameter arrangements are given on page 38

Table 5.162. Percentage of Rejection for k = 5; T-Distribution: Block = 32, $n_1 = n_2 = n_3 = n_4 = 4$ and $n_5 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.84	4.94	4.98	4.98	4.84	5.40	4.84	5.36	4.84	4.76
2	36.48	**38.98**	35.80	29.58	36.64	29.54	36.10	28.36	32.40	25.84
3	32.94	**34.82**	32.22	26.98	32.80	26.82	32.38	25.92	34.02	27.62
4	40.84	42.62	40.02	35.18	39.70	33.56	39.64	32.96	**50.76**	41.18
5	25.58	**27.86**	25.40	21.34	25.64	21.60	24.68	20.94	24.50	19.80
6	29.44	**32.02**	28.94	23.50	29.30	23.82	28.42	22.50	28.78	23.32
7	42.72	**45.28**	41.82	34.20	43.16	34.66	42.64	33.56	36.44	28.82
8	52.04	54.88	51.04	43.44	51.58	43.00	50.30	40.88	**58.20**	47.46
9	40.26	**43.76**	40.04	33.06	41.18	33.74	39.58	31.94	43.00	33.86
10	50.26	**53.52**	49.76	41.36	49.98	40.74	49.10	39.32	50.40	40.04
11	25.46	26.66	25.38	22.00	25.16	21.66	25.06	21.02	**30.04**	24.76
12	69.90	72.44	68.96	61.28	69.02	59.38	68.36	57.32	**78.96**	68.56
13	70.98	**75.48**	69.74	59.10	71.36	59.22	69.80	56.78	70.02	57.02
14	41.56	**44.60**	40.26	33.28	42.26	33.62	41.58	32.92	33.08	25.30
15	44.10	**47.32**	43.26	35.68	44.76	36.50	43.66	35.10	40.46	31.58

* Cases of the location parameter arrangements are given on page 38

5.3.2. Portion of the RCBD is equal to the CRD

The results of the simulation study show that all proposed methods retain their level of significance around the given level in this dissertation which is 0.05. However, differences occur in terms of the estimated power based on the number of treatments (k).

In the case of k = 3, we note that when the sample sizes follow nonincreasing pattern (e.g., n_1 = 16 and $n_2 = n_3 = 4$), the proposed methods T_1, T_3 including C_1 are similar in terms of the estimated powers. This occurs when the last two parameters are similar and the first one is distinct such as (0, 0.5, 0.5). Likewise, there are situations where the proposed methods T_1, T_3, T_5, T_7 and C_1 nearly have approximately the same estimated powers, for example, when the location parameters are unequally distant such as (0.05, 0.25, 0.5) and (0.1, 0.5, 1). Otherwise, T_7 is considered to be the most powerful proposed method. The same results hold when the sample sizes follow an umbrella pattern (e.g., n_2 = 16 and $n_1 = n_3 = 4$). The exception are the location parameters

of (0, 0.5, 0.5). That is, exceptions occur when the last two parameters are the same. Under that case, the proposed methods T_1, T_3, T_5 including C_1 are comparable in terms of the estimated powers. Moreover, when the sample sizes follow a nondecreasing pattern (e.g., $n_1 = n_2 = 4$ and $n_3 = 16$), the results are similar to those in the nonincreasing case. When the location parameters are the same except the first one such as (0, 0.5, 0.5), however, the proposed methods T_3, T_5 are more powerful than the others.

For $k = 4$, the results reveal that under the nonincreasing pattern for the sample sizes in the *CRD* portion, the proposed methods T_1, T_3, T_5, T_7 and C_1 tend to have estimated powers that are approximately the same in several cases. For example, when the location parameters are equally spaced such as (0, 0.1, 0.2, 0.3), when the first two location parameters have the same shifts and the last two parameters have also similar shifts such as (0.25, 0.25, 0.5, 0.5). There are also cases where the proposed methods T_3, T_5, and T_7 have highest the estimated powers. These cases arise when the distance between the second and the third location parameters is equal to the distance between the third and fourth location parameters such as (0.1, 0.2, 0.6, 1). Lastly, there are cases where T_7 has the highest estimated power compared to the others, for example, when there is a large jump between the last two parameters such as (0, 0, 0.1, 0.6). Further, the results of the proposed methods under the umbrella pattern are almost similar to those under the nonincreasing pattern except that the estimated powers for T_7 becomes significantly higher than the others in more cases than before. When the sample sizes follow nondecreasing pattern, we note that the estimated powers are almost analogous to those in the nonincreasing pattern with the exception of the cases where T_1, T_3, T_7 and C_1 have similar estimated powers such as for (0, 0.15, 0.2, 0.5).

For $k = 5$, it can be noticed that generally when the sample sizes in the *CRD* portion follow a nonincreasing pattern, the proposed methods T_3, T_5, and T_7 have the highest estimated powers

compared to the others. However, under some location parameters arrangements, the proposed method T_7 becomes significantly larger than all the other methods. This occurs when the location parameters follow arrangements, for example, when all the location parameters are the same except the last one such as (0, 0, 0, 0, 0.5), when all the parameters are the same except the last two with and equal distance among the last three parameters such as (0, 0, 0, 0.25,0.5), and finally when all the parameters are the same except the last two with the presence of a large jump between the last two location parameters such as (0, 0, 0, 0.2, 0.7). Moreover, when the sample sizes follow the umbrella pattern T_7 turns into a more powerful method with higher estimated powers under more cases compared to the nonincreasing pattern. However, when the sample sizes follow the nondecreasing pattern, the results are almost the same compared to those of the nonincreasing pattern.

Table 5.163. Percentage of Rejection for $k = 3$; Normal Distribution: Block = 8, $n_1 = 16$ and $n_2 = n_3 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.44	4.72	4.94	5.14	5.28	4.74	5.28	4.74	5.02	5.18
2	28.58	21.08	27.98	20.46	30.54	22.06	31.86	23.82	**33.90**	24.74
3	**38.54**	33.46	38.06	33.02	36.70	29.30	34.50	27.66	31.42	28.00
4	28.00	23.04	27.14	22.88	**28.26**	22.18	28.16	22.40	27.96	23.02
5	34.42	28.34	34.24	27.82	**34.82**	26.44	33.84	25.88	33.44	27.10
6	66.60	47.82	65.46	44.88	71.90	51.46	74.24	56.74	**77.48**	58.94
7	**85.46**	79.54	84.52	77.66	82.90	71.98	80.06	67.60	73.82	68.44
8	77.80	65.54	77.12	63.70	**78.56**	62.62	77.60	61.96	76.86	64.12
9	27.68	20.74	27.46	20.26	29.70	21.16	30.74	23.24	**33.08**	24.36
10	**38.28**	33.78	38.04	33.60	36.46	30.72	34.58	28.46	31.16	29.06
11	68.56	55.42	67.46	52.98	**69.78**	53.42	69.32	53.38	69.26	55.54
12	40.02	31.16	39.18	30.16	41.18	30.34	41.08	31.04	**41.82**	32.00
13	33.66	27.86	33.02	27.48	**33.96**	26.32	33.92	26.22	32.62	27.40
14	41.52	34.08	40.72	33.08	**42.02**	32.14	41.52	31.96	41.10	33.28
15	54.26	40.08	53.30	38.18	57.86	41.72	59.06	44.40	**61.64**	46.28

* Cases of the location parameter arrangements are given on page 38

Table 5.164. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 8, $n_1 = 16$ and $n_2 = n_3 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.82	5.10	4.78	5.42	4.88	5.12	5.04	5.28	4.94	5.32
2	44.12	29.18	42.94	27.32	48.32	30.56	50.70	33.52	**54.66**	35.38
3	**61.88**	55.42	60.62	54.20	59.78	47.90	56.68	43.50	50.86	44.30
4	49.28	38.50	48.74	36.74	**49.92**	35.44	48.56	34.66	48.88	36.68
5	**59.06**	47.76	58.82	46.06	58.72	43.24	56.66	41.34	55.48	43.76
6	84.58	63.98	83.14	59.70	89.98	70.02	91.66	77.36	**94.32**	80.06
7	**95.92**	93.72	95.50	92.56	95.24	89.46	94.12	87.08	89.82	86.24
8	**94.90**	89.04	94.78	87.52	94.76	85.92	93.96	84.44	94.88	87.42
9	42.58	29.48	41.82	27.72	46.94	30.70	49.38	33.58	**53.02**	35.52
10	**62.42**	55.54	61.24	53.92	60.24	47.90	57.64	43.58	51.10	44.60
11	90.18	81.94	90.28	79.82	90.52	78.90	89.80	77.62	**91.42**	81.58
12	65.24	52.10	65.56	49.94	66.68	50.14	65.86	50.06	**68.26**	53.58
13	58.00	46.02	57.84	44.50	**58.56**	42.42	56.92	41.22	57.26	43.82
14	68.34	57.32	68.22	55.08	68.66	52.68	67.22	50.46	**68.06**	54.30
15	78.88	60.58	78.26	56.56	82.62	61.32	83.52	64.92	**87.04**	68.98

* Cases of the location parameter arrangements are given on page 38

Table 5.165. Percentage of Rejection for $k = 3$; T-Distribution: Block = 8, $n_1 = 16$ and $n_2 = n_3 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.86	4.74	4.88	5.06	4.80	4.62	4.80	4.82	4.56	4.90
2	21.38	15.84	21.30	15.48	22.96	16.58	23.92	17.86	**24.94**	18.68
3	**29.56**	26.78	29.12	26.72	28.08	24.00	26.88	22.44	24.58	22.82
4	22.38	18.92	22.36	18.78	**22.70**	18.66	22.42	18.36	22.24	19.18
5	**26.16**	21.96	25.34	21.94	26.04	20.58	25.84	20.22	24.90	20.82
6	50.46	36.10	49.16	34.48	54.40	38.56	56.26	41.68	**60.14**	43.68
7	**68.24**	60.48	67.28	59.26	65.22	53.92	62.50	49.78	56.06	50.26
8	60.74	49.40	60.30	47.72	**60.90**	47.26	60.44	47.28	59.88	48.88
9	21.40	16.54	20.90	16.40	22.98	16.90	23.58	18.22	**24.96**	19.26
10	27.46	24.58	**27.72**	24.48	26.82	22.10	25.02	20.96	22.98	21.52
11	53.42	43.30	52.42	41.40	**54.14**	40.84	53.68	40.76	53.58	42.76
12	30.30	24.18	29.52	23.76	30.88	23.06	31.10	23.54	**31.66**	24.60
13	24.74	19.94	24.02	19.86	25.50	18.74	25.64	18.84	**24.50**	19.56
14	**32.48**	25.54	31.78	25.02	32.34	24.46	31.96	24.54	31.78	25.38
15	40.38	30.70	40.08	29.64	42.86	31.10	43.86	32.94	**46.24**	34.22

* Cases of the location parameter arrangements are given on page 38

Table 5.166. Percentage of Rejection for $k = 3$; Normal Distribution: Block = 8, $n_1 = n_3 = 4$ and $n_2 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.20	4.70	5.08	5.12	5.26	4.86	5.28	5.00	5.08	5.20
2	27.36	20.14	26.94	19.72	27.52	20.14	27.54	21.22	**33.36**	24.60
3	27.72	20.16	27.32	19.70	**27.94**	20.02	27.48	20.66	19.90	14.62
4	24.58	18.28	24.34	17.90	**24.74**	18.16	24.42	18.90	24.66	17.10
5	27.60	20.54	26.98	20.34	**27.74**	20.48	27.30	21.22	25.26	18.08
6	65.68	48.04	64.86	45.18	66.36	47.48	66.58	49.72	**77.06**	58.82
7	65.98	49.32	65.14	46.68	**66.50**	49.02	65.90	51.30	46.96	30.94
8	68.68	50.78	67.80	48.18	**68.78**	50.12	67.78	51.86	65.70	45.48
9	27.32	19.66	27.30	19.32	27.36	19.58	27.00	20.50	**32.82**	23.56
10	**29.26**	21.02	28.64	20.36	29.16	21.22	28.62	21.88	20.94	15.40
11	**60.88**	44.64	60.60	42.50	61.10	44.00	60.36	45.46	60.10	41.58
12	36.12	26.52	35.54	25.20	36.14	26.12	35.78	27.40	**37.50**	26.32
13	**27.80**	20.76	27.34	19.76	27.56	20.58	**27.76**	20.98	26.44	18.86
14	35.18	24.56	34.44	24.14	**35.28**	24.46	34.94	25.62	32.78	23.12
15	50.54	36.24	50.06	34.80	50.82	36.02	50.62	37.78	**57.72**	41.20

* Cases of the location parameter arrangements are given on page 38

Table 5.167. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 8, $n_1 = n_3 = 4$ and $n_2 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.58	4.52	4.46	5.08	4.56	4.78	4.50	4.72	4.66	4.90
2	43.62	29.88	43.18	28.36	43.88	30.10	43.96	32.40	**54.46**	36.14
3	46.56	34.68	45.60	33.18	**46.72**	34.36	46.24	35.82	32.74	21.82
4	**44.60**	32.82	44.58	31.42	44.48	32.00	43.28	32.78	43.06	29.22
5	**49.70**	36.42	48.82	34.82	49.22	35.76	48.50	36.22	44.44	30.22
6	84.46	64.30	83.12	60.48	84.58	63.38	84.38	67.58	**94.38**	80.16
7	79.96	62.50	78.94	59.60	80.82	61.70	**81.50**	64.94	60.96	38.70
8	**89.44**	74.96	89.42	71.72	88.96	72.94	87.50	73.40	89.00	70.14
9	43.62	29.36	42.34	27.64	44.02	29.16	43.76	30.86	**54.46**	35.48
10	46.00	33.20	45.30	32.06	**46.38**	32.86	45.58	34.20	32.38	21.56
11	84.88	67.26	85.16	64.36	84.44	65.26	82.40	66.48	**85.62**	64.82
12	59.54	44.26	59.44	42.42	59.40	42.88	57.54	44.24	**62.14**	43.38
13	**50.20**	37.08	50.06	35.76	49.94	36.16	48.60	37.06	47.24	32.42
14	58.90	43.48	**59.20**	41.68	58.44	41.96	56.86	43.14	56.82	38.34
15	74.62	55.48	73.94	52.02	74.18	54.32	73.00	56.50	**84.06**	63.72

* Cases of the location parameter arrangements are given on page 38

Table 5.168. Percentage of Rejection for $k = 3$; T-Distribution: Block = 8, $n_1 = n_3 = 4$ and $n_2 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.42	4.56	4.52	4.80	4.28	4.64	4.26	4.50	4.12	4.58
2	21.96	15.98	21.40	15.80	21.76	16.00	21.08	16.42	**26.06**	18.48
3	20.22	15.16	19.46	14.88	20.28	15.34	**20.44**	15.78	15.62	11.18
4	**21.06**	16.22	20.74	16.30	**21.06**	16.48	20.70	17.06	20.40	16.02
5	**22.32**	16.44	22.18	16.18	22.18	16.40	22.24	17.14	20.18	14.78
6	50.96	37.30	50.08	35.72	51.08	36.94	50.40	38.38	**60.72**	43.96
7	50.18	36.08	49.18	34.40	50.42	35.78	**50.90**	37.66	35.04	22.94
8	**53.84**	37.92	53.16	36.16	53.78	37.10	52.44	38.52	51.44	34.86
9	21.44	16.36	21.20	15.94	21.30	16.22	21.18	16.46	**24.94**	18.04
10	**21.50**	16.72	20.70	16.50	21.46	16.72	21.48	17.20	16.14	12.48
11	45.74	33.52	45.46	32.32	**45.98**	33.52	45.54	34.22	44.58	31.98
12	27.16	20.14	27.20	19.76	27.32	20.10	26.58	20.48	**27.82**	20.30
13	21.58	16.52	**21.60**	16.00	21.54	16.50	21.18	17.38	21.12	15.06
14	**26.36**	19.82	26.18	19.66	**26.36**	19.96	25.58	20.72	25.20	19.24
15	38.16	27.22	37.22	26.36	38.12	27.12	38.06	28.72	**43.32**	31.12

* Cases of the location parameter arrangements are given on page 38

Table 5.169. Percentage of Rejection for $k = 3$; Normal Distribution: Block = 8, $n_1 = n_2 = 4$ and $n_3 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.12	4.62	5.24	4.96	5.22	4.68	5.14	4.72	5.06	4.64
2	38.54	33.08	37.70	32.52	37.52	28.60	35.72	27.44	**40.44**	32.74
3	27.42	19.58	26.82	19.40	29.66	20.82	**30.64**	22.40	22.16	16.72
4	29.50	24.88	29.44	24.44	**30.04**	23.64	29.60	23.56	28.66	22.84
5	31.16	24.10	31.04	23.60	**32.12**	23.48	31.90	23.88	29.14	21.88
6	84.20	77.78	83.92	75.98	82.44	71.44	80.24	67.04	**87.66**	77.44
7	64.86	46.54	63.62	43.74	72.12	50.54	**73.38**	55.06	53.42	36.60
8	77.30	66.82	77.16	64.32	**78.36**	63.98	77.54	63.54	75.60	60.62
9	38.30	34.32	37.64	33.70	37.04	30.34	35.40	28.82	**40.98**	33.42
10	27.10	20.70	26.50	20.06	29.50	21.40	**30.48**	23.24	22.42	17.00
11	70.66	59.64	70.06	57.82	**71.20**	57.04	69.90	56.28	68.74	54.84
12	44.64	37.50	44.28	36.78	**44.66**	34.86	43.26	33.62	43.70	35.16
13	33.30	26.98	32.84	26.48	**33.72**	26.40	33.52	26.34	31.84	24.72
14	42.22	33.88	41.66	32.86	**43.08**	31.74	42.38	31.90	39.98	31.20
15	67.06	58.34	66.04	56.74	65.10	52.90	62.96	49.82	**70.26**	57.06

* Cases of the location parameter arrangements are given on page 38

Table 5.170. Percentage of Rejection for k = 3; Exponential Distribution: Block = 8, $n_1 = n_2 = 4$ and $n_3 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.30	4.70	5.20	5.14	5.34	4.52	5.30	4.74	5.22	4.86
2	62.50	54.48	61.86	53.34	60.00	48.82	57.16	45.68	**66.20**	54.06
3	44.78	33.30	44.10	32.16	48.60	36.06	**50.08**	39.26	36.26	27.00
4	50.90	42.64	50.60	41.24	**51.24**	40.64	50.10	40.34	49.92	39.00
5	55.70	45.86	55.20	44.76	**56.40**	44.24	55.38	44.22	52.10	41.80
6	94.04	89.42	93.74	88.06	92.80	83.52	91.20	79.64	**96.12**	88.78
7	81.12	62.50	79.82	59.18	84.62	66.56	**86.30**	70.60	70.06	50.72
8	91.56	82.66	91.64	80.54	**91.66**	78.64	90.40	77.18	90.96	78.10
9	61.28	56.04	60.64	54.88	59.12	50.02	56.84	46.54	**65.60**	55.22
10	45.18	32.94	44.40	31.44	49.12	35.16	**50.92**	38.18	37.14	26.22
11	88.98	78.86	**89.20**	76.88	88.52	74.88	86.88	72.98	88.62	74.80
12	69.70	60.22	69.48	58.34	68.46	56.06	66.40	54.38	**70.16**	56.98
13	67.08	56.44	66.46	54.52	**67.20**	53.14	65.72	52.54	65.54	51.90
14	56.70	47.42	56.84	45.78	**57.16**	45.16	55.96	44.54	54.32	43.08
15	87.46	79.20	87.08	77.34	85.38	72.56	82.68	69.02	**89.58**	77.24

* Cases of the location parameter arrangements are given on page 38

Table 5.171. Percentage of Rejection for k = 3; T-Distribution: Block = 8, $n_1 = n_2 = 4$ and $n_3 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.90	4.98	4.84	5.36	4.92	4.48	4.94	4.72	4.74	5.32
2	29.04	25.28	28.56	25.46	28.68	23.22	27.44	21.64	**31.06**	25.40
3	20.56	16.16	20.32	15.94	21.88	16.64	**22.68**	17.86	17.58	14.22
4	**22.74**	19.20	22.36	19.20	22.66	18.02	22.34	18.12	22.20	18.28
5	24.62	19.28	24.24	19.28	**24.78**	19.62	24.56	19.74	23.34	17.86
6	68.44	61.38	68.12	59.70	66.50	54.90	63.50	51.10	**72.74**	60.92
7	51.00	36.26	49.82	34.52	55.70	38.76	**57.90**	41.92	40.88	28.64
8	62.10	51.40	61.46	49.38	**62.98**	48.66	62.36	48.22	59.42	46.72
9	28.84	25.18	28.14	25.18	27.62	22.76	26.48	20.94	**30.68**	25.32
10	20.84	15.96	20.36	15.84	22.62	16.62	**23.44**	17.86	17.48	13.74
11	55.20	45.78	55.12	44.44	**55.78**	43.06	53.96	41.92	54.46	42.34
12	**33.72**	27.74	32.98	27.36	33.48	25.98	32.78	25.18	33.62	26.20
13	25.70	22.22	25.58	22.18	**26.26**	21.04	25.70	21.12	24.32	20.60
14	31.74	25.30	31.12	24.90	**31.92**	23.76	30.90	23.62	30.50	23.18
15	51.10	45.36	50.98	44.36	49.94	40.08	47.76	37.70	**53.88**	44.04

* Cases of the location parameter arrangements are given on page 38

Table 5.172. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 8, $n_1 = 20$ and $n_2 = n_3 = n_4 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.22	5.14	5.42	4.88	5.08	4.58	5.10	4.66	5.04	4.58
2	19.88	17.80	19.86	15.90	20.16	16.34	**20.20**	16.42	19.06	16.72
3	19.30	17.06	19.18	14.92	**19.94**	15.78	19.46	15.64	19.64	15.76
4	18.04	16.62	17.74	15.20	**18.18**	14.92	17.24	14.44	15.92	14.60
5	25.40	19.16	24.80	15.78	28.42	18.38	29.98	20.72	**33.10**	22.48
6	30.50	25.50	30.00	21.82	32.18	23.42	**32.66**	23.74	**32.66**	25.60
7	42.54	39.46	42.00	35.12	**42.56**	34.42	40.58	32.50	37.08	32.36
8	**78.86**	72.32	77.98	65.92	78.62	65.50	78.52	64.30	75.68	65.38
9	72.48	61.04	71.98	52.64	75.44	57.32	76.08	58.40	**77.42**	61.20
10	18.30	15.94	18.30	14.12	**19.58**	15.02	19.06	14.52	18.92	15.02
11	51.30	42.34	50.36	36.08	54.36	39.90	54.68	41.08	**55.84**	42.96
12	20.78	17.72	20.52	15.74	21.82	16.26	21.86	16.60	**22.62**	17.74
13	30.94	27.04	30.38	23.74	32.24	24.28	32.50	24.52	**33.14**	25.46
14	15.40	13.40	15.30	11.72	16.98	13.32	17.64	13.70	**18.56**	14.26
15	36.02	28.30	35.34	23.52	39.18	26.70	41.28	28.74	**45.20**	31.02

* Cases of the location parameter arrangements are given on page 38

Table 5.173. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 8, $n_1 = 20$ and $n_2 = n_3 = n_4 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.92	4.58	4.78	4.50	4.78	4.54	4.70	5.00	5.06	4.72
2	**34.94**	28.68	34.92	25.16	34.86	25.22	33.58	24.34	32.94	25.98
3	31.82	25.58	31.36	21.20	**33.24**	22.54	32.56	21.60	31.80	23.16
4	**33.02**	29.76	32.76	26.34	32.16	25.14	30.10	23.36	28.16	23.92
5	40.28	29.34	39.18	23.54	**45.36**	27.42	48.26	30.72	55.12	34.08
6	53.66	42.86	53.08	36.20	56.14	38.66	56.02	38.70	**58.00**	41.94
7	**72.64**	66.88	72.18	60.20	71.58	58.48	68.36	54.66	63.66	55.56
8	**96.00**	93.94	**96.00**	90.18	95.90	89.78	95.26	88.62	95.70	91.26
9	93.54	86.92	93.92	79.38	95.30	83.28	94.84	83.28	**96.90**	88.28
10	32.36	25.70	31.44	21.62	**34.60**	23.84	33.58	23.12	32.94	24.42
11	78.94	68.04	79.16	58.44	81.46	61.96	81.18	62.28	**84.92**	68.54
12	37.60	29.72	38.34	25.22	39.80	27.08	39.52	27.48	**40.90**	29.64
13	57.56	48.36	57.20	41.58	58.46	42.34	57.68	41.92	**59.30**	44.72
14	24.42	18.94	24.12	16.06	26.66	17.76	27.88	18.36	**29.28**	19.54
15	57.60	43.48	57.20	35.62	63.24	41.68	65.52	45.24	**72.28**	50.40

* Cases of the location parameter arrangements are given on page 38

Table 5.174. Percentage of Rejection for $k = 4$; T-Distribution: Block = 8, $n_1 = 20$ and $n_2 = n_3 = n_4 = 4$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.76	4.72	4.96	4.86	4.76	4.60	4.84	4.80	4.88	4.38
2	15.60	14.28	15.32	13.00	**16.00**	13.10	15.62	12.94	14.72	13.34
3	14.82	13.74	15.28	12.08	15.94	12.86	15.58	12.82	**15.88**	13.52
4	15.40	14.80	15.32	13.48	**15.44**	13.98	14.72	13.54	14.18	13.12
5	19.58	15.48	19.56	13.20	21.78	15.18	23.00	16.78	**25.62**	17.90
6	24.46	20.68	24.46	17.94	25.84	18.98	25.58	19.80	**25.70**	20.30
7	**33.34**	29.82	32.92	26.06	33.16	26.26	31.72	25.22	28.86	24.50
8	63.32	56.80	62.78	50.52	**63.36**	50.82	63.18	49.88	60.32	50.76
9	56.74	46.58	56.20	39.52	59.86	43.80	60.34	44.86	**61.50**	47.50
10	15.26	13.74	15.12	12.24	15.78	12.58	15.74	12.46	**15.90**	13.06
11	39.62	32.32	39.54	27.88	42.30	30.62	42.24	31.14	**42.80**	32.54
12	17.50	15.30	17.32	13.32	18.32	14.14	18.40	14.48	**19.06**	15.06
13	24.56	21.28	24.36	18.60	25.80	19.44	**26.26**	19.94	25.18	20.44
14	12.80	12.24	12.86	10.56	13.68	11.66	14.10	12.16	**14.86**	12.54
15	26.32	20.64	26.42	17.32	28.54	20.12	29.88	21.86	**33.06**	23.64

* Cases of the location parameter arrangements are given on page 38

Table 5.175. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 8, $n_1 = n_3 = n_4 = 4$ and $n_2 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.32	5.06	5.72	5.04	5.32	5.04	5.12	4.88	5.14	5.10
2	17.84	14.96	17.60	13.22	**18.18**	14.26	18.02	14.14	17.22	13.44
3	**18.42**	15.98	18.08	14.10	18.24	15.36	17.60	14.94	18.30	15.48
4	**15.60**	13.40	15.24	12.02	15.34	11.78	15.14	11.44	12.92	10.76
5	25.52	19.86	24.62	16.30	28.24	20.66	30.16	23.10	**33.30**	23.38
6	29.70	24.24	29.52	20.60	30.86	22.88	31.12	23.98	**32.62**	23.60
7	32.56	27.42	**32.86**	23.24	32.32	23.22	30.76	22.66	26.38	19.42
8	62.18	47.24	61.70	39.96	63.02	43.50	**63.40**	45.38	56.50	37.08
9	69.50	56.16	68.22	47.18	72.12	53.74	71.82	55.58	**74.04**	55.24
10	17.90	15.94	17.76	13.76	18.38	15.08	17.66	14.64	**18.68**	15.24
11	47.94	38.16	47.68	31.76	50.38	36.30	51.00	38.28	**53.14**	36.84
12	21.00	17.84	20.60	15.44	21.92	17.18	22.30	17.76	**22.62**	17.32
13	27.44	21.44	27.64	18.60	29.56	20.90	**29.64**	22.32	29.38	20.36
14	15.54	13.40	15.38	12.00	16.42	13.92	17.36	14.60	**18.96**	15.10
15	35.76	27.74	35.28	23.64	39.88	28.66	41.78	32.02	**45.88**	31.60

* Cases of the location parameter arrangements are given on page 38

Table 5.176. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 8, $n_1 = n_3 = n_4 = 4$ and $n_2 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.24	4.86	4.88	4.56	5.24	4.76	5.14	4.88	5.20	5.12
2	29.68	23.82	29.86	19.86	29.82	20.40	**28.96**	19.92	28.12	18.52
3	31.10	25.98	30.32	21.94	31.18	22.80	29.92	22.58	**31.58**	22.48
4	**27.52**	22.78	27.24	19.84	26.72	18.86	25.62	18.36	21.92	16.04
5	40.12	29.52	39.18	23.64	45.52	31.86	49.86	36.96	**56.46**	35.66
6	51.52	40.88	51.56	34.38	52.98	37.34	52.12	37.98	**55.64**	37.30
7	**59.84**	48.64	59.80	41.68	57.96	40.24	54.42	38.10	48.12	32.94
8	86.46	71.86	86.46	62.66	88.26	67.38	**88.60**	69.60	85.20	58.66
9	92.36	82.06	92.38	72.60	93.48	78.78	92.52	80.38	**95.52**	82.86
10	31.68	25.00	31.24	21.12	**31.96**	22.48	30.28	22.32	31.62	22.98
11	74.98	60.94	75.10	51.56	77.88	58.38	77.34	61.32	**81.70**	61.48
12	34.04	26.56	33.62	22.16	35.54	24.74	35.64	25.22	**36.78**	24.38
13	47.08	36.04	47.24	29.44	**49.66**	32.80	49.52	34.16	49.22	30.02
14	26.14	19.96	26.00	16.40	28.42	19.56	28.78	20.72	**32.08**	20.76
15	56.98	43.58	56.86	35.72	62.42	44.80	63.78	49.50	**72.80**	50.20

* Cases of the location parameter arrangements are given on page 38

Table 5.177. Percentage of Rejection for $k = 4$; T-Distribution: Block = 8, $n_1 = n_3 = n_4 = 4$ and $n_2 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.18	5.40	5.42	5.38	5.18	5.44	5.12	5.38	5.22	5.74
2	**13.74**	12.18	13.86	10.90	13.96	11.68	13.94	11.54	13.34	11.24
3	14.92	13.64	**15.06**	12.06	14.84	12.24	14.82	12.46	14.74	11.90
4	**13.04**	11.74	12.84	10.50	12.70	10.46	12.02	10.16	10.88	10.02
5	20.26	17.00	20.56	14.78	22.70	17.74	23.90	19.52	**27.18**	19.76
6	23.72	18.98	23.06	16.36	24.12	18.22	24.12	18.58	**25.32**	18.52
7	**27.24**	22.64	26.72	19.20	26.48	19.28	24.84	18.62	22.32	16.64
8	47.90	36.36	47.26	29.54	49.58	32.98	**50.42**	35.12	45.28	28.12
9	53.66	43.86	53.66	37.04	55.88	41.40	55.92	43.12	**58.20**	42.66
10	**14.86**	13.12	14.42	11.58	14.54	12.06	14.26	11.86	**14.86**	12.50
11	36.06	27.92	35.38	23.48	37.80	27.04	37.94	28.02	**39.38**	27.26
12	15.36	13.12	15.22	11.50	16.24	12.46	16.06	13.36	**16.48**	12.86
13	20.54	16.98	20.28	14.90	21.16	16.54	**21.62**	17.18	21.52	16.30
14	13.32	10.34	13.02	9.28	14.14	10.94	14.16	11.62	**14.66**	11.84
15	27.28	21.62	26.96	18.04	29.60	21.92	31.06	24.22	**34.68**	23.84

* Cases of the location parameter arrangements are given on page 38

Table 5.178. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 8, $n_1 = n_2 = n_3 = 4$ and $n_4 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.90	5.18	4.84	5.18	4.92	5.12	5.14	4.96	5.10	5.06
2	19.68	17.70	19.82	15.62	**20.16**	16.60	19.84	16.26	18.78	15.44
3	18.94	16.38	18.88	14.60	**19.32**	15.18	18.50	15.12	18.22	14.22
4	15.50	13.52	15.74	11.52	**16.42**	12.78	16.38	13.24	14.10	10.72
5	42.32	41.26	41.84	37.36	39.98	34.26	37.58	31.50	**47.20**	39.72
6	**36.90**	32.32	36.34	28.76	**36.90**	28.48	35.98	27.60	36.38	27.92
7	35.18	28.26	34.42	24.04	37.90	26.58	**38.38**	28.18	29.50	21.18
8	78.14	72.14	77.66	65.14	78.30	65.76	**78.44**	65.14	72.78	60.14
9	82.26	76.62	81.74	70.48	82.26	69.82	80.84	67.50	**82.50**	68.60
10	18.94	16.08	18.62	14.06	**19.66**	15.00	18.90	15.02	18.80	14.30
11	61.10	56.78	60.70	51.04	60.64	49.58	58.70	46.80	**62.14**	50.26
12	24.16	22.94	24.04	20.56	**24.72**	20.64	23.70	19.68	24.56	20.38
13	38.02	35.76	**38.06**	31.58	37.44	30.84	36.36	28.88	37.66	30.76
14	23.08	22.10	22.76	20.08	21.88	18.98	20.60	17.48	**24.30**	20.76
15	54.38	52.06	54.06	47.38	52.06	42.88	49.40	39.30	**58.92**	48.46

* Cases of the location parameter arrangements are given on page 38

Table 5.179. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 8, $n_1 = n_2 = n_3 = 4$ and $n_4 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.04	5.06	5.18	4.64	5.06	4.90	5.22	5.00	5.20	4.88
2	36.58	32.28	36.34	28.92	**37.26**	29.54	36.32	29.42	33.26	26.98
3	33.22	28.22	32.24	24.50	**34.40**	26.64	33.68	26.20	32.00	24.14
4	27.08	23.32	26.90	20.88	**28.90**	22.46	28.70	23.14	23.34	18.64
5	68.70	67.50	68.50	62.92	64.64	56.90	61.44	52.26	**75.52**	65.04
6	62.38	56.00	62.26	50.82	62.14	49.24	59.60	46.90	**63.26**	50.26
7	57.90	47.04	57.52	40.94	**61.32**	45.12	60.82	45.92	49.12	36.06
8	**94.38**	88.70	**94.38**	84.54	93.88	82.60	92.96	80.56	92.86	80.52
9	95.74	91.28	95.68	87.10	95.12	85.26	93.34	81.66	**96.22**	86.30
10	32.02	27.46	31.38	23.80	**33.60**	26.42	32.54	26.08	29.70	23.40
11	87.48	81.86	87.30	76.44	86.24	73.52	83.22	69.78	**88.60**	74.90
12	46.54	43.12	46.26	38.84	45.32	37.22	43.50	35.46	**46.76**	38.28
13	**64.08**	59.56	63.92	54.90	62.52	52.08	60.52	49.32	63.88	52.84
14	39.52	39.86	39.16	36.68	37.94	34.66	36.70	32.30	**43.08**	37.58
15	79.80	77.60	79.88	72.70	76.82	67.42	73.32	62.70	**84.84**	73.78

* Cases of the location parameter arrangements are given on page 38

Table 5.180. Percentage of Rejection for $k = 4$; T-Distribution: Block = 8, $n_1 = n_2 = n_3 = 4$ and $n_4 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.98	5.34	5.12	4.94	4.82	5.00	4.74	4.94	5.16	5.02
2	16.30	14.46	16.32	12.70	**16.78**	13.24	16.42	13.10	15.56	12.80
3	14.48	13.54	14.68	12.50	**15.68**	13.16	15.18	13.24	14.68	12.58
4	12.24	10.80	12.04	9.82	12.92	10.56	**12.86**	11.32	10.88	9.52
5	32.88	32.60	32.38	29.62	30.90	27.04	29.20	24.84	**36.30**	31.20
6	26.84	25.04	27.54	21.78	26.92	21.94	25.98	20.78	**27.68**	21.64
7	25.38	20.16	24.84	17.04	27.66	19.42	**27.72**	20.40	21.16	15.12
8	61.20	55.80	60.60	49.56	**62.00**	49.38	61.46	49.14	56.36	45.20
9	65.40	59.86	64.96	53.68	65.86	52.74	63.90	50.38	**65.94**	52.10
10	14.86	13.00	15.22	11.82	**15.34**	12.30	15.00	11.90	14.00	11.78
11	47.98	43.14	47.96	38.22	47.04	37.18	44.86	35.36	**48.02**	37.64
12	19.50	18.46	19.42	16.62	19.28	16.08	18.88	15.84	**19.54**	16.74
13	**28.88**	26.84	28.60	23.98	28.76	23.10	28.02	22.64	28.44	23.68
14	17.74	17.16	18.26	15.94	17.54	15.54	16.42	14.80	**19.00**	16.44
15	42.08	38.98	41.56	35.44	40.30	32.62	37.88	30.06	**45.12**	36.94

* Cases of the location parameter arrangements are given on page 38

Table 5.181. Percentage of Rejection for $k = 5$; Normal Distribution: Block = 8, $n_1 = 20$ and $n_2 = n_3 = n_4 = n_5 = 5$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.82	4.80	4.92	5.04	4.74	5.14	4.52	4.82	4.94	4.94
2	33.44	30.22	33.28	26.26	**33.76**	26.92	33.20	26.42	30.72	25.64
3	24.92	21.78	24.54	18.16	26.16	19.60	26.36	20.28	**27.50**	21.86
4	24.36	19.82	24.76	16.50	26.42	18.44	28.60	20.44	**34.46**	24.78
5	20.74	18.64	20.52	15.92	**21.32**	17.02	21.00	16.82	20.80	17.32
6	23.92	22.08	23.52	19.32	24.86	19.80	24.54	19.62	**25.28**	20.82
7	**39.18**	35.36	38.30	31.06	38.52	30.80	37.62	29.88	34.24	29.42
8	35.76	29.86	35.64	24.44	38.28	27.44	39.16	29.14	**43.70**	33.16
9	30.54	25.84	30.02	21.90	32.62	24.28	32.74	24.16	**34.64**	27.14
10	40.40	34.82	39.70	28.74	**41.84**	31.02	41.66	31.18	41.68	32.64
11	18.38	15.38	18.08	14.00	19.20	14.92	19.84	15.54	**21.40**	16.54
12	48.14	38.90	46.58	31.46	51.96	36.04	55.20	38.60	**61.48**	45.14
13	59.34	51.40	58.62	42.24	61.52	45.82	61.20	46.02	**62.42**	49.30
14	**37.06**	34.68	36.36	30.10	36.98	30.32	36.24	29.06	31.36	27.40
15	36.46	33.54	36.08	28.68	**38.02**	29.84	37.66	28.96	35.10	29.88

* Cases of the location parameter arrangements are given on page 38

Table 5.182. Percentage of Rejection for k = 5; Exponential Distribution: Block = 8, n_1 = 20 and $n_2 = n_3 = n_4 = n_5 = 5$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.78	5.36	5.62	5.18	5.52	5.54	5.50	5.52	5.16	5.28
2	58.36	52.72	58.18	44.90	**58.62**	44.76	57.18	43.02	54.74	44.14
3	44.84	38.00	44.96	30.86	46.90	33.22	46.82	33.62	**50.62**	37.82
4	40.56	31.48	39.50	24.50	44.42	28.02	48.66	32.12	**56.68**	37.74
5	37.46	33.02	36.72	27.54	**38.88**	29.28	37.82	28.88	36.84	29.90
6	43.26	37.24	42.86	30.60	44.58	31.98	44.06	31.20	**45.16**	34.38
7	**67.52**	62.32	67.22	54.26	67.22	53.74	65.60	51.48	61.92	52.04
8	60.98	50.50	60.64	40.98	65.20	46.42	65.90	48.66	**74.48**	55.96
9	52.20	43.08	51.06	34.68	55.36	39.36	55.62	40.14	**59.64**	43.94
10	67.04	58.74	66.60	49.46	69.44	52.10	68.94	51.86	**70.12**	55.88
11	28.80	24.62	28.28	19.92	31.10	22.20	32.46	23.32	**36.92**	26.70
12	73.78	62.78	73.84	49.56	78.12	57.30	79.92	62.30	**88.88**	72.60
13	87.22	80.78	86.68	71.06	88.76	74.72	88.16	74.22	**89.80**	78.98
14	66.14	61.86	65.92	53.74	**66.36**	53.10	64.44	50.12	58.44	49.36
15	65.08	59.04	65.20	50.22	**66.78**	51.72	64.58	50.02	63.00	51.88

* Cases of the location parameter arrangements are given on page 38

Table 5.183. Percentage of Rejection for k = 5; T-Distribution: Block = 8, n_1 = 20 and $n_2 = n_3 = n_4 = n_5 = 5$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.96	4.96	5.18	4.96	5.36	5.10	5.32	5.24	5.14	5.06
2	23.72	22.02	23.90	18.50	24.02	18.92	**24.26**	19.00	22.70	19.34
3	18.76	15.70	18.74	14.02	20.16	15.04	20.60	15.74	**21.58**	16.60
4	19.50	16.26	19.56	13.62	20.56	15.14	22.00	16.72	**25.92**	18.80
5	16.02	14.60	15.58	13.20	**16.34**	13.30	15.88	13.50	15.66	13.62
6	19.20	17.42	18.46	14.80	19.70	15.28	**20.00**	15.06	19.20	15.68
7	27.76	26.28	27.52	22.86	**27.96**	22.92	27.64	22.54	25.20	21.76
8	26.76	22.52	26.22	18.88	28.30	20.82	29.10	21.78	**32.92**	24.72
9	23.72	19.90	23.10	16.60	25.12	17.94	24.78	18.52	**25.70**	19.76
10	31.20	27.88	30.88	23.26	32.24	25.12	**32.70**	24.92	32.34	25.96
11	14.34	12.04	14.02	10.60	15.12	11.28	15.56	11.68	**16.84**	12.72
12	37.34	30.16	36.84	24.90	40.00	28.10	41.64	30.26	**46.88**	34.94
13	44.18	38.68	43.46	32.46	46.20	34.52	46.14	34.70	**46.88**	36.88
14	29.24	26.62	28.72	23.32	**29.32**	23.82	28.58	22.84	25.38	21.96
15	28.46	25.20	27.84	21.54	**28.66**	21.68	28.22	21.62	26.58	22.14

* Cases of the location parameter arrangements are given on page 38

Table 5.184. Percentage of Rejection for k = 5; Normal Distribution: Block = 8, $n_1 = n_2 = n_4 = n_5 = 5$ and $n_3 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.50	3.88	4.40	4.04	4.80	4.80	4.82	4.62	5.20	4.84
2	25.02	19.94	24.80	16.92	**26.44**	20.24	26.08	20.50	24.00	17.56
3	20.88	17.30	20.66	14.22	22.58	17.48	22.36	17.80	**24.98**	19.30
4	24.04	18.54	23.38	15.02	26.72	19.64	27.94	21.00	**34.90**	24.48
5	18.64	15.26	18.72	13.28	**19.68**	15.30	18.94	15.24	18.64	14.58
6	22.10	17.18	22.02	14.62	23.16	17.10	22.30	17.16	**23.50**	18.22
7	29.60	24.44	29.36	20.34	**31.44**	24.10	30.80	24.24	27.32	20.32
8	33.40	27.18	33.58	22.20	35.64	26.48	34.96	26.68	**43.22**	31.98
9	28.88	22.92	27.98	18.82	29.50	21.46	28.20	21.26	**33.50**	24.94
10	33.86	26.76	33.26	21.30	**35.58**	25.66	35.06	26.00	34.26	23.42
11	16.24	13.52	16.14	11.28	17.52	13.82	17.52	13.66	**20.98**	15.92
12	46.34	36.62	45.58	28.64	49.36	35.28	50.26	36.78	**61.40**	45.10
13	54.80	43.42	53.72	35.16	55.42	38.94	53.76	38.66	**58.70**	42.12
14	29.04	23.02	28.68	18.60	**30.16**	22.04	28.90	21.72	23.64	17.66
15	31.86	25.10	31.68	20.78	**32.52**	23.20	31.16	23.18	30.10	21.46

* Cases of the location parameter arrangements are given on page 38

Table 5.185. Percentage of Rejection for k = 5; Exponential Distribution: Block = 8, $n_1 = n_2 = n_4 = n_5 = 5$ and $n_3 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.14	4.02	4.08	4.10	4.68	4.80	4.88	4.62	4.70	4.94
2	49.06	38.78	49.20	31.46	**50.50**	35.78	48.98	35.66	45.60	30.38
3	39.72	30.72	39.70	24.74	41.66	29.22	41.84	29.94	**45.82**	30.48
4	38.94	28.00	37.88	21.86	42.62	28.96	45.44	31.82	**57.86**	37.84
5	34.42	28.40	34.02	23.06	**34.98**	25.74	33.62	24.66	31.92	22.54
6	38.00	31.00	37.62	25.44	39.28	28.38	37.70	28.20	**41.46**	29.42
7	54.42	44.00	54.40	35.90	**56.48**	40.46	54.78	40.38	48.72	32.40
8	60.30	47.62	60.00	36.86	62.10	42.96	60.56	43.60	**73.92**	53.98
9	48.18	39.14	47.58	30.94	48.72	34.36	46.44	33.32	**56.84**	40.84
10	60.58	49.44	60.72	40.08	**62.40**	45.16	60.44	44.86	60.74	40.38
11	27.84	21.10	27.28	17.04	29.98	21.02	29.84	21.76	**37.10**	25.36
12	73.14	58.74	72.22	46.52	75.62	54.94	75.32	56.44	**89.44**	70.76
13	82.26	71.40	82.10	59.32	82.36	63.64	80.16	62.58	**86.42**	68.92
14	55.48	45.00	54.92	37.18	**56.28**	40.86	53.98	40.08	44.06	29.22
15	**57.82**	47.48	57.44	38.74	57.56	41.82	54.86	40.68	53.30	37.14

* Cases of the location parameter arrangements are given on page 38

Table 5.186. Percentage of Rejection for $k = 5$; T-Distribution: Block = 8, $n_1 = n_2 = n_4 = n_5 = 5$ and $n_3 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.28	4.04	3.92	4.24	4.58	4.54	4.44	4.42	4.92	4.90
2	19.94	15.72	20.00	13.18	21.48	16.14	21.40	16.68	**19.62**	14.82
3	17.84	14.98	17.46	12.28	18.64	15.32	19.14	15.58	**20.78**	15.86
4	18.22	15.04	18.76	12.68	20.26	15.64	20.56	16.40	**25.64**	19.20
5	14.88	12.54	14.32	11.04	**15.24**	12.38	14.38	11.80	14.56	11.32
6	17.20	13.54	16.84	11.50	17.94	13.24	17.76	12.84	**18.62**	13.52
7	22.34	17.42	21.96	14.44	**23.82**	17.20	23.48	17.48	20.84	14.50
8	26.54	20.40	26.22	16.56	27.92	19.74	27.60	20.30	**33.44**	23.92
9	20.48	17.52	20.22	14.16	21.22	16.94	20.72	16.74	**23.44**	18.98
10	26.44	21.12	26.10	16.80	**27.90**	20.56	27.62	20.86	26.70	18.64
11	13.54	11.16	13.42	9.66	14.74	11.96	14.52	12.22	**16.70**	13.30
12	33.78	26.64	33.78	21.40	37.26	26.80	37.96	28.22	**46.64**	32.62
13	39.70	31.60	38.62	25.96	40.76	29.08	39.04	28.76	**42.72**	31.10
14	22.56	17.64	21.78	14.06	**23.40**	16.92	23.04	17.14	18.64	13.66
15	24.20	19.90	23.98	16.64	**25.42**	18.96	24.06	18.22	22.72	16.88

* Cases of the location parameter arrangements are given on page 38

Table 5.187. Percentage of Rejection for $k = 5$; Normal Distribution: Block = 8, $n_1 = n_2 = n_3 = n_4 = 5$ and $n_5 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.12	4.94	5.10	4.72	4.94	4.78	4.78	4.92	5.20	4.96
2	32.06	29.32	31.12	25.50	**32.42**	25.92	32.32	25.64	29.38	23.46
3	32.76	31.20	31.98	27.70	31.74	26.56	30.66	24.90	**33.42**	27.60
4	46.12	47.90	45.06	44.14	42.34	39.34	40.78	36.52	**51.46**	46.72
5	21.56	18.34	20.86	15.74	**22.08**	16.52	21.50	16.52	19.72	14.70
6	25.58	23.84	25.30	20.68	25.62	20.98	25.38	20.02	**25.70**	20.20
7	34.76	31.46	34.44	26.44	35.30	27.52	**35.34**	27.44	31.26	23.90
8	50.54	48.82	49.40	43.20	49.20	41.28	47.00	38.40	**54.42**	44.76
9	34.30	30.94	33.66	26.82	34.82	27.60	33.40	26.20	**35.72**	27.94
10	**46.52**	43.44	46.16	38.04	46.28	37.58	44.92	36.42	44.10	35.58
11	26.08	25.48	25.60	23.18	25.02	22.30	23.98	20.92	**27.78**	23.86
12	74.44	73.20	73.22	67.58	71.34	63.54	68.50	59.56	**79.74**	70.50
13	63.78	57.34	62.92	48.76	**64.98**	50.36	63.06	48.60	62.66	47.92
14	32.86	28.02	32.76	23.18	34.78	25.48	**34.94**	25.74	27.64	19.84
15	34.28	29.92	34.42	25.12	**35.78**	26.30	35.24	26.42	31.94	23.74

* Cases of the location parameter arrangements are given on page 38

Table 5.188. Percentage of Rejection for k = 5; Exponential Distribution: Block = 8, $n_1 = n_2 = n_3 = n_4 = 5$ and $n_5 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.22	5.62	5.12	5.80	5.32	5.74	5.26	5.54	5.10	5.62
2	**58.88**	53.20	58.52	46.02	58.68	46.08	57.18	44.48	54.38	41.26
3	57.70	57.74	57.86	51.50	56.16	48.46	54.14	45.58	**60.96**	51.86
4	72.58	74.30	71.68	69.70	67.98	62.78	65.24	58.44	**79.38**	72.34
5	39.16	34.80	39.00	29.96	**40.30**	30.82	39.14	30.50	36.24	28.06
6	46.98	41.48	46.32	36.14	**47.74**	36.54	45.98	35.80	45.18	33.98
7	62.60	57.36	62.92	49.64	**63.50**	50.38	62.32	49.52	57.24	43.58
8	80.48	76.92	80.40	70.28	77.94	66.50	74.22	62.64	**84.60**	72.04
9	59.60	54.56	59.46	47.80	60.78	48.68	58.68	46.46	**62.54**	48.64
10	**75.58**	70.42	75.34	63.40	74.60	61.76	72.74	59.42	74.88	60.74
11	46.76	45.82	46.76	41.50	45.06	38.32	42.88	35.90	**50.96**	42.72
12	93.14	91.92	92.80	87.90	90.42	83.04	87.76	78.08	**96.36**	89.00
13	87.04	80.82	86.82	72.54	**87.80**	74.34	86.00	71.74	86.80	71.00
14	57.76	50.14	57.32	42.08	**60.50**	44.98	59.56	45.18	48.54	35.34
15	62.92	54.96	62.40	46.44	**64.44**	49.34	63.06	48.50	58.26	42.76

* Cases of the location parameter arrangements are given on page 38

Table 5.189. Percentage of Rejection for k = 5; T-Distribution: Block = 8, $n_1 = n_2 = n_3 = n_4 = 5$ and $n_5 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.40	5.10	5.10	4.72	5.22	5.22	5.26	5.52	5.30	4.90
2	25.44	23.66	24.74	20.74	**25.80**	21.16	25.64	20.76	22.80	18.66
3	23.98	22.90	23.80	20.32	23.70	19.64	22.54	19.06	**24.62**	20.78
4	35.58	36.78	35.20	33.60	32.78	29.98	31.22	27.74	**39.80**	35.60
5	16.94	14.96	16.80	13.10	**17.40**	14.06	17.36	13.46	16.20	12.54
6	19.52	18.10	19.10	16.14	**20.42**	16.52	19.68	15.90	18.82	15.62
7	27.30	24.08	27.06	21.32	**27.64**	21.60	27.26	21.74	24.00	18.92
8	39.28	37.76	39.18	33.44	38.42	32.74	36.76	30.52	**41.86**	34.40
9	26.12	23.84	25.56	20.84	26.60	21.88	25.42	20.80	**27.52**	20.86
10	**36.28**	33.90	35.26	30.18	35.90	29.96	35.24	28.82	34.88	28.60
11	19.28	18.82	18.80	16.58	18.26	16.06	18.30	15.38	**20.80**	17.44
12	56.54	56.54	55.82	51.56	53.66	47.94	51.54	43.96	**62.44**	53.52
13	48.08	43.86	47.90	37.52	**48.66**	38.54	47.26	37.06	47.46	36.48
14	25.06	21.52	24.68	17.68	**26.52**	19.52	26.46	19.98	21.10	15.34
15	28.12	25.14	27.72	21.32	29.12	22.42	**28.52**	22.24	27.10	20.08

* Cases of the location parameter arrangements are given on page 38

5.3.3. Portion of the RCBD is smaller than the CRD

Here, we discuss the results of the simulation study when the proportion of the number of blocks in the *RCBD* portion is *smaller* than the sample size in the *CRD* portion. In terms of the level of significance (α), all the proposed methods maintain their type-I error. The estimated type-I are close to 0.05 which is the desired level of significance. This holds for $k = 3$, 4 and 5 regardless of the underlying distribution.

For $k = 3$, we note that when the sample sizes follow nonincreasing pattern (e.g., $n_1 = 16$ and $n_2 = n_3 = 8$), the proposed methods T_1, T_3, T_5 and C_1 are close to each other in terms of the estimated powers. This can be observed when the last two parameters are similar and the first one is distinct such as (0, 1, 1). Notice that there are also situations in which the proposed methods T_1, T_3, T_5, T_7 and C_1 have approximately equal estimated powers, for example, when the location parameters are unequally distant such as (0.05, 0.25, 0.5) and (0.2, 0.5, 8). Otherwise, T_7 is the most powerful proposed method.

Further, the results indicate that when the sample sizes follow an umbrella pattern (e.g., $n_1 = n_3 = 8$ and $n_2 = 16$) are similar to those in the nonincreasing pattern. However, we observe that when the sample sizes follow nondecreasing pattern (e.g., $n_1 = n_2 = 8$ and $n_3 = 16$), the results are similar with a few exceptions. The exceptions arise when the location parameters follow the pattern that the last two parameters are the same such as (0.5, 1, 1). In this case, the proposed methods T_3, T_5 tend to have the highest estimated powers.

For $k = 4$, when the sample sizes follow the nonincreasing pattern (e.g., $n_1 = 20$ and $n_2 = n_3 = n_4 = 10$), we find that the proposed method T_7 has the highest estimated powers among the other methods. This can be seen under many cases such as (0,0,0,0.5), (0.05, 0.1, 0.3, 0.5) and (0, 0, 0.05, 0.3). The same results hold when the sample sizes follow the umbrella pattern. However,

under the nondecreasing pattern of sample sizes, we note that T_7 and C_1 both have the best performance compared to the other methods.

For $k = 5$, the results reveal that when we have sample sizes follow a nonincreasing pattern (e.g., $n_1 = 16$ and $n_2 = n_3 = n_4 = n_5 = 8$), there are cases where the proposed methods T_1, T_3, T_5, T_7 and C_1 have similar powers to each other such as (0, 0, 0.25, 0.25, 0.5), cases where the proposed methods T_1, T_3, T_5 and C_1 are having similar estimated powers such as (0.05, 0.15, 0.25, 0.35, 0.45), and cases where only the proposed method T_7 has the highest estimated powers such as (0, 0, 0, 0.1, 0.3). In general, the proposed method T_7 has the highest estimated powers in several cases. This is also true if we assume the sample sizes in the *CRD* portion follow the umbrella and the nondecreasing patterns. The results are presented in the following tables.

Table 5.190. Percentage of Rejection for $k = 3$; Normal Distribution: Block = 8, $n_1 = 16$ and $n_2 = n_3 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.66	4.92	4.82	4.88	4.78	4.80	4.68	4.74	5.24	4.58
2	34.78	27.64	34.44	26.00	36.38	28.26	37.16	29.60	**41.48**	31.88
3	**43.36**	38.98	42.88	37.06	42.14	35.96	41.34	34.34	34.92	30.70
4	33.22	29.38	33.26	28.02	**33.52**	28.74	33.38	28.92	33.52	28.66
5	**39.48**	34.52	39.34	32.88	39.12	33.14	38.68	32.16	37.32	31.30
6	79.24	64.98	78.58	61.90	82.42	67.90	83.92	71.58	**88.28**	75.28
7	**90.28**	85.74	90.06	83.92	89.04	81.14	88.46	78.54	78.76	72.90
8	86.00	77.92	85.88	75.70	**86.24**	76.12	85.76	75.68	84.64	75.14
9	33.88	28.24	33.64	26.90	35.84	29.28	37.14	30.96	**41.20**	32.82
10	**43.68**	39.62	43.36	37.86	42.08	36.26	41.39	34.36	34.78	31.20
11	78.72	70.12	78.00	67.80	**79.04**	68.28	78.50	68.06	78.78	68.28
12	48.04	39.64	47.80	37.80	48.78	39.36	49.64	39.94	**49.84**	40.40
13	40.16	33.02	39.82	31.40	**40.18**	32.04	39.48	31.72	38.42	31.18
14	51.32	43.66	50.76	41.24	51.30	42.04	**51.50**	41.90	49.58	41.32
15	64.12	52.52	63.44	50.40	66.32	53.74	67.52	55.96	**71.56**	58.30

* Cases of the location parameter arrangements are given on page 38

Table 5.191. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 8, $n_1 = 16$ and $n_2 = n_3 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.16	5.46	5.12	5.42	5.36	5.28	5.42	5.40	5.20	5.20
2	57.34	44.76	57.10	41.88	60.24	46.52	62.08	49.78	**68.12**	53.38
3	**68.86**	63.72	68.08	61.50	67.40	59.22	65.66	56.68	56.18	50.72
4	59.20	50.90	58.80	48.52	59.22	48.50	58.60	47.68	**59.30**	48.30
5	**66.78**	59.66	66.68	57.44	66.46	56.02	65.06	54.48	63.28	54.78
6	93.54	84.04	93.38	81.90	95.24	87.26	95.80	89.80	**98.06**	93.56
7	**97.80**	95.70	97.34	94.76	97.52	94.00	97.36	93.24	92.68	88.84
8	98.22	95.60	98.22	94.42	98.18	93.92	97.72	93.18	**98.26**	94.76
9	56.46	44.60	56.26	42.52	59.66	47.18	61.12	49.98	**67.36**	53.44
10	**69.12**	62.96	68.48	60.92	67.66	58.88	66.14	56.48	56.20	51.28
11	96.00	91.84	96.20	90.48	95.94	90.04	95.16	89.16	**96.70**	91.04
12	76.02	66.26	76.28	63.26	76.74	64.38	75.96	64.22	**79.18**	67.40
13	**67.44**	58.98	67.34	56.50	67.10	55.68	66.10	54.68	66.48	55.28
14	**78.62**	70.40	78.44	67.70	78.30	67.36	76.86	66.36	77.68	67.24
15	88.10	76.78	87.94	74.12	89.58	77.38	90.04	79.24	**93.48**	83.70

* Cases of the location parameter arrangements are given on page 38

Table 5.192. Percentage of Rejection for $k = 3$; T-Distribution: Block = 8, $n_1 = 16$ and $n_2 = n_3 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.32	5.60	5.58	5.52	5.30	5.40	5.26	5.34	5.32	5.08
2	26.78	21.24	26.80	19.98	27.60	21.82	28.42	23.08	**31.14**	24.42
3	**32.86**	30.58	32.66	29.36	32.02	27.92	30.60	26.54	26.30	24.22
4	24.82	22.58	**25.38**	21.54	25.30	21.88	25.76	22.04	24.80	21.42
5	**31.10**	27.32	30.60	26.40	30.40	25.82	30.00	25.44	28.62	24.64
6	63.42	51.56	62.66	48.84	66.40	53.86	68.52	56.68	**74.10**	60.76
7	**75.10**	70.00	74.90	68.00	73.62	65.38	71.82	62.74	62.40	57.52
8	70.58	61.98	70.62	59.76	**71.06**	60.30	70.48	59.78	69.36	59.40
9	27.02	21.78	26.92	20.84	28.16	22.60	28.88	23.76	**31.64**	25.14
10	**32.26**	30.00	31.90	28.94	31.06	27.66	30.65	26.42	26.06	23.90
11	62.26	53.50	61.68	51.12	**62.38**	52.00	62.14	52.04	61.90	51.92
12	36.64	30.68	36.32	29.36	37.26	30.20	37.24	30.32	**38.16**	31.36
13	**29.74**	25.80	29.72	24.88	**29.74**	25.08	29.42	24.58	29.18	24.26
14	38.46	33.54	**38.82**	31.92	38.70	32.26	38.04	31.68	37.70	31.34
15	49.28	39.80	48.64	38.08	51.20	40.52	52.34	41.86	**55.40**	44.44

* Cases of the location parameter arrangements are given on page 38

Table 5.193. Percentage of Rejection for $k = 3$; Normal Distribution: Block = 8, $n_1 = n_3 = 8$ and $n_2 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.80	5.32	4.86	5.24	4.80	5.14	4.88	5.32	4.80	5.34
2	34.24	26.74	34.06	25.12	34.60	25.12	35.14	25.90	**40.86**	31.76
3	35.42	28.30	35.06	26.76	35.64	26.76	**35.72**	27.56	25.80	20.22
4	30.22	24.62	29.82	23.82	**30.32**	23.50	30.28	23.92	30.00	23.24
5	36.22	29.70	35.98	28.28	36.38	28.38	**36.68**	29.12	33.20	25.92
6	78.52	66.08	77.64	62.96	78.84	64.04	79.20	65.24	**87.30**	75.30
7	78.82	65.28	78.38	62.20	**79.26**	63.42	79.06	64.68	59.84	43.60
8	81.78	69.56	81.44	66.74	**81.92**	66.58	81.26	67.18	79.08	64.18
9	33.82	27.44	33.90	26.16	34.06	26.40	34.10	27.06	**40.50**	31.96
10	34.82	28.38	34.90	26.82	**35.06**	26.74	34.86	27.72	26.32	19.52
11	72.44	60.60	72.20	58.00	**72.82**	58.20	72.14	58.76	71.60	56.54
12	45.74	37.20	45.40	35.38	45.86	35.28	45.60	36.00	**46.36**	35.96
13	34.12	27.30	33.96	25.96	**34.24**	25.88	34.02	26.56	33.10	25.36
14	44.44	36.36	44.36	34.48	**44.70**	34.34	44.50	35.12	43.18	33.56
15	63.40	51.04	62.68	48.10	63.30	48.50	63.04	49.44	**70.68**	55.84

* Cases of the location parameter arrangements are given on page 38

Table 5.194. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 8, $n_1 = n_3 = 8$ and $n_2 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.14	5.02	5.28	4.96	5.30	4.78	5.40	4.96	5.18	4.92
2	57.30	44.38	56.52	41.72	57.60	42.64	57.44	44.32	**68.38**	52.92
3	55.72	45.48	55.54	43.62	56.12	44.10	**56.22**	44.98	41.56	30.42
4	54.56	43.80	**55.04**	41.58	54.28	40.92	52.90	40.98	53.50	40.08
5	61.18	50.88	**61.40**	48.46	60.72	47.38	59.62	47.52	56.70	42.70
6	**93.60**	83.34	93.22	80.34	93.26	81.20	93.00	82.20	98.26	93.02
7	91.14	79.34	90.34	77.22	91.66	78.62	**92.26**	80.28	77.56	59.08
8	96.16	89.74	96.30	88.12	95.88	86.94	94.82	86.14	**96.54**	87.58
9	56.86	44.52	56.44	41.80	**56.96**	42.46	56.94	44.02	67.68	53.26
10	57.12	46.76	56.70	44.64	57.24	44.74	**57.62**	45.88	42.58	30.98
11	93.86	84.94	93.70	83.30	93.26	81.92	91.92	80.92	**94.14**	83.22
12	72.86	60.38	72.90	57.44	72.40	56.88	70.50	57.16	**75.34**	59.80
13	61.20	50.70	**61.44**	48.26	60.78	47.98	59.32	48.02	59.22	45.58
14	72.94	60.04	**73.28**	57.72	72.48	56.56	70.32	56.34	71.28	55.60
15	86.88	75.56	86.54	72.74	86.46	72.66	85.82	73.14	**93.22**	82.76

* Cases of the location parameter arrangements are given on page 38

Table 5.195. Percentage of Rejection for $k = 3$; T-Distribution: Block = 8, $n_1 = n_3 = 8$ and $n_2 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.92	5.44	4.90	5.32	5.04	5.26	5.16	5.38	5.22	5.12
2	26.00	21.64	26.40	20.50	26.12	20.66	26.42	21.30	**31.78**	24.56
3	26.28	21.94	**26.42**	20.56	26.22	20.82	26.08	21.28	20.48	16.38
4	**22.70**	19.48	22.68	18.66	22.64	18.50	22.68	18.52	21.96	18.42
5	**27.94**	21.90	27.66	20.60	**27.94**	20.34	27.62	21.00	25.54	18.78
6	62.74	50.94	61.78	48.46	63.28	49.00	63.42	50.56	**73.22**	59.80
7	63.30	50.30	62.34	47.74	63.40	48.16	**63.66**	49.72	46.78	34.02
8	65.04	52.56	64.80	50.14	**65.14**	49.96	64.88	50.44	62.18	47.90
9	27.10	21.10	26.72	20.08	27.04	20.10	27.24	20.96	**32.16**	24.62
10	26.78	21.24	26.76	20.42	**26.94**	20.08	26.76	20.62	19.92	15.04
11	**56.80**	45.40	56.56	43.36	56.68	43.30	56.00	43.46	55.56	42.68
12	34.84	27.50	34.74	25.98	35.04	25.96	34.36	26.52	**36.02**	27.46
13	25.84	21.06	25.46	19.90	25.84	19.86	**25.90**	20.54	25.14	19.94
14	35.46	28.70	35.16	27.06	**35.80**	27.40	35.42	28.04	33.84	26.90
15	49.06	38.74	48.66	36.98	49.18	36.74	48.88	37.24	**55.88**	43.30

* Cases of the location parameter arrangements are given on page 38

Table 5.196. Percentage of Rejection for $k = 3$; Normal Distribution: Block = 8, $n_1 = n_2 = 8$ and $n_3 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.90	4.94	4.84	4.78	4.96	4.68	5.14	4.62	4.70	4.80
2	42.96	39.32	42.88	37.80	41.60	36.42	40.26	35.04	**47.20**	39.78
3	34.86	27.56	34.48	25.90	36.46	28.52	**37.58**	29.98	28.10	21.06
4	33.70	28.64	33.24	27.26	**33.74**	27.50	33.00	27.16	33.28	25.96
5	38.10	33.02	37.70	31.30	38.66	32.12	**39.02**	31.84	35.60	29.10
6	90.28	85.78	89.78	84.22	89.14	81.76	88.12	79.08	**93.46**	87.10
7	78.58	64.38	77.66	61.44	81.60	67.22	**83.18**	70.16	65.44	49.36
8	86.38	79.24	86.32	76.78	**86.50**	77.12	85.72	76.88	84.90	73.48
9	43.30	39.86	43.36	38.48	42.12	36.60	40.54	34.76	47.20	39.86
10	35.20	27.94	34.76	26.28	36.90	28.20	**38.18**	29.70	28.10	21.58
11	**80.00**	71.10	79.72	69.02	79.98	68.70	79.54	68.22	78.94	66.72
12	52.92	45.80	52.54	44.00	52.06	43.14	51.32	42.26	**53.16**	42.78
13	**39.62**	33.52	39.20	32.26	39.52	32.56	39.18	32.62	37.76	30.64
14	49.98	42.54	49.66	40.98	**50.08**	40.76	49.38	40.22	48.04	38.58
15	75.38	68.82	75.34	66.62	73.94	64.24	72.44	62.20	**79.00**	68.66

* Cases of the location parameter arrangements are given on page 38

Table 5.197. Percentage of Rejection for $k = 3$; Exponential Distribution: Block = 8, $n_1 = n_2 = 8$ and $n_3 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.66	4.94	4.82	4.76	4.62	4.86	4.56	4.92	4.94	4.74
2	70.54	65.08	70.32	62.72	68.74	59.82	66.34	56.84	**76.64**	65.26
3	56.00	45.44	55.90	42.82	58.84	46.94	**60.14**	48.88	45.52	35.46
4	**60.86**	51.90	60.60	49.90	59.86	49.28	58.66	47.86	58.88	47.74
5	63.72	54.80	63.78	52.84	**63.82**	53.40	63.40	52.70	60.60	48.76
6	97.94	95.36	97.86	94.08	97.22	91.98	96.16	90.08	**99.10**	96.00
7	91.36	79.72	90.56	77.42	93.00	82.32	**93.88**	84.74	81.60	66.82
8	97.16	92.64	**97.20**	91.42	96.82	90.50	96.40	89.12	96.58	89.58
9	69.80	64.08	69.34	62.10	68.10	59.18	65.62	56.54	**75.80**	65.30
10	55.00	45.02	54.04	43.44	57.46	46.84	**59.46**	49.36	44.72	34.88
11	95.42	89.86	95.56	88.68	94.98	87.70	94.04	86.28	**95.46**	87.22
12	79.12	70.72	78.86	68.52	78.08	66.70	76.18	64.74	**79.56**	67.98
13	**66.26**	58.12	66.10	56.32	65.86	55.58	64.30	54.60	64.46	53.84
14	77.08	68.94	**77.36**	66.72	76.80	65.86	75.04	64.48	75.62	63.72
15	93.46	88.44	93.46	86.62	92.48	84.34	90.84	81.62	**95.36**	88.00

* Cases of the location parameter arrangements are given on page 38

Table 5.198. Percentage of Rejection for $k = 3$; T-Distribution: Block = 8, $n_1 = n_2 = 8$ and $n_3 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.52	6.22	5.54	5.98	5.54	5.76	5.46	5.78	5.34	5.72
2	33.76	30.74	33.62	29.18	32.72	27.72	31.16	26.54	**36.66**	31.16
3	27.30	22.38	27.48	21.30	28.74	22.76	**29.58**	23.60	22.36	17.34
4	28.12	23.88	28.42	22.64	**28.44**	22.50	28.08	22.90	27.56	21.52
5	28.86	25.34	28.92	24.26	29.70	25.32	**29.38**	25.44	27.24	22.74
6	75.98	70.12	75.08	67.98	74.42	65.14	72.70	62.12	**80.68**	71.68
7	62.62	49.80	62.24	47.36	65.32	52.12	**66.54**	54.82	50.82	38.24
8	69.74	61.98	69.54	59.72	**70.00**	60.04	**70.02**	59.66	68.02	56.96
9	32.98	30.56	33.02	29.36	31.90	27.94	31.12	26.60	**36.44**	30.74
10	25.34	21.86	25.68	20.70	26.64	22.66	**27.60**	23.88	20.74	17.10
11	**65.68**	57.28	64.94	54.90	65.52	55.14	64.36	54.48	63.52	52.56
12	38.18	33.86	38.42	32.30	38.34	32.10	37.46	31.54	**38.48**	31.64
13	**29.98**	26.24	29.74	24.80	29.92	25.14	29.60	25.08	28.86	23.36
14	37.48	32.50	37.04	30.44	**37.78**	30.96	37.54	30.90	36.74	28.70
15	58.70	53.44	58.46	51.00	57.34	49.80	56.12	47.74	**62.94**	52.42

* Cases of the location parameter arrangements are given on page 38

Table 5.199. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 8, $n_1 = 20$ and $n_2 = n_3 = n_4 = 10$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.22	4.70	5.02	4.80	5.22	4.86	5.26	4.94	4.98	4.72
2	24.36	22.06	24.02	21.10	**24.50**	21.04	24.18	20.82	23.40	20.78
3	23.16	21.58	23.04	20.40	**23.50**	21.00	22.82	20.66	23.22	20.58
4	**21.20**	19.76	21.02	19.52	20.96	19.16	20.26	18.64	17.84	16.68
5	35.18	28.12	34.82	26.84	36.74	28.26	38.60	30.66	**45.66**	34.38
6	41.08	33.92	40.82	32.04	41.88	32.72	41.62	32.78	**43.12**	34.22
7	**53.82**	48.66	53.40	46.62	53.40	45.58	51.64	44.34	44.38	39.08
8	**88.90**	84.50	88.54	82.50	88.58	81.52	88.66	81.78	85.26	78.08
9	87.52	80.10	86.52	77.12	88.18	78.68	87.84	79.38	**89.66**	80.94
10	23.60	20.08	23.22	19.42	**23.72**	19.34	22.98	19.18	22.90	18.70
11	67.18	58.42	66.42	55.56	68.26	57.12	69.00	58.06	**71.16**	60.88
12	27.02	23.38	26.94	22.24	28.10	22.96	28.48	23.36	**28.98**	24.10
13	41.20	35.30	40.20	33.50	41.64	34.30	**41.92**	35.12	41.80	35.04
14	21.42	18.22	20.74	17.64	21.82	18.52	22.70	19.00	**24.62**	20.40
15	49.66	40.42	49.28	38.30	51.48	40.28	53.18	42.58	**59.90**	47.82

* Cases of the location parameter arrangements are given on page 38

Table 5.200. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 8, $n_1 = 20$ and $n_2 = n_3 = n_4 = 10$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.02	5.12	5.22	5.22	5.02	5.20	4.98	5.20	5.06	5.18
2	46.78	40.80	**47.10**	38.76	46.10	37.96	45.12	37.18	43.56	36.46
3	43.04	36.02	41.98	34.12	**43.94**	34.94	42.30	34.20	42.36	34.16
4	**40.78**	36.70	40.42	35.10	40.04	33.64	38.28	32.20	33.00	28.34
5	57.66	46.34	56.72	42.72	60.54	46.68	63.46	50.76	**73.66**	58.80
6	70.00	60.86	69.80	57.58	70.76	58.34	69.94	58.40	**73.00**	62.06
7	**82.64**	77.82	82.08	75.30	82.08	73.46	80.00	71.38	72.68	65.14
8	**99.18**	97.82	99.06	97.04	99.06	96.38	98.98	96.16	98.88	96.54
9	99.04	97.20	99.04	96.50	98.98	96.28	98.72	96.06	**99.46**	97.88
10	43.06	36.12	42.72	34.64	**43.62**	35.00	42.30	34.52	41.92	34.22
11	92.46	86.42	92.40	83.94	92.74	84.46	92.10	84.32	**94.76**	88.74
12	49.64	42.32	49.74	40.46	50.30	40.78	50.18	41.52	**52.68**	43.36
13	71.70	64.46	70.86	61.82	71.64	61.38	71.74	61.90	**74.18**	64.18
14	35.46	28.08	35.32	26.68	37.06	28.54	38.36	29.90	**43.26**	33.54
15	76.32	65.34	75.52	62.06	78.24	65.18	79.42	67.78	**88.36**	76.96

* Cases of the location parameter arrangements are given on page 38

Table 5.201. Percentage of Rejection for $k = 4$; T-Distribution: Block = 8, $n_1 = 20$ and $n_2 = n_3 = n_4 = 10$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.14	5.12	4.90	5.08	4.94	4.88	4.74	5.02	5.26	5.04
2	19.34	17.36	19.02	16.58	19.20	16.56	**19.56**	16.56	17.90	15.98
3	18.14	15.82	18.10	15.02	**18.24**	15.46	17.86	15.34	18.22	15.50
4	**16.96**	15.98	16.74	15.38	16.92	15.02	16.06	14.62	15.24	13.70
5	27.52	22.50	26.88	21.46	28.48	22.44	30.22	23.84	**34.70**	26.54
6	30.68	26.32	30.28	25.32	31.40	25.84	31.24	26.44	**32.74**	27.10
7	**41.18**	35.88	40.82	34.30	40.74	33.64	39.36	32.64	34.18	29.18
8	**75.66**	69.38	75.16	66.48	75.22	65.16	75.16	65.22	71.06	62.30
9	72.32	63.14	71.62	59.94	73.42	62.02	72.58	62.44	**75.48**	63.90
10	18.52	16.06	18.34	15.28	**18.98**	15.68	18.38	15.42	18.16	16.20
11	51.04	43.10	50.28	41.16	52.32	42.22	52.90	43.44	**54.74**	45.24
12	21.20	17.92	20.64	17.32	21.38	17.76	21.40	17.56	**22.48**	19.02
13	32.54	27.98	31.76	26.64	32.58	26.94	**32.62**	27.78	32.56	27.32
14	16.28	14.04	16.10	13.54	17.02	14.08	17.26	14.64	**19.50**	15.88
15	36.46	29.68	35.84	28.16	37.56	29.66	38.58	31.30	**44.52**	34.94

* Cases of the location parameter arrangements are given on page 38

Table 5.202. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 8, $n_1 = n_3 = n_4 = 10$ and $n_2 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.94	4.94	5.08	4.90	5.02	4.78	4.90	4.76	4.82	4.74
2	**23.00**	18.92	22.54	18.48	22.86	18.24	22.46	18.06	21.32	17.20
3	**23.10**	19.72	22.76	19.26	23.02	18.96	21.86	18.26	22.72	18.64
4	**19.54**	17.34	19.20	16.70	19.14	15.98	18.92	15.54	16.92	14.06
5	35.30	27.78	34.72	26.28	37.62	29.22	38.44	30.78	**45.34**	34.94
6	40.32	33.12	39.18	31.52	40.82	32.62	40.42	32.80	**42.08**	34.20
7	**46.38**	38.32	45.58	36.52	45.70	35.78	44.84	35.40	38.10	29.68
8	82.16	70.24	81.38	67.08	82.64	67.96	**83.12**	69.14	76.78	61.24
9	85.08	77.14	84.70	74.34	85.74	75.54	85.38	75.34	**87.60**	77.88
10	22.76	20.36	22.58	19.56	22.76	19.48	21.76	18.58	**22.86**	19.12
11	64.42	54.24	63.14	51.16	65.52	53.16	65.68	54.06	**68.20**	55.46
12	26.72	22.32	26.54	20.70	27.20	21.76	27.36	22.16	**29.06**	22.42
13	38.22	31.24	37.56	29.26	38.60	30.24	**39.38**	31.42	38.12	30.02
14	20.20	16.72	20.42	16.06	21.10	17.20	21.26	17.66	**23.94**	19.32
15	50.12	40.10	49.06	37.96	52.38	41.28	53.02	43.34	**59.74**	48.22

* Cases of the location parameter arrangements are given on page 38

Table 5.203. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 8, $n_1 = n_3 = n_4 = 10$ and $n_2 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.10	5.14	4.78	5.06	4.90	5.08	4.90	5.10	4.60	5.10
2	**41.04**	34.34	40.52	32.64	40.64	32.12	39.96	31.38	38.04	29.74
3	**41.82**	35.72	40.82	33.80	41.64	34.04	39.78	33.08	40.98	34.08
4	**35.10**	29.26	34.70	27.90	34.28	26.66	32.96	25.54	27.62	21.68
5	56.96	44.96	56.28	42.18	60.28	47.78	62.58	51.46	**72.76**	58.02
6	68.70	58.60	68.24	55.68	68.80	55.96	67.02	55.06	**71.78**	58.32
7	**74.50**	65.28	73.98	62.72	73.28	59.86	71.12	58.10	62.98	50.80
8	96.92	91.94	96.82	89.58	97.08	90.00	**96.94**	90.34	96.48	87.00
9	98.30	95.56	98.44	94.24	98.30	94.26	98.04	93.50	**99.28**	96.60
10	**41.12**	34.78	40.40	32.78	40.72	32.60	39.34	31.18	40.50	32.30
11	89.80	82.34	89.40	79.18	90.06	80.18	89.30	79.60	**93.28**	83.86
12	47.32	40.04	47.20	38.08	48.18	39.06	47.58	38.90	**50.78**	40.70
13	64.78	54.66	64.76	51.20	65.28	52.02	65.24	52.28	**67.20**	52.12
14	35.32	29.16	34.64	27.46	37.16	29.54	37.66	30.52	**43.40**	32.94
15	75.44	64.04	75.00	60.50	77.80	65.18	78.48	66.78	**87.64**	75.08

* Cases of the location parameter arrangements are given on page 38

Table 5.204. Percentage of Rejection for $k = 4$; T-Distribution: Block = 8, $n_1 = n_3 = n_4 = 10$ and $n_2 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.84	4.74	4.92	4.96	4.80	4.72	4.84	4.76	5.00	4.88
2	17.58	15.22	17.14	14.64	17.68	15.02	**17.78**	15.24	17.02	14.32
3	**17.96**	16.42	17.78	15.78	17.70	15.66	16.92	15.02	17.04	15.82
4	**16.34**	14.62	16.24	14.16	16.02	13.96	15.64	13.60	14.14	12.64
5	27.40	21.54	27.48	20.68	29.12	22.34	30.08	23.68	**35.42**	26.88
6	29.76	25.12	29.36	23.90	30.00	24.28	29.88	24.14	**30.88**	25.34
7	**35.88**	30.50	35.52	28.92	35.24	28.00	34.20	27.20	28.68	23.10
8	65.68	53.24	65.00	50.80	66.16	51.60	**66.70**	52.98	60.58	44.96
9	69.72	59.24	68.86	55.82	70.36	57.22	70.10	57.34	**72.72**	60.30
10	**18.90**	16.28	18.70	15.88	18.92	15.72	18.50	14.88	18.76	15.32
11	48.84	39.90	48.06	37.64	49.94	39.94	49.50	40.72	**52.84**	41.32
12	20.40	18.06	20.08	17.44	20.82	17.82	20.66	18.20	**22.80**	18.70
13	28.56	23.44	28.22	22.76	29.00	23.48	**29.36**	23.82	29.16	22.78
14	17.16	14.56	16.94	14.16	18.04	14.76	17.94	14.88	**19.78**	16.36
15	37.48	30.64	36.60	29.18	39.00	31.42	40.12	32.86	**45.64**	37.14

* Cases of the location parameter arrangements are given on page 38

Table 5.205. Percentage of Rejection for $k = 4$; Normal Distribution: Block = 8, $n_1 = n_2 = n_3 = 10$ and $n_4 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.06	5.54	5.10	5.68	4.84	5.28	5.08	5.20	5.08	5.70
2	**24.68**	21.96	24.36	21.18	**24.68**	21.12	**24.68**	21.10	23.42	19.98
3	23.58	20.12	22.86	19.28	**23.80**	19.50	22.94	19.08	22.44	18.86
4	19.24	17.02	19.00	16.56	19.72	17.10	**20.00**	17.30	15.84	13.52
5	48.50	46.86	47.78	44.84	45.90	41.56	44.90	39.70	**55.66**	49.34
6	44.32	39.94	43.74	37.84	44.10	36.80	43.08	35.90	**44.52**	37.78
7	45.84	38.20	44.94	35.76	47.06	37.60	**47.20**	38.28	37.24	29.46
8	**89.14**	84.04	88.94	81.86	89.00	81.28	88.94	81.30	84.60	76.98
9	**91.92**	86.90	90.96	84.72	91.88	83.84	91.04	82.56	91.66	84.30
10	22.88	19.38	22.36	18.46	**23.46**	18.46	23.04	18.38	21.24	18.26
11	75.38	68.54	74.62	65.66	74.36	64.50	73.68	63.22	**76.30**	66.46
12	30.76	28.70	30.62	27.70	30.58	27.10	29.68	26.50	**31.54**	27.34
13	**45.08**	41.98	44.48	40.60	44.02	38.82	43.68	38.50	44.66	39.56
14	62.42	60.02	61.42	57.60	60.52	54.10	59.02	52.00	**68.64**	61.56
15	25.96	24.66	25.28	23.66	25.18	22.36	24.22	21.64	**28.12**	25.10

* Cases of the location parameter arrangements are given on page 38

Table 5.206. Percentage of Rejection for $k = 4$; Exponential Distribution: Block = 8, $n_1 = n_2 = n_3 = 10$ and $n_4 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.08	5.02	5.08	4.94	4.98	5.00	5.20	5.18	5.18	4.88
2	44.08	39.14	**44.42**	37.68	44.00	36.86	42.86	36.42	41.46	34.10
3	42.62	36.30	42.20	34.48	**43.48**	35.32	42.66	35.24	39.84	32.82
4	**35.48**	30.18	34.88	28.98	36.08	29.86	35.84	30.26	28.62	23.92
5	76.40	74.12	76.16	71.84	73.34	66.80	71.56	64.36	**85.22**	77.30
6	74.42	68.58	74.12	66.06	73.40	64.16	71.08	61.74	**75.24**	65.20
7	73.10	63.44	72.80	60.76	**74.44**	62.18	74.14	62.92	62.80	51.56
8	98.90	97.50	**98.94**	96.68	98.66	95.16	98.24	94.28	98.52	94.94
9	99.12	97.90	99.24	97.28	98.90	96.36	98.26	94.76	**99.34**	97.02
10	41.94	36.36	40.90	34.72	**42.74**	35.74	41.78	35.30	40.12	32.62
11	94.14	91.96	94.12	90.44	93.02	87.92	91.70	85.38	**95.44**	90.48
12	56.42	51.94	56.42	49.78	55.62	47.54	53.78	46.00	**58.66**	49.78
13	76.00	69.88	75.40	67.54	73.84	64.98	72.54	63.32	**76.04**	66.68
14	46.20	43.10	45.98	41.46	44.38	38.80	42.66	37.34	**50.96**	44.38
15	88.84	85.80	88.56	83.90	86.76	79.64	84.40	76.86	**93.16**	87.30

* Cases of the location parameter arrangements are given on page 38

Table 5.207. Percentage of Rejection for $k = 4$; T-Distribution: Block = 8, $n_1 = n_2 = n_3 = 10$ and $n_4 = 20$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.04	4.94	5.20	5.08	4.90	4.96	5.10	4.84	5.62	4.74
2	18.34	17.00	18.18	16.60	**18.58**	16.30	18.50	16.18	17.68	15.64
3	17.96	15.24	17.02	14.46	**18.14**	14.74	18.02	14.58	17.32	14.00
4	15.24	13.32	14.82	12.86	15.46	13.34	**15.64**	13.34	13.56	11.26
5	37.70	35.82	36.78	34.84	36.12	31.74	35.48	30.46	**42.72**	38.16
6	32.48	29.20	32.30	27.86	32.14	27.58	31.74	27.18	**33.74**	27.86
7	35.06	28.32	34.12	27.18	35.62	28.24	**35.70**	28.78	28.12	23.54
8	**75.26**	69.00	74.40	66.08	74.88	65.26	74.86	65.04	69.84	60.54
9	78.12	71.02	77.60	68.78	77.40	67.58	76.18	65.66	**78.46**	68.08
10	18.96	16.08	18.34	15.28	19.06	15.54	18.68	15.44	**19.12**	15.34
11	57.66	52.74	57.22	50.48	56.92	48.76	55.84	47.46	**59.04**	51.08
12	24.96	22.76	24.30	21.88	24.50	21.20	24.20	20.60	**25.02**	22.48
13	**34.72**	31.84	34.06	30.60	34.00	29.76	33.90	29.22	34.28	29.96
14	20.24	19.22	19.86	18.58	19.42	17.68	18.92	17.14	**21.58**	19.92
15	49.14	46.90	48.54	45.00	47.50	42.34	46.38	41.00	**54.38**	47.50

* Cases of the location parameter arrangements are given on page 38

Table 5.208. Percentage of Rejection for $k = 5$; Normal Distribution: Block = 8, $n_1 = 16$ and $n_2 = n_3 = n_4 = n_5 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.20	5.24	5.10	4.92	5.10	5.00	4.98	4.84	4.80	4.96
2	**35.26**	31.58	34.66	28.44	35.24	28.50	35.22	28.28	32.64	26.48
3	28.96	25.14	28.50	22.24	29.72	23.28	29.78	24.02	**31.96**	26.16
4	30.20	25.10	30.08	21.82	31.32	23.10	33.06	24.98	**39.98**	29.90
5	23.22	20.78	22.80	17.96	**23.54**	18.84	23.16	18.52	22.78	18.82
6	26.44	24.16	25.98	21.00	26.84	21.62	26.40	21.66	**26.82**	22.44
7	**41.74**	38.44	41.10	34.38	41.44	34.36	41.14	33.72	36.24	31.06
8	42.64	36.66	42.48	31.62	44.08	33.58	45.48	34.26	**51.12**	39.46
9	33.94	29.48	33.78	25.70	34.98	27.14	35.00	26.66	**37.08**	29.08
10	44.30	38.74	44.00	34.38	**45.32**	35.58	44.76	35.58	44.74	36.20
11	20.48	18.60	20.28	16.48	21.14	17.62	22.10	18.04	**24.74**	20.16
12	55.94	48.02	55.30	42.08	58.14	44.72	59.88	46.54	**68.94**	54.26
13	65.34	57.72	64.54	51.28	**66.24**	53.40	65.30	52.68	66.08	53.56
14	40.14	36.76	39.70	32.70	**40.46**	32.78	39.10	32.14	33.76	28.54
15	40.96	36.66	40.30	32.30	**41.18**	32.70	40.50	31.76	38.20	31.54

* Cases of the location parameter arrangements are given on page 38

Table 5.209. Percentage of Rejection for k = 5; Exponential Distribution: Block = 8, n_1 = 16 and $n_2 = n_3 = n_4 = n_5 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.88	4.98	4.94	4.96	5.06	4.96	4.96	4.94	5.16	5.22
2	**62.38**	56.64	62.00	51.24	62.02	50.46	60.56	49.20	57.90	47.52
3	53.80	45.82	53.44	40.06	54.58	41.32	54.68	41.86	**57.66**	45.38
4	48.96	40.36	48.48	34.50	51.18	37.60	53.88	40.56	**67.04**	49.86
5	43.24	37.94	42.98	33.50	**44.04**	34.46	42.86	33.34	40.80	32.90
6	**49.90**	43.28	49.14	37.66	50.64	38.96	**49.90**	38.20	49.80	39.76
7	70.96	64.94	**71.06**	59.22	70.42	58.10	68.64	56.76	64.16	53.20
8	71.00	60.64	71.16	52.40	72.70	55.22	72.48	56.56	**82.20**	66.14
9	60.44	51.38	59.54	44.32	62.24	47.48	61.32	47.28	**66.22**	51.20
10	75.46	68.12	74.92	61.28	76.10	62.10	75.26	61.40	**76.42**	62.58
11	34.84	28.68	34.60	24.84	36.50	26.54	37.10	27.80	**42.48**	31.68
12	82.80	74.12	83.06	66.18	84.04	69.24	84.88	71.36	**94.34**	83.38
13	91.28	85.24	90.70	79.66	91.90	80.38	91.06	79.92	**92.28**	82.06
14	**70.40**	64.94	70.06	59.08	70.06	58.44	68.04	56.16	59.72	50.30
15	71.52	64.78	71.50	57.56	**71.94**	57.96	70.38	56.22	68.38	54.86

* Cases of the location parameter arrangements are given on page 38

Table 5.210. Percentage of Rejection for k = 5; T-Distribution: Block = 8, n_1 = 16 and $n_2 = n_3 = n_4 = n_5 = 8$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.12	5.24	5.06	5.28	5.06	5.10	4.94	5.06	5.16	4.88
2	**27.40**	25.06	27.22	22.30	**27.40**	22.84	27.06	22.92	25.00	21.42
3	21.20	19.06	20.76	16.80	21.60	17.56	22.06	17.66	**23.62**	18.66
4	23.54	20.16	23.40	18.24	24.26	18.68	25.26	19.28	**30.00**	22.88
5	18.14	16.32	18.18	15.02	**18.38**	15.36	17.94	14.90	17.58	14.80
6	20.70	18.26	20.22	15.92	21.14	16.70	**21.26**	16.86	20.80	16.84
7	31.26	28.62	31.48	25.68	**31.56**	26.14	31.16	25.72	27.52	22.64
8	32.62	27.48	32.00	23.72	33.28	25.12	33.84	25.96	**39.10**	29.90
9	27.04	23.26	26.64	20.94	27.60	21.96	27.62	21.92	**28.38**	23.40
10	33.94	29.26	33.64	25.64	**34.54**	26.74	34.40	26.68	34.08	27.44
11	16.62	14.72	16.60	13.30	16.78	13.90	17.44	14.26	**19.52**	15.50
12	43.14	35.80	42.98	31.14	44.78	33.18	46.06	34.32	**53.58**	40.78
13	50.86	44.14	50.32	38.78	**51.68**	39.86	51.08	39.42	50.56	39.90
14	29.52	27.84	29.08	25.36	**29.70**	25.50	29.02	24.36	25.12	22.14
15	30.64	26.96	29.98	23.66	**31.08**	24.80	30.86	24.74	28.46	23.62

* Cases of the location parameter arrangements are given on page 38

Table 5.211. Percentage of Rejection for $k = 5$; Normal Distribution: Block = 8, $n_1 = n_2 = n_4 = n_5 = 8$ and $n_3 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	5.58	5.34	5.52	5.28	5.56	5.60	5.72	5.86	6.04	5.70
2	31.38	27.32	30.96	23.76	31.42	24.96	**31.50**	25.38	28.88	22.00
3	27.38	22.98	27.32	20.20	28.10	21.26	27.96	21.74	**29.82**	23.08
4	30.24	24.68	29.46	21.32	31.84	23.22	32.74	24.70	**41.66**	31.14
5	**22.48**	19.52	22.40	17.18	22.50	17.54	21.94	17.14	21.92	16.78
6	25.36	22.42	25.04	19.84	25.36	20.28	24.84	20.22	**26.18**	21.52
7	35.90	30.60	35.44	26.38	**36.56**	27.76	36.42	27.94	31.80	24.00
8	41.36	34.18	40.80	29.28	42.04	30.76	41.56	31.32	**49.94**	37.72
9	34.56	29.72	33.80	26.00	34.58	26.56	33.48	26.04	**38.20**	29.80
10	41.44	34.74	40.46	29.68	41.74	31.60	**41.78**	31.44	40.16	29.62
11	19.48	16.44	19.08	14.56	19.72	15.40	19.98	15.60	**24.04**	18.28
12	57.42	47.60	56.30	41.66	58.44	43.56	58.86	44.96	**70.26**	55.16
13	63.64	55.04	63.08	47.94	63.64	48.74	62.10	47.62	**64.56**	50.62
14	**36.48**	30.68	35.46	26.94	36.44	27.60	36.02	27.22	28.80	21.34
15	**38.32**	32.12	37.74	27.96	37.94	28.52	37.00	28.02	34.66	25.50

* Cases of the location parameter arrangements are given on page 38

Table 5.212. Percentage of Rejection for $k = 5$; Exponential Distribution: Block = 8, $n_1 = n_2 = n_4 = n_5 = 8$ and $n_3 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.86	4.72	4.78	4.54	5.02	4.80	5.06	4.86	5.06	5.14
2	58.22	49.62	**58.24**	43.22	57.88	43.78	56.48	43.10	53.42	39.66
3	49.46	42.00	49.28	35.82	49.88	37.20	49.18	37.04	**54.70**	41.38
4	47.20	37.88	46.20	32.14	49.08	35.48	51.66	37.86	**66.20**	48.98
5	**42.48**	35.76	41.40	30.94	41.88	31.32	39.54	30.42	38.72	28.14
6	46.92	39.06	45.88	34.16	46.56	34.66	45.50	34.18	**47.50**	35.34
7	63.38	54.70	**64.04**	48.70	63.66	49.44	62.54	48.60	58.72	43.14
8	70.70	61.02	70.68	53.28	70.68	54.66	69.46	54.14	**81.18**	65.46
9	58.84	50.02	57.82	43.06	58.62	43.80	56.76	42.46	**64.74**	49.88
10	**71.60**	61.84	71.22	54.78	71.52	55.42	69.70	55.18	70.62	53.66
11	34.88	28.40	34.24	24.56	35.32	26.66	35.64	27.38	**43.26**	31.82
12	83.72	74.90	83.68	65.76	84.20	67.80	83.62	68.86	**93.96**	83.78
13	89.28	81.90	89.18	74.66	88.88	74.28	87.06	72.54	**91.24**	79.48
14	**65.18**	55.68	65.14	49.32	64.80	48.80	62.76	47.18	52.82	38.42
15	**67.88**	58.72	67.68	51.82	67.20	51.50	64.80	49.78	62.68	47.00

* Cases of the location parameter arrangements are given on page 38

Table 5.213. Percentage of Rejection for $k = 5$; T-Distribution: Block = 8, $n_1 = n_2 = n_4 = n_5 = 8$ and $n_3 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.38	4.34	4.80	4.40	4.56	4.76	4.64	4.76	4.76	4.76
2	23.18	20.06	22.52	17.98	23.68	18.38	**23.70**	18.64	21.24	17.02
3	21.12	18.00	20.48	16.20	21.48	17.04	21.64	17.24	**23.48**	18.82
4	22.82	19.40	22.60	17.50	23.50	19.08	24.04	19.72	**30.18**	23.28
5	17.34	15.58	16.64	14.04	17.34	14.42	17.10	14.16	16.20	13.76
6	20.36	17.58	20.22	15.80	20.46	16.28	19.90	16.48	**21.26**	17.20
7	27.02	23.02	26.86	20.12	**27.34**	20.94	27.32	21.30	24.68	18.88
8	32.04	26.30	31.18	22.68	32.54	23.54	32.08	23.88	**38.26**	28.58
9	25.02	22.02	24.34	19.30	24.82	19.62	24.34	19.58	**27.80**	22.30
10	31.98	26.50	31.22	23.14	**32.26**	24.22	32.08	24.30	30.70	23.32
11	16.20	14.24	16.06	12.48	16.22	13.02	16.60	13.30	**19.30**	16.16
12	41.64	34.78	40.84	30.74	42.58	32.78	43.38	33.44	**52.44**	40.12
13	49.44	41.16	48.32	35.84	49.10	36.68	47.72	36.14	**50.20**	38.54
14	27.28	23.12	**27.50**	20.32	**27.50**	21.10	26.76	20.78	22.66	17.10
15	**31.18**	26.04	30.14	22.66	30.86	23.18	29.36	23.04	28.32	21.86

* Cases of the location parameter arrangements are given on page 38

Table 5.214. Percentage of Rejection for $k = 5$; Normal Distribution: Block = 8, $n_1 = n_2 = n_3 = n_4 = 8$ and $n_5 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.96	4.84	5.12	4.64	4.96	4.72	4.90	4.68	4.90	5.02
2	34.14	30.80	34.00	27.32	**34.76**	27.80	34.54	27.74	31.54	25.34
3	32.92	30.72	32.10	27.66	32.56	27.04	32.24	26.48	**34.02**	28.20
4	43.78	42.16	42.88	38.22	41.30	35.46	41.00	34.32	**52.40**	45.30
5	22.86	19.82	23.44	17.88	**23.50**	18.32	22.94	18.26	22.06	17.12
6	27.24	24.20	27.16	21.32	**27.66**	22.20	26.92	21.62	26.14	21.26
7	39.00	34.96	38.72	30.66	**39.52**	31.20	39.32	31.34	34.26	27.88
8	50.92	48.26	50.40	43.44	50.10	42.28	48.26	40.96	**56.22**	47.22
9	36.76	33.06	36.66	29.68	36.74	30.24	36.06	29.32	**38.22**	30.26
10	47.76	44.22	47.12	40.16	**47.94**	40.12	47.72	39.22	46.14	38.18
11	24.56	23.48	24.60	21.72	23.84	21.22	23.24	20.40	**28.70**	23.72
12	72.86	70.02	72.30	64.74	71.12	62.08	69.76	60.04	**80.06**	70.74
13	68.84	60.94	68.32	54.08	**69.12**	55.58	67.44	53.88	66.38	53.62
14	36.76	31.84	36.36	27.44	**37.52**	28.66	37.20	29.00	30.22	23.58
15	39.38	34.60	39.30	30.54	**39.62**	31.62	38.42	31.04	34.88	27.94

* Cases of the location parameter arrangements are given on page 38

Table 5.215. Percentage of Rejection for k = 5; Exponential Distribution: Block = 8, $n_1 = n_2 = n_3 = n_4 = 8$ and $n_5 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.64	4.76	4.90	4.70	4.92	4.92	4.78	4.76	5.06	5.24
2	**63.58**	57.12	63.16	51.38	63.14	50.96	61.52	49.74	57.88	46.72
3	59.92	56.54	59.96	51.42	58.48	49.06	56.84	47.52	**63.76**	53.04
4	70.38	69.22	69.86	64.50	67.06	60.78	66.52	58.08	**80.82**	72.64
5	43.48	37.86	43.24	33.42	**44.00**	34.10	42.34	33.52	39.30	30.62
6	52.20	46.46	51.44	41.58	**52.26**	42.28	50.40	41.08	50.54	40.42
7	**68.60**	62.20	**68.60**	55.72	68.14	55.60	67.02	54.76	60.92	48.58
8	82.28	77.90	82.44	71.72	80.16	68.34	77.72	65.02	**87.14**	76.38
9	64.40	57.68	63.68	51.38	64.54	51.88	62.34	50.32	**67.38**	52.98
10	**78.42**	74.06	78.10	68.62	77.58	66.36	76.32	64.40	78.34	66.54
11	46.00	44.04	45.42	39.80	44.16	38.00	43.50	36.68	**52.70**	44.26
12	94.20	92.46	94.44	88.60	92.90	85.18	91.06	82.56	**97.94**	92.84
13	91.58	86.80	91.02	81.76	**91.66**	82.18	89.98	79.82	91.44	81.00
14	65.70	57.70	65.14	51.56	**66.58**	52.76	65.80	52.20	54.76	42.64
15	69.44	62.32	68.92	56.04	**70.26**	56.42	68.60	55.06	64.66	50.70

* Cases of the location parameter arrangements are given on page 38

Table 5.216. Percentage of Rejection for k = 5; T-Distribution: Block = 8, $n_1 = n_2 = n_3 = n_4 = 8$ and $n_5 = 16$

			Method							
Case*	C_1	C_2	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	4.70	5.16	4.58	4.84	4.76	5.10	4.92	5.18	4.70	4.84
2	26.60	24.70	26.52	21.84	27.02	22.62	**27.06**	22.24	24.32	20.30
3	25.90	24.08	24.82	21.50	25.36	21.26	24.70	20.22	**26.50**	22.58
4	32.32	31.74	31.96	29.26	30.76	27.00	30.46	25.90	**38.62**	33.48
5	18.38	17.48	17.90	15.72	**18.90**	16.14	18.48	16.14	17.52	14.44
6	20.66	19.06	20.76	16.90	**20.94**	17.16	20.12	16.96	20.82	17.04
7	**29.82**	25.74	28.80	22.70	29.72	23.22	29.62	23.38	25.38	20.18
8	37.80	36.64	37.48	32.90	36.86	32.14	36.12	30.76	**42.44**	35.64
9	28.34	25.56	28.00	23.30	28.62	23.56	28.10	22.94	**29.12**	24.02
10	**37.86**	33.20	37.22	29.76	37.02	29.40	36.10	28.72	36.70	29.36
11	20.24	19.42	20.06	17.74	19.84	17.34	19.44	16.58	**21.94**	19.20
12	56.24	53.92	56.00	49.30	54.38	47.04	53.58	44.82	**64.02**	54.38
13	51.08	46.34	50.40	41.18	**51.28**	42.06	50.28	40.76	51.02	40.16
14	26.92	23.44	25.94	20.84	**27.60**	21.78	27.32	21.72	21.96	16.82
15	30.44	26.46	30.44	23.74	**30.88**	24.40	30.06	24.02	27.98	21.74

* Cases of the location parameter arrangements are given on page 38

CHAPTER 6. CONCLUSIONS

6.1. Summary and Major Findings

In this dissertation, novel nonparametric methods for the nondecreasing ordered alternative were proposed for a mixed design consisting of a combination of completely randomized design (*CRD*) and randomized complete block design (*RCBD)*. The proposed methods were formed based on Jonckheere-Terpstra test which is an extended version Mann-Whitney statistic as stated in Chapter 2. In each method, the test was introduced by multiplying the kernel of Mann-Whitney statistic (*U*-statistic) by the distance among the treatments. The motivation behind such procedures is to investigate how the proposed methods will behave as the distance among treatments increased.

Moreover, it is worth mentioning that Magel et al. (2009) have shown that the idea of standardizing first is a special case of the standardizing last when the variances of the two combined tests were the same. To illustrate that, let us consider two of our proposed methods:

$$T_3 = \frac{Z_{MJT} + Z_{BMJT}}{\sqrt{2}}$$

$$= \frac{1}{\sqrt{2}}\left[\frac{MJT - \mu_{MJT}}{\sigma^2_{MJT}} + \frac{BMJT - \mu_{BMJT}}{\sigma^2_{BMJT}}\right] \tag{6.1}$$

and

$$T_4 = \frac{MJT + BMJT - E(0)}{\sqrt{Var(0)}} = \frac{(MJT + BMJT) - \left(\mu_{MJT} + \mu_{BMJT}\right)}{\sqrt{\sigma^2_{MJT} + \sigma^2_{BMJT}}}$$

$$= \sqrt{\frac{\sigma^2_{MJT}}{\sigma^2_{MJT} + \sigma^2_{BMJT}}}\,\frac{MJT - \mu_{MJT}}{\sigma^2_{MJT}} + \sqrt{\frac{\sigma^2_{BMJT}}{\sigma^2_{BMJT} + \sigma^2_{MJT}}}\,\frac{BMJT - \mu_{BMJT}}{\sigma^2_{BMJT}} \tag{6.2}$$

It can be noted that when $\sigma^2_{MJT} = \sigma^2_{BMJT}$ in equation (6.2), the first method (T_3) becomes a special case of the second methods (T_4). In the first method, we add an equal weight to the variance of both tests *MJT* and *BMJT*. However, in the second method, the weights are different so that if the variance of *MJT* test is larger, then more weight will be assigned to it and vice versa.

Three cases were considered where the number of blocks were proportional to the sample sizes. In other words, the number of blocks in the *RCBD* portion are *larger*, *equal*, and *smaller* than the sample sizes in the *CRD* portion. In either case, from the findings of the simulation study, it was shown that all the proposed methods appear to maintain their type one error. Additionally, the estimated powers for the methods formed by standardized last idea (T_2, T_4, T_6, and T_8) are less than those methods formed by standardized first idea (T_1, T_3, T_5, and T_7) under all distributions for all cases, except the following two cases:

- Cases where the number of blocks in the *RCBD* portion are ***smaller*** than the sample sizes in the *CRD* portion. In particular, when the number of blocks is *one-eighth* of the sample sizes in the *CRD* portion, we found that T_2, T_4, T_6, and T_8 had higher powers than T_1, T_3, T_5, and T_7.
- When the number of blocks in the *RCBD* portion are ***smaller*** than the sample size in the *CRD* portion, However, cases were the number of blocks of the *RCBD* portion are *one-fourth* of the sample sizes in the *CRD* portion, proposed methods are found to be having practically the same estimated powers.

Moreover, the simulation study has shown that the estimated power for the proposed method, T_7, is better than the test statistics proposed by Magel et al. (2009) under the nondecreasing ordered alternative as long as a large jump is present between the last two adjacent location parameters such as (0, 0, 1) for k = 3, (0, 0, 0.1, 0.6) for k = 4, and (0, 0, 0, 0.25, 0.5) for k = 5. The other

proposed methods (T_1, T_3, and T_5) were comparable with the test statistics proposed by Magel et al. (2009) under most of the scenarios. However, in situations where the number of blocks in the *RCBD* portion are *larger* than the sample sizes in the *CRD* portion, cases were the sample sizes of the *CRD* portion are *one-eighth* of the number of blocks in the *RCBD* portion, the second version of the tests, C_2, introduced by Magel et al. (2009) is preferred.

6.2. Limitation

Because of the data sets were simulated came from continuous distributions, the proposed methods were designed to ignore the correction for ties. Therefore, the findings of the simulation study are limited to data with no tied observations. However, if researchers intend to utilize these proposed methods to data sets simulated from discrete distributions, they need to first redefine the indicator function for the *U*-statistics in (2.1). Note, however, researchers may obtain different conclusions regarding the performance of the proposed methods for discrete distributions.

6.3. Future Work

Throughout this dissertation, the design used to propose the aforementioned methods was a mixed design of a *CRD* and *RCBD*. However, in some situations, getting a complete block is not always possible. If we look back at the given example in Chapter 1, such cases appear if some of the company's employees, who agreed to take part in the study, quit their jobs before the study is completed. If we employ our proposed methods, these observations could be considered as part of the *CRD* portion, but they are no more independent and so results would be conservative. Thus, for future study, one can consider a combination of a *CRD* and an incomplete block design (*IBD*). .In addition, further study for this dissertation could be done by considering different arrangements of the sample sizes, number of blocks, and the location parameters. This work could also be

expanded by changing the variance of the error in the *CRD* portion compared with the *RCBD* portion.

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APPENDIX. DERIVATION OF THE EXPECTED VALUES AND VARIANCES

Hollander and Wolfe (1999), based on the Mann-Whitney statistic properties for the variance and the covariance stated in equations (2.16) and (2.17), have shown that under the null hypothesis, the Jonckheere-Terpstra ($JT = \sum_{i<j} U_{ij}$) has an expected value

$$E(JT) = \sum_{i<j} \frac{n_i n_j}{2} = \frac{N^2 - \sum_{i=1}^{k} n_i^2}{4}$$

and variance

$$Var(JT) = \frac{N^2(2N+3) - \sum_{i=1}^{k} n_i^2(2n_i+3)}{72}$$

Moreover, In Chapter 3, we have shown that the variance of the linear combination of Mann-Whitney statistics consists of two parts: the variance and the covariance terms. Thus, it becomes more difficult to derive an exact form of the expected values and variances when we take the distance among populations into account such as for *MJT*, *MJT*^{2} and *NMJT* tests. To illustrate that, for any linear combinations, we have $C_2^{k(k-1)/2}$ covariance terms, however, among these terms there are $\frac{k(k-1)(k-2)(k-3)}{2}$ zero terms and $\frac{k(k-1)(k-2)}{6}$ negative terms. In the following sections we are considering the derivations of the expected value and the variance for *MJT*^{2} and *NMJT* tests.

A.1. Squared Modified Jonckheere-Terpstra (*MJT*^{2})

In Chapter 3, in displays (3.17) and (3.18), we have presented the expected value and variance of the squared modified Jonckheere-Terpstra test ($MJT^2 = \sum_{i<j}(j-i)^2 U_{ij}$) when the null hypothesis is true. However, in this section we have explained in more detail the procedures to derive the expected value and variance despite the fact that it is hard to get an exact expression

for all the *k*-sample case. Hence, the general expected value for *three* populations can be derived as follows:

$$\mathrm{E}(MJT^2) = \sum_{i<j} (j-i)^2 \, \mathrm{E}(U_{ij}) = \sum_{i<j} (j-i)^2 \, \frac{n_i n_j}{2}$$

Similarly, the general variance of the squared modified Jonckheere-Terpstra test (MJT^2) can be obtained as follows:

$$\begin{aligned}
\mathrm{Var}(MJT^2) &= \mathrm{Var}\left(\sum_{i<j} (j-i)^2 \, U_{ij} \right) \\
&= \sum_{i<j} (j-i)^4 \, \mathrm{Var}(U_{ij}) + 2 \sum_{i<j} \sum_{i'<j'} (j-i)(j'-i') \, \mathrm{Cov}(U_{ij}, U_{i'j'}) \\
&= \sum_{i<j} (j-i)^4 \, \mathrm{Var}(U_{ij}) + 2 \sum_{i<j<t} (j-i)^2 \, (t-i)^2 \, \mathrm{Cov}(U_{ij}, U_{it}) \\
&+ 2 \sum_{i<j<t} (j-i)^2 \, (t-j)^2 \, \mathrm{Cov}(U_{ij}, U_{jt}) + 2 \sum_{i<j<t} (t-i)^2 \, (t-j)^2 \, \mathrm{Cov}(U_{it}, U_{jt}) \\
&= \sum_{i<j} (j-i)^4 \, \frac{n_i n_j (n_i + n_j + 1)}{12} \\
&+ 2 \sum_{i<j<t} [(j-i)^2 (t-i)^2 - (j-i)^2 (t-j)^2 + (t-i)^2 (t-j)^2] \frac{n_i n_j n_t}{12} \\
&= \sum_{i<j} (j-i)^4 \, \frac{n_i n_j (n_i + n_j + 1)}{12} \\
&+ 2 \sum_{i<j<t} [(t-i)^2 \{(j-i)^2 + (t-j)^2\} - (j-i)^2 (t-j)^2] \frac{n_i n_j n_t}{12}
\end{aligned}$$

For the sake of illustration, let us consider the case $k = 3$.

$$MJT^2 = \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} (j-i)^2 U_{ij} = U_{12} + 4U_{13} + U_{23}$$

Further,

$$\mathrm{E}(MJT^2) = \mathrm{E}(U_{12} + 4U_{13} + U_{23}) = \frac{n_1n_2 + 4\,n_1n_3 + n_2n_3}{2}$$

and

$$\begin{aligned}
\mathrm{Var}(MJT^2) &= \mathrm{Var}(U_{12} + 4U_{13} + U_{23}) \\
&= \mathrm{Var}(U_{12}) + 16\,\mathrm{Var}(U_{13}) + \mathrm{Var}(U_{23}) + 8\,\mathrm{Cov}(U_{12}, U_{13}) + 2\,\mathrm{Cov}(U_{12}, U_{23}) \\
&+ 8\,\mathrm{Cov}(U_{13}, U_{23}) \\
&= \frac{n_1n_2(n_1+n_2+1)}{12} + 16\frac{n_1n_3(n_1+n_3+1)}{12} + \frac{n_2n_3(n_2+n_3+1)}{12} + 14\frac{n_1n_2n_3}{12} \\
&= \frac{n_1n_2(N+1)}{12} + 16\frac{n_1n_3(N+1)}{12} + \frac{n_2n_3(N+1)}{12} - 4\frac{n_1n_2n_3}{12} \\
&= \frac{(n_1n_2 + 16\,n_1n_3 + n_2n_3)(N+1) - 4\,n_1n_2n_3}{12}
\end{aligned}$$

A.2. New Modified Jonckheere-Terpstra (*NMJT*)

Under the null hypothesis, the expected value and variance of the squared modified Jonckheere-Terpstra test ($NMJT = \sum_{i<j} i(j-i)U_{ij}$) are given in equations (3.28) and (3.29). In this section we have explained in more detail the procedures to derive the expected value and variance for *three* populations and using the same procedures one can derive the expected values and variances for *four* and *five* populations. Thus, the expected value can be derived as follows:

$$\mathrm{E}(NMJT) = \sum_{i<j} i(j-i)\,\mathrm{E}(U_{ij}) = \sum_{i<j} i(j-i)\,\frac{n_in_j}{2}$$

Likewise, the variance of the new modified Jonckheere-Terpstra can be derived as follows:

$$\begin{aligned}
\mathrm{Var}(NMJT) &= \mathrm{Var}\left(\sum_{i<j} i(j-i)U_{ij}\right) \\
&= \sum_{i<j} i^2(j-i)^2\,\mathrm{Var}(U_{ij}) + 2\sum_{i<j}\sum_{i'<j'} (ii')(j-i)(j'-i')\,\mathrm{Cov}(U_{ij}, U_{i'j'})
\end{aligned}$$

$$= \sum_{i<j} i^2(j-i)^2 \operatorname{Var}(U_{ij}) + 2 \sum_{i<j<t} i^2(j-i)(t-i) \operatorname{Cov}(U_{ij}, U_{it})$$

$$+ 2 \sum_{i<j<t} ij\,(j-i)\,(t-j) \operatorname{Cov}(U_{ij}, U_{jt}) + 2 \sum_{i<j<t} ij\,(t-i)\,(t-j) \operatorname{Cov}(U_{it}, U_{jt})$$

$$= \sum_{i<j} i^2(j-i)^2 \frac{n_i n_j (n_i + n_j + 1)}{12}$$

$$+ 2 \sum_{i<j<t} [\, i^2(j-i)(t-i) - (ij)(j-i)(t-j) + (ij)(t-i)(t-j)] \frac{n_i n_j n_t}{12}$$

$$= \sum_{i<j} i^2(j-i)^2 \frac{n_i n_j (n_i + n_j + 1)}{12}$$

$$+ 2 \sum_{i<j<t} [\, i^2(j-i)(t-i) - (ij)(t-j)\,\{(j-i) + (t-i)\}] \frac{n_i n_j n_t}{12}$$

More specifically, in the case of $k = 3$, the new modified Jonckheere-Terpstra (*NMJT*) is given as

$$NMJT = \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} i(j-i) U_{ij} = U_{12} + 2U_{13} + 2U_{23}$$

with expected value

$$\mathrm{E}(NMJT) = \mathrm{E}(U_{12} + 2U_{13} + 2U_{23}) = \frac{1}{2}\, n_1 n_2 + \, n_1 n_3 + n_2 n_3$$

and variance

$$\operatorname{Var}(NMJT) = \operatorname{Var}(U_{12} + 2U_{13} + 2U_{23})$$

$$= \operatorname{Var}(U_{12}) + 4 \operatorname{Var}(U_{13}) + 4 \operatorname{Var}(U_{23}) + \, 4 \operatorname{Cov}(U_{12}, U_{13}) + 4 \operatorname{Cov}(U_{12}, U_{23})$$

$$+ 8 \operatorname{Cov}(U_{13}, U_{23})$$

$$= \frac{n_1 n_2 (n_1 + n_2 + 1)}{12} + 4 \frac{n_1 n_3 (n_1 + n_3 + 1)}{12} + 4 \frac{n_2 n_3 (n_2 + n_3 + 1)}{12} + 8 \frac{n_1 n_2 n_3}{12}$$

$$= \frac{n_1 n_2 (N+1)}{12} + 4\ \frac{n_1 n_3 (N+1)}{12} + 4\ \frac{n_2 n_3 (N+1)}{12} - \frac{n_1 n_2 n_3}{12}$$

$$= \frac{(n_1 n_2 + 4\, n_1 n_3 + 4\, n_2 n_3)(N+1) - \ n_1 n_2 n_3}{12}$$