MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya.
Tel: +254(0) 799 529 958, +254(0) 799 529 959, +254 (0)712 524 293
Website: www.must.ac.ke Email: info@mucst.ac.ke

UNIVERSITY EXAMINATIONS 2024/2025

SECOND YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN PUBLIC HEALTH AND BACHELOR OF SCIENCE IN HEALTH RECORDS AND INFORMATION MANAGEMENT
AND
THIRD YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN MEDICAL MICROBIOLOGY

HPP 3213/HPR 3213/HMM 3311: MEDICAL BIOSTATISTICS/ BIOSTATISTICS

DATE: JANUARY 2025 **TIME: 2 HOURS**

INSTRUCTIONS: Answer Question ONE and any other TWO questions.

QUESTION ONE (30 MARKS)

a) Differentiate between the following terms
   i. Descriptive and inferential statistics (2 Marks)
   ii. Discrete and continuous random variables (2 Marks)
   iii. Null and alternative hypothesis (2 Marks)

b) Explain two uses of biostatistics in your field of study (4 Marks)

c) Consider the following data shows the number of days it took 43 patients to recover from common cold.

No of days	3	4	5	6	7	8	p	10
No of patients	1	4	k	9	8	6	5	3

i. Find the value of k (l Mark)

ii. If the mean of recovery days is known to be 6.67 find the value of p (to the nearest whole number) (3 Marks)

iii. What is the standard deviation (3 Marks)

d) During a regular machine maintenance test a sample of ten drug containers with liquid drug were taken at a random from an automatic drug filling machine by a microbiologist. The mean volume of drug in containers was found was found to be $\bar{x}$ =15.8 mls and standard deviation of 0.60mls. To check whether the machine is faulty evaluate whether the sample mean significantly differ from intended volume of 16mls in each container use t = 1.26 (5 Marks)

e) The following data shows the blood group of blood used for transfusion in hospital x for the first three months of year 2024. Represent the data using an appropriate chart. (4 Marks)

	A	**AB**	**B**	**O**
JAN	10	35	25	15
FEB	25	5	30	20
MAR	20	15	35	20

f) Dementia is a medical condition that is associated with loss of memory. The probability that a patient transitions to Alzheimer disease is known to be 0.2. In random sample of 10 dementia patients. Find the probability that;

i. Less than 3 will transit to Alzheimer disease (4 Marks)

QUESTION TWO (20 MARKS)

a) A random sample of 48 newborns is to be recruited in a one-week study investigating birthweight of children in hospital x for an international report. Describe and justify any three sampling methods applicable for this study (9 Marks)

b) The following data shows hypothetical weight of newborns from a study described in (a) above.

Class	1.5-1.9	2.0-2.4	2.5-2.9	3.0-3.4	3.5-3.9	4.0-4.4	4.5-4.9
Frequency	3	5	8	12	11	7	2

i. Compute any two measures of central tendency (4 Marks)

ii. What is the coefficient of variation for this data (4 Marks)

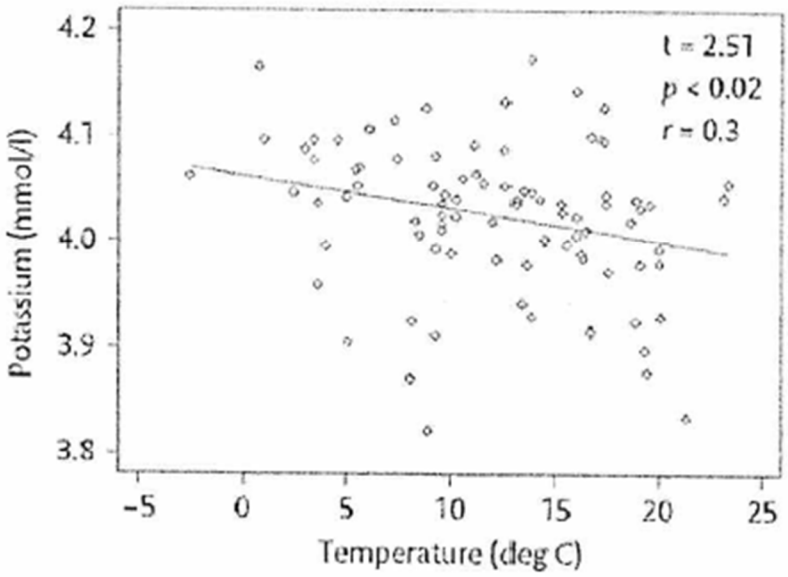
iii. Represent the data using a histogram and comment on the distribution of newborn birth weight for this hospital (3 Marks)

QUESTION THREE (20 MARKS)

a) Why would you use a sample for a research instead of Census? (2 Marks)

b) Explain two data collection method applicable in your area of study (4 Marks)

c) In a study of the relationship between serum potassium concentration and ambient temperature, investigators obtained mean daily temperatures recorded in central oxford between April l, 1996 and Dec 31, 1997. They also obtained details of mean daily potassium concentrations from six hospital sites and family physicians in Oxfordshire at the same time. Figure I shows a graph produced from the study.



i. What kind of diagram is this? (l Mark)

ii. What is the sloping line on the diagram? Write its equation in general form(2 Marks)

iii. What is meant by the symbol 'r'? explain why the value of 'r' is wrong on the diagram (4 Marks)

iv. How would you describe the evidence of the relationship between ambient temperature and serum potassium based on this graph? (2 Marks)

v. Assuming causation based on this graph, and using the r on the graph, compute the coefficient of determination and interpret. (2 Marks)

vi. Given that $\sum x = 79, \sum y = 60, \sum xy = 600,\ \sum x^2 = 700, \sum y^2 = 800$,n=10 compute the Pearson moment correlation coefficient for the two variables x and y. (3 Marks)

QUESTION FOUR (20 MARKS)

a) Explain two sources of data, giving examples from your field of study. (4 Marks)

b) During a study, data on the following variables was collected for each patient in a hospital ward (see table). For each of the following variables, state whether it is qualitative or quantitative; hence further classify into nominal, ordinal, discrete or continuous (4 Marks)

Variable	**Type**	**Subtype**
Blood Pressure		
Gender		
Bed Number		
Blood Type		

c) A researcher is interested in studying the effectiveness of a new weight loss program. They recruit 9 participants and measure their weight before and after completing the program. Carry out the necessary test to test the effectiveness of new weight loss program use t = 1.23 (12 Marks)

Before	70	62	71	89	69	126	81	70	60
After	65	60	71	82	52	124	80	70	61

QUESTION FIVE (20 MARKS)

a) List two characteristics of a normal distribution (2 Marks)

b) The length of human pregnancies from conception to birth leading to a normal delivery is modelled through a normal distribution with a mean of 266 days and a standard deviation of 16 days.

i. What percentage pregnancies will last between 240 and 270 days (roughly between 8 and 9 months) (4 Marks)

ii. After how many days will 70% of the pregnancy will have matured (3 Marks)

c) A clinical study is conducted to evaluate the effectiveness of a new antibiotic in treating bacterial Pneumonia infections. The study includes 80 patients split into two groups: 40 patients receiving the new antibiotic and 40 receiving a standard antibiotic. After the treatment period, the patients are assessed, and the outcomes (cure or no cure) are recorded as follows.

	Cured	Not Cured
New Antibiotic	24	16
Standard Antibiotic	20	20

i. State three uses of chi-square test (3 Marks)

ii. Determine if there is a statistically significant difference in the effectiveness (cure rate) between the new antibiotic and the standard antibiotic at a 5% significance level (8 Marks)

Use $\varphi = 3.69$