



MURANG'A UNIVERSITY OF TECHNOLOGY
SCHOOL OF PURE, APPLIED AND HEALTH SCIENCES
DEPARTMENT OF MATHEMATICS AND ACTUARIAL
SCIENCE

UNIVERSITY ORDINARY EXAMINATION

2024/2025 ACADEMIC YEAR

FIRSTS YEAR FIRST SEMESTER EXAMINATION FOR BACHELOR
OF SCIENCE IN APPLIED STATISTICS IN PROGRAMMING
AMS 103 – PRINCIPLES OF STATISTICAL INFERENCE
DURATION: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

1. Answer question ONE and any other two questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A – ANSWER ALL QUESTIONS IN THIS SECTION

- a) Define the term non-parametric test. (1 mark)
- b) Differentiate between Type I and Type II errors as used in test of hypothesis. (2 marks)
- c) A company claims that it receives an equal number of customer complaints on each day of the week (Monday through Friday). To test this claim, a sample of 100 complaints is recorded over the period, and the number of complaints received on each day is shown below.

Day	Mon	Tue	Wed	Thur	Fri
Number of complaints	15	20	25	8	22

Test the company's claim at 5% level of significance using the Chi-square test. (6 marks)

- d) Briefly explain four reasons why sampling is important in statistics. (4 marks)
- e) Define the term data and outline the different scales of measurement used to categorize it. (5 marks)
- f) A psychologist claims that the average time spent by university students on social media is 3 hours per day. To test this claim, a random sample of 25 university students is surveyed, and their average time spent on social media is found to be 2.5 hours per day, with a standard deviation of 0.8 hours. Use a significance level of 0.05 test the psychologist's claim. (5 marks)
- g) Explain briefly any three properties of the normal distribution. (3 marks)
- h) State two probability sampling methods and two non-probability sampling methods. (4 marks)

SECTION B– ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

- a) The mean height of 500 people is 170 cm and the standard deviation is 9 cm. Assuming the heights are normally distributed, determine the number of people likely to have heights between 150cm and 195 cm. (5 marks)
- b) The data given below are obtained from student records. Calculate the spearman rank correlation for the data. (6 marks)

Student	Grade Point Average (x)	Graduate Record Exam Score (y)
1	8.3	2300
2	8.6	2250
3	9.2	2380
4	9.8	2400
5	8.0	2000
6	7.8	2100
7	9.4	2360
8	9.0	2350
9	7.2	2000
10	8.6	2260

- c) A marketing company wants to test if a new advertisement campaign has improved customer perceptions of a particular brand. They survey 15 customers before and after they are

exposed to the new campaign. The scores (out of 100) that each customer gives before and after watching the advertisement are recorded below. Test at 5% level of significance, whether the new advertisement has a significant effect on customer perceptions using the sign test. (9 marks)

Customer	Score Before	Score After
1	70	75
2	65	70
3	85	82
4	60	68
5	75	80
6	90	88
7	82	84
8	88	85
9	55	62
10	73	70
11	68	70
12	60	60
13	85	88
14	72	68
15	78	80

QUESTION THREE (20 MARKS)

- a) A company wants to know if employee satisfaction is related to the department in which they work. They survey employees in three departments; A, B and C and classify their satisfaction levels either “Satisfied” or “Not Satisfied”. The results are as follows:

Department	Satisfied	Not satisfied	Total
A	40	10	50
B	30	20	50
C	20	30	50
Total	90	60	150

Test the hypothesis that employee satisfaction and the department are independent at 5% level of significance. (5 marks)

- b) A researcher wants to study the relationship between the number of hours studies and the marks obtained by students in an exam. The data for 10 students is given below:

Students	1	2	3	4	5	6	7	8	9	10
Hours studied	2	9	6	1	4	8	5	3	7	10
Marks obtained	50	75	63	45	58	72	60	55	68	78

- i. Calculate the Pearson correlation coefficient between the hours studied and the marks obtained. (8 marks)
- ii. Develop a regression equation to predict marks obtained by students based on the hours studied and predict the marks for a student who studies for 7.5 hours. (7 marks)

QUESTION FOUR (20 MARKS)

- a) A researcher is studying the impact of two different teaching methods on student performance in statistics. The test scores (out of 100) for the two groups of students who received different teaching methods are as follows:

Method A: 62, 68, 75, 80, 82, 85, 88, 90, 92, 95, 67, 74, 79, 84, 86, 91

Method B: 58, 63, 70, 76, 78, 81, 84, 87, 89, 91, 60, 66, 72, 77, 79, 83

Use the Mann-Whitney U test to determine if there is a significant difference in scores between the two teaching methods at 1% significance level. (10 marks)

- b) A health organization wants to evaluate the effectiveness of a new health awareness program in two different villages. The organization recorded the number of villagers who adopted healthy lifestyle changes after the program in each village as follows:

Village A: Out of 200 villagers, 120 adopted healthy lifestyle changes

Village B: Out of 180 villagers, 90 adopted healthy lifestyle changes

At 5% level of significance, does the data reveal significance difference between the two villages in adapting the health lifestyle changes? (8 marks)

- c) Statistics can be broadly categorized into two categories, which are these categories? (2 marks)