



MANICALAND STATE UNIVERSITY OF APPLIED SCIENCES

FACULTY OF APPLIED SCIENCES & TECHNOLOGY

DEPARTMENT OF APPLIED STATISTICS

MODULE: STATISTICAL INFERENCE II

CODE: HAST223

SESSIONAL EXAMINATIONS
OCTOBER 2021

DURATION: 3 HOURS

EXAMINER: MS L. MADZIVANYIKA

INSTRUCTIONS

1. Answer **All** in Section A
2. Answer **three** questions in Section B.
3. Start a new question on a fresh page
4. Total marks 100

Additional material(s): Non-programmable electronic scientific calculator,
Statistical tables, Graph paper.

SECTION A (Answer all questions)[40 Marks]

A1.

- (a). Give two examples of qualitative data used in statistics.
- (b). State two examples of quantitative data used in statistics.
- (c). Explain the concepts of the following terms in statistical inference:
 - i. Population,
 - ii. Discrete data and
 - iii. Nominal data.

[2, 2, 2, 2, 2]

A2. The table below shows the hours of relief provided by two analgesic drugs in 12 patients suffering from arthritis.

Case	Drug A	Drug B	Case	Drug A	Drug B
1	2.0	3.5	7	14.9	16.7
2	3.6	5.7	8	6.6	6.0
3	2.6	2.9	9	2.3	3.8
4	2.6	2.4	10	2.0	4.0
5	7.3	9.9	11	6.8	9.1
6	3.4	3.3	12	8.5	20.9

- a) State the null hypothesis in this case.
- b) Calculate the actual differences of Drug A and B.
- c) Is there any evidence that one drug provides longer relief than the other? [5,5,10]

A3.

Use the Kolmogorov-Smirnov Test to test whether the observations 5, 6, 7, 8, and 9 are from a normal distribution with $\mu = 6.5$ and $\sigma = \sqrt{2}$. That is, the hypothesized distribution is $F_0(X) \sim N(6.5, \sqrt{2})$. [10]

SECTION B (Answer 3 questions only) [60 Marks]

B4.

Consider the following combination of upward and downward price changes;

+ + - - + - + - - - + +

A + sign means that the stock price increased and a – sign means that the stock price decreased.

- i. What is the expected number of runs shown in the combination?
- ii. Calculate the standard deviation of the number of runs.
- iii. What is the unconditional probability per day for the run?
- iv. Calculate the average length of a run.

[5, 5, 5, 5]

B5.

- a) State assumptions of the Kruskal-Wallis test.
- b) An elementary school gym teacher is interested in evaluating the effectiveness of four free throw teaching techniques. The gym teacher randomly assigns the 80 students to one of four groups with 20 students per group. After two months, every member of the groups shoots 10 free throws, and the gym teacher records the results. The number of successful free throws each student shoots in each of the four groups is presented in the table below. Use the free throw results to decide if differences exist among teaching methods at the $\alpha = 0.05$ level. *Use the Kruskal Wallis Test.*

Number t) of successful free throws

| Method | Data | | | | | | | | | | | | | | | | | | | |
|----------|------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6 | 1 | 2 | 0 | 0 | 1 | 1 | 3 | 1 | 2 | 1 | 2 | 4 | 2 | 1 | 1 | 1 | 3 | 7 | 1 |
| 2 | 3 | 2 | 1 | 2 | 1 | 6 | 2 | 1 | 1 | 2 | 1 | 1 | 2 | 3 | 2 | 2 | 3 | 2 | 5 | 2 |
| 3 | 2 | 1 | 2 | 3 | 2 | 2 | 4 | 3 | 2 | 3 | 2 | 5 | 1 | 1 | 3 | 7 | 6 | 2 | 2 | 2 |
| 4 | 2 | 1 | 1 | 3 | 1 | 2 | 1 | 6 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 5 | 4 |

[5, 15]

B6. An investigation was carried out to find out the favourite colour for 30 individuals in a classroom. The following results were obtained;

| | |
|----|------------------|
| 12 | Preferred blue |
| 8 | Preferred red |
| 4 | Preferred yellow |
| 5 | Preferred purple |

- Show the above data on an appropriate graph.
- State the difference between Ordinal and Nominal data.
- Give examples of qualitative and quantitative data.

[10, 5, 5]

B7. A random sample of 100 voters is selected and 53 are found to support a certain presidential candidate.

- Determine a 99% confidence interval for the true proportion of the voting population favouring the candidate.
- Find the maximum sample size required in order to be 99% confident that the sample proportion will be within 0.05 of the true value of the proportion.
- Find the probability of those not in support of the presidential candidate.

[5, 10, 5]

END OF QUESTION PAPER