TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:

BTAP/BTRE

AMA4117: PROBABILITY &STATISTICS

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: 17 May 2016

Instructions to Candidates
You should have the following for this examination
-Answer Booklet, examination pass and student ID
This paper consists of Choose No questions. Attempt Choose instruction.
Do not write on the question paper.

Question ONE(30 MarkS)

(a)   Define the following terms;
  (i)   Skewness   (1mark)
  (ii)   Data   (1mark)
  (iii)   Independent events   (1mark)
  (iv)   Coefficient of variation   (1mark)

(b)   The analysis of shafts for a compressor is summarized by conformance to specifications as follows;

		Surface finish		
		Yes	No	Total
Roundness	Yes	345	5	350
	No	12	8	20
	Total	357	13	370

Let A denote the event that a compressor conforms to surface finish and B the event that a compressor conforms to roundness specifications. Determine the following:

  (i)   P(A)   (1 mark)

(ii)   P(B)   (1mark)
(iii) P(A\B)   (1mark)
(iv)   P(B\A)   (1mark)
(v)   P(A∩B)   (1mark)
(vi)   Whetherthe events areindependent   (1mark)

(c)   (i) Verifythat the following function is aprobabilitydistribution function (2 marks)

x	-1	0	1	2	3
p(x)	1/8	2/8	2/8	2/8	1/8

(ii)   Hence determinethe probabilities;
       P(X <3),   (2marks)
       P(-1≤ X ≤ 2)   (2marks)

(d)   Thenumberof telephone calls,X, received perminute at a switchboard has the

following probabilitydistribution

x	10	11	12	13	14	15
p(x)	0.08	0.15	0.30	0.20	0.20	0.07

Determine;

(i)   Themean calls received per minute   (2 marks)

(ii)   Thevarianceof thenumberof calls received per minute   (3 marks)

(e)   Assume you have data values of 1, 2, 3, 4, 5, 6, 7, 8, and 9.Determine

(i)   The skewness coefficient   (4marks)

(ii)   coefficient of kurtosis   (4 marks)

(iii) Excess kurtosis in (ii)   (1 mark)

Question TWO(20 MarkS)

Data indicating thenumber of candidates found cheating in last year's KCSE examinations for

a sample of 100 schools are summarized below.

Cheating candid	Numb. ofschools
≥ 10 but < 20	16
≥ 20 but < 25	10
≥ 25 but < 30	20
≥ 30 but < 35	21
≥ 35 but < 40	14
≥ 40 but < 50	10
≥ 50 but < 70	4
Total	100

(a)   Drawa histogram depictingtheabove data.   (7 marks)

(b)   Estimatethemeanand median ofthe data. What do thedataandyourstatistics .
       indicateaboutthedistributionof thenumberof cheating candidates?   (6 marks)

(c)   Estimate, by calculation, the upper and lower quartiles and the ninety-fifth percentile of this
       distribution. Give your answers correct to the nearest whole number.   (7 marks)

Question THREE(20 MarkS)

Maccal Ferries runs ferries to the Scottish Islands from the mainland. The data below give the prices (in £) for a
return ticket for a driver and for a car on each of 10 routes.

Route	A	B	C	D	E	F	G	H	I	J
Driver cost (x)	20	23	27	33	28	42	38	23	22	19
Car cost (y)	92	107	124	165	105	163	143	85	100	83

You are given that

$$\sum x^2 = 8\,113 \quad \sum y^2 = 144\,671 \quad \sum x = 34\,046$$

(a)   Plot a scatter diagram of the data, marking the letters near your points.   (4 marks)
(b)   Find the correlation coefficient between x and y and comment on its value.   (6 marks)
(c)   Find the regression line that predicts car cost for a given driver cost.   (4 marks)
(d)   Plot the line on your scatter diagram. Which route gives the cheapest actual car cost compared to
       predicted cost and which the most expensive?   (4 marks)

Question FOUR(20 MarkS)

(a) A large organisation has been accused of being "ageist", i.e. tending not to employ older people. In
    response, it publishes the following table showing the age distribution of its current employees.

Age last birthday (years)	Number of employees
15 − 19	240
20 − 24	340
25 − 29	360
30 − 39	420
40 − 49	380
50 − 64	240

(i)   Draw a histogram on graph paper to show the data.   (6 marks)
(ii)   State, with reasons, whether the data suggest that the organisation is ageist.

                                                                                         (2 marks)
(iii) Explain why the way the data have been presented in the table may be misleading to the
       casual observer.   (2 marks)

(b)   (i)   Explain what is meant by the dispersion of a set of data.   (1 mark)

        (ii)   Define three different measures of dispersion for a set of data and give one advantage and one disadvantage of each measure.   (6 marks)

        (iii)   Which of your measures would you recommend in calculating the dispersion of a set of data giving the wages of all employees in a company? Give brief reasons for your choice.   (3 marks)

Question FIVE(20 Marks)

(a)   (i)   Explain what the terms quantitative and qualitative mean when referring to variables in a set of data.   (2 marks)

       (ii)   Suggest two categories into which qualitative variables can be sub-divided and give an example of a variable of each category.   (4 marks)

       (iii)   Quantitative variables may be divided into the categories discrete and continuous. Give one example of each of these categories.   (2 marks)

       (iv)   For each of the four examples you have given, state which between a bar chart or a histogram you would use to graph its frequency distribution. In each case, indicate how you would order the categories across a page.   (4marks)

(b)   A sample of data is given as 2.7, 3.8, 3.0, 4.4, each value being correct to 1 decimal place.

       (i)   Draw up a table showing the minimum and maximum possible values of each of the data points.   (4 marks)

       (ii)   Using your table, calculate the minimum and maximum possible values for the mean of the four data points.   (2 marks)

       (iii)   You are told that the minimum and maximum possible values of the standard deviation of the four points are 0.7182 and 0.8261, respectively. Show that the coefficient of variation must lie between 20.4% and 24.1%.   (2 marks)