



MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF COMPUTING AND INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

UNIVERSITY POSTGRADUATE NEXAMINATION

2023/2024 ACADEMIC YEAR

**FIRST YEAR FIRST SEMESTER EXAMINATION FOR MASTER OF
SCIENCE IN INFORMATION TECHNOLOGY, MASTER OF
TECHNOLOGY (ELECTRICAL AND ELECTRONIC ENGINEERING),
AND MASTER OF TECHNOLOGY IN MECHANICAL ENGINEERING**

SCS 602: RESEARCH METHODS

DURATION: 3 HOURS

INSTRUCTIONS TO CANDIDATES:

1. Answer ANY FOUR questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

QUESTION ONE (25 MARKS)

- a) Research can be divided into five categories. Explain each of the categories and list two research topics in your field of study that can fit into each category giving a reason why the topic fits. (15 marks)
- b) Distinguish between quantitative and qualitative research approaches giving details of data collection methods, how to analyze data in each case and further classification for the case of quantitative approach. (10 marks)

QUESTION TWO (25 MARKS)

- a) Describe in details, giving appropriate illustrations where possible, the six steps of hypothesis testing. (8 marks)
- b) The lifetime, X hours of Everwhite camera batteries is normally distributed. The manufacturer claims that the mean lifetime of these batteries is 100 hours.
- i. The members of a photography club suspect that the batteries do not last as long as is claimed by the manufacturer. In order to investigate their suspicion, the members test a random sample of five of these batteries and found the lifetimes, in hours, to be as follows;
85, 92, 100, 95, 99
Test the members' suspicion at the 5% level of significance. (9 marks)
- ii. The manufacturer, believing that the mean lifetime of these batteries has not changed from 100 hours, decides to determine the lifetime, x hours, of each of a random sample of 80 Everwhite camera batteries. The manufacturer obtains the following results, where \bar{x} denotes the sample mean:
 $\sum x = 8080$ and $\sum(x - \bar{x})^2 = 6399$
Test the manufacturer's belief at the 5% level of significance (8 marks)

QUESTION THREE (25 MARKS)

- a) Distinguish between independent groups, matched pairs and repeated measures in research design. (7 marks)
- b) Describe the following terminology as relates to random variables and experimentation, giving an example in each case based on your area of study.
- i. Independent variables (4 marks)
- ii. Dependent variables (3 marks)
- iii. Confounding variable (3 marks)
- iv. Extraneous variable (4 marks)

- c) Describe the important measures of central tendency pointing out a situation when one measure is considered relatively appropriate in comparison to other measures. (4 marks)

QUESTION FOUR (25 MARKS)

- a) Discuss a research problem and outline the main issues which should receive the attention of a researcher in formulating a research problem. Give suitable examples to elucidate your points. (5 marks)
- b) “A research scholar has to work as a judge and derive the truth and not as a pleader who’s only eager to prove his case in favor of his plaintiff.” Discuss this statement pointing out the objectives of research. (5 marks)
- c) The following python code is used to actualize an important research metric. Use it to answer the questions that follow:

```
from sklearn.linear_model import LinearRegression

model = LinearRegression ( )

X, y = df [[“hours,” “prep-exams”]], df.score

model.fit (x, y)

print(r-squared)

0.717554
```

- i. Describe each line of code. (6 marks)
- ii. Discuss the concept being actualized by the code and its importance in research. (5 marks)
- iii. How do you interpret the value 0.717554? (4 marks)

QUESTION FIVE (25 MARKS)

- a) Describe each of the following statistical measures or concepts by use of appropriate examples in your area of research, discuss how a researcher would use them when carrying out research.
- i. Analysis of variance (ANOVA). (5 marks)
 - ii. Coefficient of skewness. (5 marks)
 - iii. Regression equation of X on Y. (5 marks)
- b) Discuss the broad types of questionnaires, types of questions and any six qualities of a good questionnaire. (10 marks)