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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY

UNIVERSITY EXAMINATIONS, 2022/2023 ACADEMIC YEAR

FIRST YEAR,FIRST SEMESTER END OF SEMESTER EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF EDUCATION (ARTS)

KMA 2103-INTRODUCTION TO PROBABILITY AND STATISTICS

Date: 9th December, 2022

Time:11.30am-1.30pm

INSTRUCTIONS TO CANDIDATES:

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE(30 MARKS)

a) Consider the following frequency distribution

classes	10-14	15-19	20-24	25-29	30-34
frequency	7	11	14	13	5

i) Compute mean and, (2 marks)

ii) Variance of the observations. (3 marks)

iii) Represent the data in a histogram. (2 marks)

b) Given the following data in a frequency distribution below

Value	10	11	12	13	15
Freq	2	2	4	3	1

i) Harmonic and (2 marks)

ii) Geometric means. (3 marks)

c) There are four green and 5 red balls which are identical in side in a box. Two balls are picked from the box one at a time and without replacement. Find the probability that the at least one green ball is picked. (3 marks)

d) A market trader sells ball-point pens on his stall. He sells the pens for a different fixed price, $ X, in each of six weeks. He notes the number of pens, Y, that he sells in each of those six weeks. The results are as shown in the following table;

Price (X)	10	15	20	25	30	35
No. of Pens sold	68	60	55	48	38	32

Determine the Spearman's Rank correlation coefficient, comment on the result. (5 marks)

e) The probability distribution of a random variable X is given by

$$f(x) = \begin{cases} \frac{x+1}{14}, & x = 1,2,3,4 \\ 0, & \text{Otherwise} \end{cases}$$

Find

(i) Expected value of X. (2 marks)

(ii) Variance of X. (3 marks)

f) The 1st, 2nd, 3rd and 4th central moments of a set of observations are 0, 19.667, 9 and 581.667 respectively. Determine the moment coefficient of skewness and kurtosis, hence interpret it. (5 marks)

QUESTION TWO (20MARKS)

a) The table below represents each quantity purchased (X) and price per unit (Y) in a wholesale shop

Quantity	150	169	175	180	200
Price	20	17	16	14	12

i) Obtain a simple regression equation relating price to quantity purchased. (7 marks)

ii) Estimate the price paid by an individual who bought is 140 units. (2 marks)

iii) Determine the Pearson's product moment correlation coefficient between quantity purchased and price per unit, hence comment on the result. (5 marks)

b) A horse was subject to the test of how many minutes it takes to reach a point from the starting point. The horse was made to carry luggage of various weights on 10 trials. The data collected are presented below in the table

Weight (in Kgs)	11	23	16	32	12	28	29	19	23	20
Time taken (in mins)	13	22	16	47	13	39	43	21	24	22

Compute the Spearman's rank correlation coefficient and comment on interpret it. (6 marks)

QUESTION THREE (20 MARKS)

The data below shows the sales unit for a salesman in 50 days.

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

a) Determine the appropriate number of classes, class width and class limits for these data. (4 marks)

b) Using the results in (a) construct a grouped frequency distribution. (2 marks)

c) Estimate;

i) Mode. (3 marks)

ii) Median. (3 marks)

iii) Quartile deviation. (3 marks)

iv) Mean. (2 marks)

v) Standard deviation. (3 marks)

QUESTION FOUR (20 MARKS)

a) Define the following terms as used in probability theory

i) Experiment. (1 mark)

ii) Event. (1 mark)

iii) Sample space. (1 mark)

iv) Mutually exclusive events. (1 mark)

b) A company has three Machines A, B and C. Machine A produces 40% of the day's products. Machine B produces 30% of the products while Machines C produces 10%. Out of the products produced by machine A, B and C, 5%, 4% and 2% respectively are defective.

i) Find the probability that the product picked from production line is defective. (3 marks)

ii) If a product picked is defective, what is the probability that it was produced by machine A? (3 marks)

b) A watch manufacturing company quality control department has found that 5% of watches produce are faulty. To ensure that no lot is shipped customers exceeds the acceptable number of default watches, a sample of 20 items are selected hourly. If more than two faulty watches are found in the sample, then that hour lot is not shipped until all items are inspected. Let X be the number of faulty watches in the sample be X

i) Identify the probability distribution of X. (2 marks)

ii) Find the probability that the lot will not be shipped to the customers? (3 marks)

c) The number of traffic accidents that occur on a particular stretch of road during a month follows a Poisson distribution with a mean of 7.6. Find the probability that the number of accidents will occur on this stretch of road this month is;

i) Exactly 5. (2 marks)

ii) Less than three accidents will occur next month. (3 marks)

QUESTION FIVE (20 MARKS)

a) What is statistics? (2 marks)

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

Speed (km/hr.)	60-69	70-79	80-89	90-99	100-109	110-119	120-129	130-139	140-149
No of vehicles	138	163	325	541	427	214	110	52	30

Taking A=104.5, using coding formulae to find;

i) the mean speed. (3 marks)

ii) the standard deviation of the speeds. (3 marks)

c) The frequency distribution of data is given by

Class	10-19	20-29	30-39	40-49	50-59	60-69	70-79
Freq	2	8	f_1	18	f_2	6	1

Find

i) The values of f_1 and f_2 given that the total frequency is 60 and the mode is 40.05. (8 marks)

ii) Determine the 6^{th} decile. (4 marks)