UGANDA MARTYRS UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF NATURAL SCIENCES

END OF SEMESTER TWO FINAL ASSESSMENT 2023/2024

FIRST YEAR EXAMINATION FOR BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

COMPUTATIONAL STATISTICS

CSC 1204

DATE: Thursday 16/5/24

TIME: 9.30 am – 12.30 pm

DURATION: 3 hours

Instructions

---

1. Carefully read through ALL the questions before attempting
2. The exam contains six (6) questions. Attempt **ANY FOUR (4)** of the questions.
3. Answers for each of the questions attempted should start on a new page.
4. No names should be written anywhere in your report and presentation.
5. Ensure that your Registration Number is indicated on all page of the examination answer booklet.
6. Ensure your work is clear and readable with examples. Untidy work shall be penalized.
7. Any type of examination Malpractice will lead to automatic disqualification.
8. Do not write anything on the question paper.

QUESTION ONE

(i) List the three examples of measures of central tendency. **(3 marks)**

(ii) The following data is a record of high temperatures for a sample of 50 countries in Africa.

112	100	127	120	124	118	105	110	109	112
110	113	117	116	114	122	114	114	105	109
107	112	114	115	118	117	115	122	106	110
116	108	110	121	113	120	119	111	104	111
120	113	120	117	105	110	118	112	114	114

(a) Construct a grouped frequency table using a class width of 4, starting with a temperature of 100. **(12 marks)**

(b) Determine the mean temperature. **(2 marks)**

(c) Calculate the median temperature. **(4 marks)**

(d) Find the modal temperature. **(4 marks)**

QUESTION TWO

(a) Define a random variable. **(1 mark)**

(b) Distinguish between a discrete random variable and a continuous random variable giving two examples of each. **(6 marks)**

(c) The probability mass function of a discrete random variable X is given by $P(X=x)=kx^2$, for $0,1,2,3,4$. Given that k is a constant;

(i) Construct a probability mass function (pmf) using a table. **(4 marks)**

(ii) Find the value of k **(4 marks)**

(iii) Calculate the variance of X **(4 marks)**

(iv) Find the standard deviation of X **(2 marks)**

(d) Find $P(X=2)$ and $P(X=5)$. **(4 marks)**

QUESTION THREE

(a) Define the term correlation analysis. **(1 mark)**

(b) Discuss the three types of correlation analysis using well labelled diagrams. **(9 marks)**

(c) Applicants for a job with a company are interviewed by two of the personnel staff. After the interviews, each applicant is awarded a mark by each of the interviewers. The marks are given below.

Candidates	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Interviewer 1	22	27	24	17	20	22	16	13
Interviewer 2	28	23	25	14	26	17	20	15

(i) Plot these results on a scatter diagram and comment on your graph. **(5 marks)**

(ii) Calculate spearman's rank correlation coefficient between the two sets of marks. **(8 marks)**

(iii) Comment on your results. **(2 marks)**

QUESTION FOUR

(a) What are measures of dispersion as used in statistics? **(1 mark)**

(b) A sample of University students was asked how much they spend monthly on meals.

Monthly cell phone plan cost ($)	10-19	20-29	30-39	40-49	50-59
Number of students	8	16	21	11	4

Using the frequency distribution table above to find the;

(i) Mean deviation **(5 marks)**

(ii) Variance **(5 marks)**

(iii) Lower quartile **(5 marks)**

(iv) Coefficient of variation **(5 marks)**

(v) Plot a histogram and use it to find the modal expenditure. **(4 marks)**

QUESTION FIVE

(a) What is regression analysis? **(1 marks)**

(b) For a regression line $y = \alpha + \beta x$, show that the parameters of the simple linear regression equation are given by the following expressions.

$$\alpha = \frac{\sum y - b\sum x}{n} \qquad \beta = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - \left(\sum x\right)^2}$$

(10 marks)

(c) The following table shows the ages and glucose levels of six students of Uganda Martyrs University who visited Nkozi hospital.

Age (x)	Glucose level (y)
43	99
21	65
25	79
42	75
57	87
59	81

(i) Identify the dependent and independent variables. **(2 marks)**

(ii) Calculate the values of α and β for the given data for the regression line $y = \alpha + \beta x$ **(10 marks)**

(iii) Write down the regression equation and hence estimate y when $x = 76$. **(2 marks)**

QUESTION SIX

(a) Write shorts on each of the following types of probability giving relevant examples.

(i) Experimental probability **(2 marks)**

(ii) Equally likely probability **(2 marks)**

(iii) Subjective probability **(2 marks)**

(b) Differentiate between an event and sample space as used in probability. **(2 marks)**

(c) A coin is tossed three times.

(i) Draw a probability tree diagram. **(2 marks)**

(ii) Write down the sample space. **(4 marks)**

(iii) Find the probability of getting one head. **(1 mark)**

(d) Events A and B are said to be independent events such that $P(A) = 0.4, P(A \cup B^1) = 0.9$.

Find:

(i) $P(B)$ **(3 marks)**

(ii) $P(A \cap B)$ **(2 marks)**

(iii) $P(A^1 \cap B^1)$ **(2 marks)**

(iv) $P(A^1 \cup B^1)$ **(3 marks)**

SUCCESS