MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR
FOURTH YEAR SECOND SEMESTER

SCHOOL OF SCIENCE
BACHELOR OF SCIENCE IN APPLIED STATISTICS WITH COMPUTING

COURSE CODE: STA 4242-1
COURSE TITLE: BIOMETRY METHODS

DATE: 23/4/2024 **TIME: 0830-1030 HRS**

INSTRUCTIONS TO CANDIDATES

1. Answer **ALL** questions from section A and any **TWO** from section B.
2. Use of sketch diagrams where necessary and brief illustrations are encouraged.
3. Read the instructions on the answer booklet keenly and adhere to them.

*This paper consists of **four** printed pages. Please turn over.*

SECTION A (20 MARKS)

Answer all questions

QUESTION ONE (20 MARKS)

(a) Define the following terms as used in biometry

(i) Double blind

(ii) Placebo

(iii) Cross sectional study

(iv) Retrospective study [4Mks]

(b) A study was conducted to investigate the effectiveness of bicycle safety helmets in preventing head injury. The data consist of a random sample of 793 persons who were involved in bicycle accidents during one-year period.

Head injury	Wearing helmet		Total
	Yes	No	
Yes	17	218	235
No	130	428	558
Total	147	646	793

(i) Compute and compare the proportions of head injury for the group with helmets versus the group without helmets. What would be your conclusion? [3Mks]

(ii) Calculate the odds ratio associated with not using helmet. Does this result support your conclusion in part (i)? [3Mks]

(c) The table below contains data from a study of the relationship between lung cancer and smoking behavior in 20 hospitals. For each patient admitted, researchers studied the smoking behavior of non-cancer control patients of the same gender at the same hospital within the same 5-year grouping of age. A smoker was defined as a person who had smoked at least one cigarette a day for at least one year.

Have smoked	Lung cancer	
	Cases	Controls
Yes	688	650
No	21	59
Total	709	709

(i) Identify the response variable and explanatory variable [2Mks]

(ii) Identify the type of study in the research and explain [3Mks]

(iii) Compare the smokers with non-smokers in terms of the proportion of who suffered lung cancer and why [5Mks]

SECTION B (30 MARKS)

Answer any TWO Questions

QUESTION TWO (15 MARKS)

(a) In 2002, tuberculosis was diagnosed in a certain high school student (index case) in Kenya. Subsequently, laboratory studies revealed that the student's disease was caused by drug-resistant tubercule bacilli. An epidemiologic investigation was conducted at the high school. The table below gives the rate of positive tuberculin reactions determined for various groups of students according to degree of exposure to index case.

Exposure level	No. tested	No. positive
High	129	63
Low	325	36

(i) Compute and compare the proportions of positive cases for the two exposure levels. What would be your conclusion? [4Mks]

(ii) Calculate the odds ratio associated with high exposure. Does this result support your conclusion in part (i)? [4Mks]

(b) Explain four items that should be considered when designing forms to be used for data collection [7Mks]

QUESTION THREE (15 MARKS)

A study was carried out to investigate the relationship between obesity and cardio-vascular disease (CVD). It was hypothesized that the relationship between obesity and CVD was confounded by age. The data below summarizes the findings

Age	Obesity	CVD	No CVD	Total
<18	Obese	13	39	256
	Not obese	11	193	
18-35	Obese	12	78	308
	Not obese	6	212	
36-60	Obese	41	123	425
	Not obese	26	235	
>60	Obese	28	65	183
	Not obese	7	83	

(i) Obtain estimates of the relative risk and odds ratio using the crude method. [5Mks]

(ii) Obtain estimates of the relative risk and odds ratio using the cochran-Mantel-Haenszel procedure. [6Mks]

(iii) Compare the estimates obtained in (i) and (ii) above [4Mks]

QUESTION FOUR (15 MARKS)

(a) A case-control study of the epidemiology of preterm delivery, defined as one with less than 37 weeks of gestation, was undertaken at Nairobi Hospital in 2012. The study population consisted of 175 mothers of singleton preterm infants and 303 mothers of singleton full-term infants. The table gives the distribution of mother's age.

Age	Cases	Controls
14-17	15	16
18-19	22	25
20-24	47	62
25-29	56	122
≥ 30	35	78

Calculate and interpret the generalized odds ratio [4Mks]

(b) Distinguish between sensitivity and specificity [2Mks]

(c) Describe briefly what is done in phase I of clinical trials [4Mks]

(d) What is a confounder? Describe how a confounder is controlled. [5Mks]

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