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**KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY  
UNIVERSITY EXAMINATIONS, 2024/2025 ACADEMIC YEAR  
FOURTH YEAR, FIRST SEMESTER EXAMINATION  
FOR THE DEGREE OF BACHELOR OF SCIENCE IN MATHEMATICS  
(SPECIAL EXAMINATION)**

**KMA 400 RESEARCH METHODOLOGY**

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**DATE: 15<sup>TH</sup> AUGUST 2024**  
**TIME: 8:30 AM – 10:30 AM**

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**INSTRUCTIONS TO CANDIDATES**

**ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS**

**QUESTION ONE COMPULSORY (30 MARKS)**

**Read the following essay then use it to answer the questions that follows.**

Voter turnout in the Kenya has been decreasing steadily over the past ten years, in contrast to other areas of the country. According to surveys conducted by local nonprofits, turnout is lowest among those under 25 years of age. Low voter turnout has been shown to have negative associations with overall civic engagement. It is becoming an area of increasing concern in many democracies. When specific groups of citizens lack political representation, they are likely to become more excluded over time, leading to an erosion of trust in democratic institutions. Addressing this problem will have practical benefits, and will contribute to understanding of this widespread phenomenon. There have been some effective attempts at engaging these groups. In the last two elections, major parties increased their campaigning efforts. In addition, voter education with the aim of informing citizens on the need for participation in choosing the leadership has been increased. However, these interventions have yet to have any significant effect on turnout. An attempt to determine the main factors that lead to low voter turnout as well as the possible ways of solving this problem is necessary.

**Required:**

- In reference to the passage above, what could be the research topic? (2 marks)
- What is the main problem of concern that motivates this research? (2 marks)
- In line with the characteristics of good research objectives in (c), outline **TWO** possible specific objectives to the problem in the passage. (2 marks)
- Discuss **TWO** possible research designs that can be adopted in this research. (4 marks)
- Briefly explain any **FIVE** data collection methods you would use. (5 marks)
- Outline the possible steps that you would follow when conducting this research. (6 marks)
- Highlight **FOUR** characteristics of a good research that your research on the above topic must have. (4 marks)
- To determine whether the voter turnout is really magnified problem for under 25 years of age, comparative research was conducted to compare willingness of under 25 of age and those between 25 and 40 years to

turnout for voting. In 10 selected counties, a sample was taken and each sampled individual was asked to rate their possibilities of turning out to vote in a scale of 0-10 (0 not likely and 10 for highly likely). The following average rates were obtained as follows.

Under 25	5	3	8	2	4	6	7	5	4	4
25-40	8	7	6	4	4	7	7	6	8	5

Use the ordinary sign test to determine whether the average rate of turnout for under 25 is significantly less than that of between 25-40 years of age. Use 5% level of significance.

(5 marks)

**QUESTION TWO: (20 MARKS)**

- a) Errors in sampling can be either systematic or sampling. Differentiate between the two and give examples of the causes for each of the two and how the two errors can be reduced. (4 marks)
- b) Sampling methods are broadly classified as probability or non-probability sampling methods. Distinguish between the two classifications, hence elaborate on any **FOUR** probability sampling designs you may use in data collection. (8 marks)
- c) To ensure that the questioner captures the required information, it must be designed to be as good as possible. Briefly explain any **SIX** characteristics of a good questioner. (6 marks)

**QUESTION THREE: (20 MARKS)**

- a) You are a public health researcher interested in social factors that influence heart disease. You survey 500 towns and gather data on the percentage of people in each town who smoke, the percentage of people in each town who bike to work, and the percentage of people in each town who have heart disease. Because you have two independent variables and one dependent variable, and all your variables are quantitative, you decide to use multiple linear regression to analyze the relationship between them. You decide to analyze the data using excel and obtain the following summary output.

<i>Regression Statistics</i>	
Multiple R	0.9898
R Square	0.9796
Adjusted R Square	0.9795
Standard Error	0.6540
Observations	498

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	2	10176.57	5088.28	11895.24	0
Residual	495	211.7403	0.427758		
Total	497	10388.31			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	14.9846	0.0801	186.9882	0	14.8272	15.1421
biking	-0.2001	0.0013	-146.525	0	-0.2028	-0.1975
smoking	0.17833	0.0035	50.3866	5.2E-197	0.1713	0.1853

Use the output given to answer the following questions.

- i) Write simple linear regression model. (2 marks)
- ii) Interpret the parameters of biking and smoking. (2 marks)
- iii) Predict the percentage of those with heart disease for a town whose 16% of the population bike to work and 4% are smokers. (2 marks)
- iv) Based on the p-value, test the hypotheses on significance of individual parameters at 5% level of significance. (4 marks)
- v) Test on the adequacy of the overall model at 5% level of significance. (3 marks)
- vi) What percentage in variation in percentages of heart disease is determined by biking and smoking? (2 marks)
- b) There are several factors to consider before choosing a method of data analysis. Highlight any **FOUR** of these factors. (4 marks)

#### QUESTION FOUR (20 MARKS)

- a) Literature review plays an important role in every research. Discuss key issues that must be taken into consideration when reviewing literature. (10 marks)
- b) Discuss the **FOUR** levels of measurements, give an example in each case. Hence state how the levels of measurements determine the method of data analysis. (10 marks)

#### QUESTION FIVE (20 MARKS)

- a) Choosing a research problem requires a careful consideration since it has a great impact on the research process. Discuss the steps to be followed when formulating a research problem. (10 marks)
- b) In hypothesis testing one can either adopt parametric or non-parametric tests. Highlight the advantages of adopting nonparametric tests. (4 marks)
- c) You have collected the following data on ownership of Small Micro enterprises (SME).

Sex	SME Owners	Not SME Owner
Men	100	400
Women	50	450

Does the act of owning a SME depend on sex? Test the hypothesis at 5 % significance level.

(6 marks)