



## MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

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### UNIVERSITY EXAMINATIONS 2023/2024

FIRST YEAR SECOND SEMESTER EXAMINATION FOR DEGREE OF DOCTOR OF PHILOSOPHY IN  
EDUCATION

**EMM 8100: ADVANCED STATISTICAL METHODS IN EDUCATION**

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**DATE: APRIL 2024**

**TIME: 3 HOURS**

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**INSTRUCTIONS:** Answer Question one and any other THREE questions.

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#### QUESTION ONE (24 MARKS)

- a. Explain the concept of probability and its relevance in statistics. Give examples to illustrate different types of probability. (8 marks)
- b. Explain the importance of sampling in statistical research and decision-making in education settings. (8 marks)
- c. Below are scores for 100 students in a mathematics class. Use appropriate exploratory statistics techniques to make meaning out of the data. (8 marks)

82, 75, 68, 91, 85, 79, 73, 88, 92, 70, 84, 77, 81, 89, 74, 72, 87, 90, 78, 83, 76, 69, 93, 80, 86, 71, 94, 67, 95, 79, 81, 75, 84, 88, 73, 82, 87, 76, 89, 71, 83, 78, 90, 85, 72, 80, 74, 91, 86, 77, 92, 79, 88, 83, 75, 90, 81, 84, 76, 89, 82, 87, 78, 91, 80, 85, 77, 92, 79, 86, 81, 83, 76, 89, 78, 82, 80, 85, 77, 84, 79, 87, 75, 81, 78, 86, 74, 88, 73, 90, 76, 79, 82, 85, 77, 83, 72, 86, 71, 88

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#### QUESTION 2: 12 MARKS

A researcher wants to test whether a new teaching method improves students' reading comprehension scores. The researcher collects data from a sample of 25 students and finds that the mean reading comprehension score before implementing the new teaching method is 70 with a standard deviation of 8, and the mean score after implementing the new teaching method is 75 with a standard deviation of 7.



- a. State the null and alternative hypotheses in symbols and words (4 marks)
- b. Conduct a hypothesis test at a significance level of 0.05 and determine whether there is a significant difference in mean reading comprehension scores before and after implementing the new teaching method. (8 marks)

### QUESTION 3: 12 MARKS

A teacher wants to examine the relationship between students' attendance and their grades in a sample of 6 students. The data are as follows:

- Student 1: 95% attendance, Grade of 88
  - Student 2: 85% attendance, Grade of 72
  - Student 3: 98% attendance, Grade of 90
  - Student 4: 75% attendance, Grade of 65
  - Student 5: 80% attendance, Grade of 70
  - Student 6: 92% attendance, Grade of 85
- a. Represent the data appropriately graphically. (4 marks)
  - b. Calculate the correlation coefficient between students' attendance and their grades. (8 marks)

### QUESTION 4: 12 MARKS

A researcher conducts an analysis of variance (ANOVA) to compare the mean scores of three different teaching methods (Method A, Method B, and Method C) on student performance. The researcher collects data from a sample of 30 students, with 10 students randomly assigned to each teaching method. The data and relevant sums of squares are provided below. Fill in the missing values in the ANOVA table.

Source	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F
Between Groups	112.5	??	??	??
Within Groups	315.0	??	??	
Total	427.5	??		



## QUESTION 5: 12 MARKS

- a. A fair six-sided die is rolled twice. What is the probability of rolling a 4 on the first roll and a 6 on the second roll? (4 marks)
- b. The scores on a standardized test follow a normal distribution with a mean of 500 and a standard deviation of 100. What percentage of students scored above 600 on the test? (8 marks)

