MACHAKOS UNIVERSITY

ISO 9001:2008 Certified

SCHOOL OF PURE AND APPLIED SCIENCES FOR THE BACHELOR'S DEGREE

DEPARTMENT OF MATHEMATICS AND STATISTICS

UNIVERSITY EXAMINATION 2019/2020

SMA 160: INTRODUCTION TO PROBABILITY AND STATISTICS

DATE: JAN-APRIL 2020 SERIES **TIME:** **2 HOURS**

INSTRUCTIONS:

1) Answer Question ONE and any other TWO questions.
2) Mobile phones and any written material are prohibited in the examination room.
3) No writing should be done on this question paper. Any rough work should be done at the back of the answer booklet and canceled.
4) All answer booklets should be handed in at the end of the exam whether used or not.
5) Programmable calculators are prohibited

QUESTION ONE (COMPULSORY – 30 MARKS)

(a) Define the following terms as used in statistics.
   (i) Range (1 mark)
   (ii) Coefficient of correlation (1 mark)

(b) State four classes of classification (4 marks)

(c) Distinguish between a histogram and a frequency polygon (2 marks)

(d) If the probability that a student A will fail a certain statistics examination is 0.3, the probability that student B will fail the examination is 0.15, and the probability that both students A and B will fail the examination is 0.08. What is the probability that
   (i) At least one of these two students will fail the examination? (3 marks)
   (ii) Neither student A nor student B will fail the examination? (3 marks)

(e) The following data shows the marks obtained by 49 students in a class.

Marks	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45
Number of students	5	6	15	10	5	4	2	2

(a) Calculate the
   (i) Median (4 marks)
   (ii) Arithmetic mean (2 marks)
   (iii) Variance (4 marks)
   (iv) Mode (4 marks)

(f) Compute the harmonic mean of the following numbers 3,9,27. (2 marks)

QUESTION TWO (20 MARKS)

The marks obtained by 80 students are given below

Marks	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	3	9	15	30	18	5

(a) Compute the
   (i) Lower quartile (3 marks)
   (ii) Upper quartile (3 marks)
   (iii) Quartile deviation (2 marks)

(b) Draw a cumulative frequency curve hence use it to estimate (4 marks)
   (i) 4^{th} decile (3 marks)
   (ii) 40^{th} percentile (3 marks)

(c) State one merit and one demerit of arithmetic mean (2 marks)

QUESTION THREE (20 MARKS)

(a) Find the mean deviation of the following set of numbers (5 marks)
20, 30, 60, 80, 110.

(b) The following marks were obtained in a statistics test in a class of 25 students

Marks	0-29	30-39	40-49	50-59	60-69	70-79	80-89	90-100
Frequency	0	3	7	7	5	2	1	0

Calculate

(i) Mean (4 marks)

(ii) The standard deviation (4 marks)

(iii) The variance (2 marks)

(c) An analysis of monthly wages paid to the workers in two firms A and B belonging to the same industry gives the following results.

	Firm A	Firm B
Number of workers	500	600
Average monthly wage	£186	£175
Variance distribution of wages	81	100

Which firm has a large wage bill? (5 marks)

QUESTION FOUR (20 MARKS)

In a mock examination, the marks of six candidates in the mathematics papers were as follows,

	1	2	3	4	5	6
Paper I (x)	47	44	42	51	65	63
Paper II (y)	50	43	43	35	51	48

(a) Obtain the least squares Regression line connecting paper I and paper II (12 marks)

(b) Calculate the correlation coefficient between paper I and paper II (8 marks)

QUESTION FIVE (20 MARKS)

(a) Define the following terms

(i) Probability (1 mark)

(ii) Sample space (1 mark)

(b) A bag contains 5 red balls and 3 black balls. If 3 balls are drawn without replacement, what is probability that;

(i) No black balls will be selected? (2 marks)

(ii) Exactly one red ball will be selected? (3 marks)

(iii) At least one red ball will be selected? (3 marks)

(c) Machine A_1 produces50%, Machine A_2 30% then the remaining by machineA_3, in a factory out of the items by these machines3%, 4% and 5%respectively are defective. An item produced in this factory (selected randomly) was found to be defective. Find the probability that this item was produced by machine;

(i) A_1 (4 marks)

(ii) A_2 (3 marks)

(iii) A_3 (3 marks)