Strathmore
UNIVERSITY

SCHOOL OF COMPUTING & ENGINEERING SCIENCES

BACHELOR OF INFORMATICS AND COMPUTER SCIENCE

END OF SEMESTER EXAMINATION

ICS 2106: PROBABILITY AND STATISTICS 1

DATE: 4th August, 2022 Time: 2 Hours

Instructions

1. This examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.
3. Do not write on the question paper.

QUESTION ONE (30 Marks)

a. Differentiate between a statistic and a parameter (2 Marks)

b. Differentiate between probability and non-probability sampling methods, giving examples(3 Marks)

c. Draw a back to back stem and leaf to compare the reaction time of boys and girls to a certain stimuli and compare the distributions (4 Marks)

Boys	Girls
0.14, 0.19, 0.18, 0.09, 0.19, 0.23, 0.16 0.22, 0.15, 0.16, 0.20, 0.16, 0.16, 0.11 0.15, 0.21, 0.23, 0.22, 0.23, 0.18	0.18, 0.24, 0.16, 0.22, 0.19, 0.19, 0.25, 0.22, 0.21, 0.16 , 0.22, 0.18, 0.21, 0.22 0.22, , 0.25, 0.17, 0.22, , 0.19, 0.19

d. The number of goals scored in 15 hockey matches is shown in the table.

No of goals	1	2	3	4	5
No of matches	2	1	5	3	4

i. Estimate the mean, median and standard deviation (6 Marks)

ii. Estimate the bowleys coefficient of skewness hence interpret your result (4 Marks)

e. Suppose there are 40 transistors of which 8 are defective. If sampling without replacement is performed, what is the probability of picking 4 good transistors in the first 7 draws (3 Marks)

f. Find the regression coefficient of Y on X and of X on Y on the basis of the following.

$\sum X = 50 \quad \sum Y = 60 \quad \overline{X} = 5 \quad \overline{Y} = 6 \quad \sum XY = 350$

Variance of X= 4 and Variance of Y=9 (4 Marks)

g. Stores A, B and C have 50, 75 and 100 employees respectively. 50, 60 and 70 percent of these are women. Resignation among these employees are equally likely regardless of gender. One employee resigns and this is a woman. What is the probability that she works in store C? [4 Marks]

QUESTION TWO(20 Marks)

(a) Differentiate between correlation and regression analysis in a bi-variate data analysis [2 Marks]

(b) The data below gives performance of students in Computer programming and statistics.

Roll number	1	2	3	4	5
Marks in Computer programming	48	35	17	23	47
Marks in Statistics	45	20	40	25	45

Determine the correlation coefficient between the performances and interpret your results [6 Marks]

(c) A company is introducing a job evaluation scheme in which all jobs are graded by points for skill, responsibility and so on. Monthly pay scales (in thousand Kenya shillings) are then drawn up according to the number of points allocated. To date the company has applied this scheme to 9 jobs:

Job	A	B	C	D	E	F	G	H	I
Points	5	25	7	19	10	12	15	28	16
Pay	3.0	5.0	3.25	6.5	5.5	5.6	6.0	7.2	6.1

(i)Fit the least squares regression line for linking pay scales to points [6 Marks]

(ii)Estimate the monthly pay for a job graded by 20 points [2 Marks]

(iii) Determine coefficient of determination hence interpret your results (4 Marks)

QUESTION THREE (20 MARKS)

a. The following data shows the distribution of salaries in US Dollars in a certain industry.

Salary in US dollars	30-40	40 – 50	50-60	60-70	70-80	80-90	90-100	100-110
No.of employees	20	30	60	75	115	100	60	40

(i) Construct a histogram and a frequency polygon on the same graph to represent the above data [4 Marks]

(ii) Using the coding method, calculate the mean salary and the standard deviation hence interpret your results. [6 Marks]

(iii) Calculate the median salary [2 Marks]

(iv) Calculate the first quartile (Q1) and third quartile (Q3) hence finds the interquartile range (IQR) of the salaries [4marks]

b. For a discrete random variable Y the probability distribution is $f(y)=\begin{cases}\frac{5-y}{10}, & y=1,2,3,4\\ 0, & elsewhere\end{cases}$,

calculate $E(Y)$ and var(Y) (4 Marks)

QUESTION FOUR (20 MARKS)

a. A fruit seller found out that out of 50 apples in a box, 10 were bad and could not be sold.3 apples are drawn at random by a customer, one at a time, without replacing the previous one each time

(i) Draw a tree diagram to represent probability outcomes of this experiment (4 Marks)

(ii) Find the probability that all the three apples drawn are good (3Marks)

(iii) Find the probability that at least one of the apples is bad (3 Marks)

b. The personnel department of a company has records which show the following analysis of its 200 employees

Age	Bachelors degree only	Masters degree	Total
Under 30	90	10	100
30-40	20	30	50
Over 40	40	10	50
Total	150	50	200

If one employee is selected at random find the probability that the employee

(i) has only a bachelor's degree only [2 Mark]

(ii) has a master's degree given that the employee is over 40 years [2 Marks]

(iii) is under 30 years of age given that the employee has only a bachelor's degree [2 Marks]

c. Suppose 80 per cent of the material received from a supplier A is of exceptional quality, whithe le only 50 per cent of the material received from supplier B is of exceptional quality. However, the wholesaler capacity of supplier A is limited and for this reason only 40 per cent of the material purchased comes from supplier A. The other 60 per cent comes from supplier B. An incoming shipment of material is inspected and it is found to be of exceptional quality. Using Baye's approach, determine the probability that it came from supplier A. [4 Marks]

QUESTION FIVE (20 MARKS)

a. Differentiate between discrete and continuous random variable (2 Marks)

b. A random variable X has the probability distribution shown below,

x	1	2	3	4	5
P(X=x)	7c	5c	4c	3c	c

i. Determine constant c (3 Marks)

ii. Find P(X>3) (4 Marks)

iii. Find expected value and the variance of X (5 Marks)

c. If 3% of the electric bulbs manufactured by a company are defective find the probability that in a sample of 100 bulbs less than 3 bulbs are defective. (6 Marks)