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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY

UNIVERSITY EXAMINATION, 2020/2021 ACADEMIC YEAR
FIRST YEAR, FIRST SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE
(MATHEMATICS)

Date: 18th December, 2020
Time: 11.30am – 1.30pm

KMA 102 - INTRODUCTION TO PROBABILITY AND STATISTICS

INSTRUCTIONS TO CANDIDATES

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

QUESTION ONE (30 MARKS)

a) Differentiate between the following terms as applied in Probability and Statistics

i) Population and Sample (2 Marks)

ii) Mutually exclusive event and independent event (2 Marks)

b) Define Sampling as method of data collection and explain it relevance as a method of data analysis (4 Marks)

c) An insurance company researcher conducted a survey on the number of car thefts in a large city for a period of 30 days last summer. The raw data are shown. Construct a stem and leaf plot by using classes 50–54, 55–59, 60–64, 65–69, 70–74, and 75–79.
52 62 51 50 69 58 77 66 53 57 75 56 55 67 73 79 59 68 65 72 57
51 63 69 75 65 53 78 66 55 . (5 Marks)

d) The data bellows shows the distance in kilometers travelled by 70 matatus during a certain week .

Class	6340-6349	6350-6359	6360-6369	6370-6379	6380-6389
Frequency	12	13	17	15	13

Find
i) Mode (2 Marks)
ii) Median (3 Marks)
iii) 27th Percentile (3 Marks)

e) If the weights of 7 ear-heads of sorghum are 89, 94, 102, 107, 108, 115 and 126g. Find the arithmetic mean and standard deviation using a calculator hence determine the coefficient of variation of the ear-heads of sorghum

(5 Marks)

f) In a large restaurant, an average of 3 out of 5 customers asks for water with their meal. A random sample of 10 customers is selected, find the probability that;

i) exactly 6 customers will ask water with their meals (2 Marks)

ii) less than 9 customers will ask water with their meals (2 Marks)

QUESTION TWO (20 MARKS)

a) Giving examples in each discuss the two broad branches of probability. (4 Marks)

b) Two fair dice labeled 1 to 6 are tossed. Let A be the event the product of the number showing up is greater than 21 and let B be the event that the product is divisible by 6. Find

$P(A \cup B)$ (2 Marks)

c) A manufacturer orders biomedical parts from three different suppliers. From past records of the manufacturer, the percentages of the defectives from each of the suppliers is 3%, 5% and 4% respectively. The current inventory of parts contains 5000 units from supplier 1, 3,500 units from supplier 2 and 2000 units from supplier 3. If a part is chosen from the inventory at random,

i) What is the probability it is defective (3 Marks)

ii) What is the probability that the defective part is from supplier 1 (3 Marks)

d) A discrete random variable Y has a probability mass function given by the table below

Y	0	1	2	3	4
P(Y=y)	c	2c	5c	10c	17c

Determine

i) the value of constant c (2 Marks)

ii) $P(1 \le y < 4)$ (2 Marks)

iii) Standard deviation (4 Marks)

QUESTION THREE (20 MARKS)

a) State the properties of a poisson distribution (3 Marks)

b) Births in a hospital occur randomly at an average rate of 1.8 births per hour. What is the probability of observing;

i) births in a given hour at the hospital? (3 Marks)

ii) more than or equal to 2 births in a given hour at the hospital? (3 Marks)

iii) 5 births in a given 2 hour interval at the hospital? (3 Marks)

c) A probability distribution of the claim sizes for an auto insurance policy is given in the table below

Claim Size	20	30	40	50	60	70	80
probability	0.05	q	p	2p	2q	0.1	q

i) If the average claim size is 52, find the values p and q and hence find the standard deviation of the claim size (5 Marks)

ii) Determine the percentage of claim that are within one standard deviation of the mean claim size (3 Marks)

QUESTION FOUR (20 MARKS)

a) The table shows the speed distribution of vehicles on Thika Super high way on a typical day.

Speed (km/hr)	2260-2269	2270-2279	2280-2289	2290-2299	2300-2309	2310-2319	2320-2329	2330-2339	2340-2349
No of vehicles	138	163	325	541	427	214	110	52	30

Find

i) Mean (3 Marks)

ii) standard deviation (4 Marks)

iii) 6^{th} decile (3 Marks)

iv) inter quartile range (5 Marks)

b) Consider the following table with Marks obtained by two students James (mark x) and John (mark y). The weights are to be used in determining who joins the engineering course whose requirement is a weighted mean of 58% on the four subjects below;

Subject	Mathematics	English	History	Physics	Total
Mark x	25	87	83	30	225
Mark y	70	45	35	75	225
Weight	3.6	2.3	1.5	2.6	10

Using the weights above determines who joined the engineering course (5 Marks)

QUESTION FIVE (20 MARKS)

a) The data represent the record high temperatures in degrees Fahrenheit (F) for each of States in USA. 112 100 127 120 134 118 105 110 109 112 110 118 117 116 118 122 114 114 105 109 107 112 114 115 118 117 118 122 106 110 116 108 110 121 113 120 119 111 104 111 120 113 120 117 105 110 118 112 114 114

i) Were the data obtained from a population or a sample? Explain your answer. (2 Marks)

ii) What was the temperature of the hottest and the coolest county? (1 Mark)

iii) Construct a frequency distribution for the data. (6 Marks)

iv) Are there any peaks in the distribution? (1 Mark)

v) Identify any possible outliers. (1 Mark)

b) Discuss any three methods data presentation (9 Marks)