

**كلية العلوم**

**قسم الإحصاء وبحوث العمليات**

**College of Sciences**

**Department of**

**Statistics and Operations Research**

**Quiz 3**

**Nonparametric Statistical Methods**

 **(STAT 333)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Name** **:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_**

**Student ID :\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Signature :\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Instructions:**

1. Read all the instructions carefully.
2. This is a closed book exam.
3. You have 1.5 hours to complete the exam.
4. This exam has **6** pages including this cover.
5. There are **3** main questions in this exam.
6. Show all your work to receive full credit. In fact, answers must be accomplished by adequate justification. If you run out of space, use the back of any page for answers as needed. Clearly direct the marker to answers that you provide on the back of a page.

**ANSWER ALL THE FOLLOWING QUESTIONS:**

**Question 1 (**10 **marks total):**

A graduate student performed a pilot study for his dissertation. He wanted to examine the effects of animal companionship on elderly males. He selected 10 male participants from a nursing home. Then he used an ABAB research design, where A represented a week with the absence of a cat and B represented a week with the presence of a cat. At the end of each week, he administered a 20-point survey to measure quality of life satisfaction. The survey results are presented as follows:

|  |  |
| --- | --- |
|  |  |
| Participants | Week 1 | Week 2 | Week 3 | Week 4 |
| 1 | 7 | 6 | 8 | 9 |
| 2 | 9 | 8 | 10 | 7 |
| 3 | 15 | 18 | 16 | 17 |
| 4 | 7 | 6 | 8 | 9 |
| 5 | 7 | 8 | 10 | 11 |
| 6 | 10 | 14 | 13 | 11 |
| 7 | 12 | 19 | 11 | 13 |
| 8 | 7 | 4 | 2 | 5 |
| 9 | 8 | 7 | 9 | 5 |
| 10 | 12 | 16 | 14 | 15 |

Use an appropriate non-parametric test with α = 0.10 to determine if one or more of the groups are significantly different.

If a significant difference exists, use an appropriate test to identify which groups are significantly different. Use the Bonferroni procedure to limit the Type I error rate.

**Sol.**

1. The Null and Research Hypotheses are

…………………………………………………………………….…………

…………………………………………………………………….…………

1. The Level of Risk Associated with the Null Hypothesis is………………
2. The Appropriate Test Statistic is …………………………………………
3. The Calculated Test Statistic is ……………………………………………
4. The Value Needed for Rejection of the Null Hypothesis Using the Appropriate Table of Critical Values for the Particular Statistic is ……………………...….
5. The decision is ………………………………………………………..………..
6. Reporting the Results as follows:

………………………………………………………..………………………………………………..

………………………………………………………..………………………………………………..

………………………………………………………..………………………………………………..

………………………………………………………..………………………………………………..

………………………………………………………..………………………………………………..

………………………………………………………..………………………………………………..

………………………………………………………..………………………………………………..

………………………………………………………..………………………………………………..

………………………………………………………..………………………………………………..

………………………………………………………..………………………………………………..

………………………………………………………..………………………………………………..

………………………………………………………..………………………………………………..

………………………………………………………..………………………………………………..

………………………………………………………..………………………………………………..

………………………………………………………..………………………………………………..

**Question** 2 **(**10 **marks total):**

A researcher conducted a study with n = 15 participants to investigate strength gains from exercise. The participants were divided into three groups and given one of three treatments. Participants’ strength gains were measured and ranked. The rankings are presented as follows:

|  |  |
| --- | --- |
|  |  |
| Treatments |  |  |
| I | II | III |
| 7 | 13 | 12 |
| 2 | 1 | 5 |
| 4 | 7 | 16 |
| 11 | 8 | 9 |
| 15 | 3 | 14 |

Use an appropriate non-parametric test with α = 0.05 to determine if one or more of the groups are significantly different. If a significant difference exists, use an appropriate test to identify which groups are significantly different.

**Sol.**

1. The Null and Research Hypotheses are

…………………………………………………………………….…………

…………………………………………………………………….…………

1. The Level of Risk Associated with the Null Hypothesis is………………
2. The Appropriate Test Statistic is …………………………………………
3. The Calculated Test Statistic is ……………………………………………
4. The Value Needed for Rejection of the Null Hypothesis Using the Appropriate Table of Critical Values for the Particular Statistic is …………………….
5. The decision is ……………………………………..
6. Reporting the Results as follows:

………………………………………………………..………………………………………………..

………………………………………………………..………………………………………………..

………………………………………………………..………………………………………………..

**Question** 3 **(5 marks total):**

1. Two types of errors associated with hypothesis testing are Type I and Type II. Type II error is committed when \_\_\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| (A) | We reject the null hypothesis whilst the alternative hypothesis is true | (B) | We reject a null hypothesis when it is true |
| (C) | We accept a null hypothesis when it is not true | (D) | None of these |

1. By taking a level of significance of 5% it is the same as saying \_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| (A) | We are 5% confident the results have not occurred by chance | (B) | We are 95% confident that the results have not occurred by chance |
| (C) | We are 95% confident that the results have occurred by chance | (D) | We are 90% confident that the results have occurred by chance |

1. The level of significance can be viewed as \_\_\_\_\_\_\_\_\_\_\_ that an analyst will accept when making a decision.

|  |  |  |  |
| --- | --- | --- | --- |
| (A) | the amount of confident  | (B) | the amount of risk  |
| (C) | the acceptance rejoin  | (D) | the rejection rejoin |

1. One or two tail test will determine \_\_\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| (A) | If the two extreme values (min or max) of the sample need to be rejected | (B) | If the hypothesis has one or possible two conclusions |
| (C) | If the region of rejection is located in one or two tails of the distribution | (D) | None of these |

1. Which of the following is not true of parametric statistics?

|  |  |  |  |
| --- | --- | --- | --- |
| (A) | They are inferential tests | (B) | They assume certain characteristics of population parameters |
| (C) | They assume normality of the population | (D) | They are distribution-free |

1. If, while conducting a study, you find that the data violate all the assumptions of the statistic you had planned to do, what are your alternatives?

|  |  |  |  |
| --- | --- | --- | --- |
| (A) | Do the statistic since there will be no evidence of the error | (B) | Run the study again and hope the data are better |
| (C) | Do a nonparametric statistic | (D) | Change your profession |

1. Assuming the assumptions of parametric tests are met, non-parametric tests, compared to their parametric counterparts:

|  |  |  |  |
| --- | --- | --- | --- |
| (A) | Have less statistical power | (B) | Are less likely to accept the alternative hypothesis |
| (C) | Are more conservative | (D) | Are all of these |

1. The level of measurement that allows for the rank ordering of data items is \_\_\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| (A) | nominal measurement | (B) | ratio measurement |
| (C) | interval measurement | (D) | ordinal measurement |

1. The labeling of parts as "defective" or "non-defective" is an example of\_\_\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| (A) | interval measurement | (B) | dichotomous measurement |
| (C) | ratio measurement | (D) | ordinal measurement |

1. Compare the distribution of the number of hours per week spent on Facebook for Freshmen, Sophomore, Juniors and Seniors at UF, based on random samples of 10 students per group, which had quite different standard deviations. The simplest type of statistical analysis that would be appropriate to use is:

|  |  |  |  |
| --- | --- | --- | --- |
| (A) | Kruskal-Wallis | (B) | Friedman Test |
| (C) | Wilcoxon Rank-Sum Test | (D) | Mann–Whitney |

End of the Exam