

UGANDA MARTYRS UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS & STATISTICS

UNIVERSITY EXAMINATIONS
SEMESTER I, 2012/13

SECOND YEAR EXAMINATIONS FOR BACHELOR OF SCIENCE
(GEN)

STA: NON PARAMETRIC STATISTICS

DATE: 21ST DECEMBER 2012

TIME: 9:00 – 12:00 NOON

Instructions:

- i) Attempt any four questions.
 - ii) Read through the paper carefully and follow instructions on the answer booklet.
 - iii) Calculators and mathematical tables may be used.
 - iv) Neat work is highly recommended
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QUESTION 1

- (a) Define the following terms as applied to ANOVA test;
- (i) Treatment
 - (ii) Total variation
 - (iii) Treatment variation
 - (iv) Random variation
- (b) The following is a sample information. Test the hypothesis that the treatment means are equal. Use the 0.05 significance level.

| Treatment 1 | Treatment 2 | Treatment 3 |
|-------------|-------------|-------------|
| 8 | 3 | 3 |
| 6 | 2 | 4 |
| 10 | 4 | 5 |
| 9 | 3 | 4 |

- (i) State the null hypothesis and alternate hypothesis
- (ii) What is the decision rule
- (iii) Compute SST, SSE and SS total
- (iv) Complete an ANOVA table

State your decision regarding the null hypothesis

QUESTION 2

A new assembly – line procedure has been Mr. Mump. To test whether the new procedure is superior to the old procedure, a sample group of 15 men was selected at random. First their production under the old system was determined. Then the New Mump procedure was introduced. After an appropriate break –in period, their production was measured again. The results were;

Production

| Employee | Old system | Mump method |
|----------|------------|-------------|
| A | 60 | 64 |
| B | 40 | 52 |
| C | 59 | 58 |
| D | 30 | 37 |
| E | 70 | 71 |
| F | 78 | 83 |
| G | 43 | 46 |
| H | 40 | 52 |
| I | 87 | 84 |
| J | 90 | 80 |
| K | 56 | 57 |
| L | 21 | 21 |
| M | 99 | 108 |

| | | |
|---|----|----|
| N | 50 | 56 |
| O | 56 | 62 |

At the 0.05 significance level can we conclude that the production is greater using the Mump method?

- State the null and alternate hypothesis.
- State the decision rule
- Arrive at a decision regarding the null hypothesis

QUESTION 3

- State the assumptions underlying ANOVA test.
- The following is a sample information. Test the hypothesis that the treatment means are equal. Use the 0.05 significance level.

| Treatment 1 | Treatment 2 | Treatment 3 |
|-------------|-------------|-------------|
| 9 | 13 | 10 |
| 7 | 20 | 9 |
| 11 | 14 | 15 |
| 9 | 13 | 14 |
| 12 | | 15 |
| 10 | | |

- State the null hypothesis and alternate hypothesis
- What is the decision rule
- Compute SST, SSE AND SS total
- Complete an ANOVA table
- State your decision regarding the null hypothesis

QUESTION 4

- Compare and contrast parametric and non parametric Statistical methods and give advantages and disadvantages of a non parametric statistical methods.

- Gross sales before and after a training program is given by

| Sales person | 1 | 2 | 3 | 4 | 5 | 6 |
|--------------|----|----|-----|----|-----|----|
| Sales before | 90 | 83 | 105 | 97 | 110 | 78 |
| Sales after | 97 | 80 | 110 | 93 | 123 | 84 |

Determine if the training program is effective using sign test. What is the P-value

QUESTION 5

- Define the following terms;

(i) Non-Parametric

(ii) P-value

(b) The following table shows voter reactions to new property tax plan in Kampala district according to party affiliation.

| Party Affiliation | Reaction | | |
|-------------------|----------|---------|---------|
| | In Favor | Neutral | Opposed |
| Democratic Party | 120 | 20 | 20 |
| NRM | 50 | 30 | 60 |
| FDC | 50 | 10 | 40 |

(i) Find the row and column totals

(ii) Grand total

(iii) Calculate the expected frequencies

(iv) Use 0.01 level of significance to test the claim that Party Affiliation and voter reaction are independent

QUESTION 6

(a) Differentiate between the following as applied to statistics

(i) Type I error and Type II error.

(ii) Null and Alternative hypothesis

(b) The following observations were selected from populations that were not necessarily normally distributed. Use the 0.05 significance level, a two-tailed test, and the Wilcoxon rank-sum test to determine whether there is a difference between the two populations.

| | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|
| Population A | 38 | 45 | 56 | 57 | 61 | 69 | 70 | 79 |
| Population B | 26 | 31 | 35 | 42 | 51 | 52 | 57 | 62 |