TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

DIPLOMA IN COMMUNITY HEALTH & MANAGEMENT

AMA 2201: BIOSTATISTICS

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: OCTOBER 2013
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
  - *Answer Booklet*
  - *Mathematical Tables*
  - *Scientific Calculator*
This paper consist of **FIVE** questions in **TWO** sections **A** & **B**

Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **FOUR** printed pages
SECTION A (COMPULSORY)

Question One

a) Define the following terms as used in biostatistics:
   (i)   A statistic   **(1 mark)**
   (ii)   A parameter   **(1 mark)**

b) Given that $X = X_1, X_2, X_3, Y = Y_1, Y_2, Y_3$ where $X_1 = -5, X_2 = 2, X_3 = 1, Y_1 = 1, Y_2 = 4, Y_3 = 3$
   Find:

$$\sum_{l=1}^{3} x \sum_{l=1}^{3} y^2$$

   (i)   **(2 marks)**

$$\sum_{l=1}^{3} xy$$

   (ii)   **(2 marks)**

c) For each of the following variates state whether they are quantitative or qualitative and give 3 possible measurements or observations of the variate.
   (i)   Height
   (ii)   Age
   (iii)   Eye colour
   (iv)   Town of birth
   (v)   Distance from college   **(5 marks)**

d) The heights of sample of 80 female students are summarized by the equation:

$$\sum (x - 160) = 240 \qquad \sum (x - 160)^2 = 8720$$

   and   . Find the standard deviation of the heights of the 80 female students.   **(5 marks)**

e) Compute the harmonic mean of the following data:

Class	10 - 20	20 – 30	30 – 40	40 – 50	50 - 60
Frequency	5	7	13	3	2

                                                                                                      (2 marks)

f) Show that the following statements hold:

$$\sum_{l=1}^{1} xi - \sum_{l=-2}^{2} i = x_1$$

   (i)   **(2 marks)**

$$\sum_{l=1}^{4} i^{-1} = 1.08333$$

   (ii)   **(2 marks)**

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g) Find the mean of the following data using an appropriate assumed mean:

Class	5 – 20	21 – 36	37 – 52	53 – 68	69 – 84	85 – 100
f	6	12	17	11	3	1

h) Give **TWO** uses of ogives **(2 marks)**

SECTION B (Answer any TWO questions from this section)

Question Two

a) Give **TWO** differences between a histogram and a bar chart. **(2 marks)**

b) State whether each of the following is a discrete or continuous variable.
  (i)   The number of components in a machine **(1 mark)**
  (ii)   The capacity of a container **(1 mark)**
  (iii)   Time **(1 mark)**
  (iv)   Height **(1 mark)**
  (v)   Cost in kshs **(1 mark)**

$$S^2 = \frac{\sum fx^2}{N} = \left(\frac{\sum fx}{N}\right)^2$$

c) Show that the variance of a given sample is given by: **(6 marks)**
d) Give **THREE** advantages of the arithmetic mean **(3 marks)**

e) Define what is meant by the term "conditional probability." **(2 marks)**

f) State any **TWO** measures of dispersion. **(2 marks)**

Question Three

a) Show that the sum of squares of the deviations of a set of data from any number of α is least only when $\alpha = \overline{X}$ where $\overline{X}$ is the Arithmetic mean. **(5 marks)**

b) Compute the Mean Absolute Deviation (MAD) for the data given below. **(6 marks)**

Mass (gms)	Frequency
491.5 – 495.5	4
495.5 – 499.5	11
499.5 – 503.5	18
503.5 – 507.5	10
507.5 – 511.5	7

c) At the end of a Biostatistics course, Diana sits two written papers, S_1 and S_2, and hands in a piece of course work. Her marks out of 100 were 76 for S_1 and 67 for S_2, and she gained 81 marks for her coursework. Her overall percentage mark for the course is weighted so that the two written papers

count for 40% each and the course work for 20%. Find Diana's overall percentage mark.

(3 marks)

d) Calculate the range and semi interquartile Range of the data below.

Class	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
Frequency	12	19	5	10	9	6

(6 marks)

Question Four

a) The following are results of an assessment test given to Biostatistics students that was marked out of 30 marks)

19.6	19.8	19.9	19.7	19.8	19.8	19.6	19.9	20.0
3	2	6	5	6	2	1	7	7
19.8	20.1	19.5	20.0	19.7	19.9	19.6	19.8	19.9
9	6	6	5	2	6	8	7	0
19.7	19.9	20.0	19.8	19.8	19.7	19.7	19.7	19.8
3	3	3	6	1	7	8	5	7
19.6	19.7	19.9	20.0	20.1	20.0	19.8		
6	7	9	0	1	1	4		

Arrange the marks into equal classes of 0.09mm and hence determine: **(7 marks)**

(i) The lower class boundary of the third class **(2 marks)**
(ii) The central value of the fifth class **(2 marks)**

b) A racing car counts five laps of circuit in a race, each lap covered as at the following average speed (in mph)

12.4, 132.8, 125.7, 126.9, 134.9

Find the average speed of the car for the whole race. **(5 marks)**

c) List **FOUR** advantages of median. **(4 marks)**

Question Five

a) Group the following data taking a class limit of 4 using:
(i) Inclusive form of grouping **(3 marks)**
(ii) Exclusive form of grouping **(3 marks)**

2,4,3,1,5,7,9,21,13,15,18,17,14,10,12,16,7,6,19,7,6,19,22,11,23,22,24,2,5,3,4,3,2

b) Pretty visits her aunt who says 30km away she travels to her aunts house by a circle with an average of 10km/h, she returns in her friends car at an average speed of 30km/h. What is her average speed round trip? **(3 marks)**

c) A company has 3 establishment E_1, E_2, E_3 in 3 cities. Analysis of the monthly salaries paid to the employees in the 3 establishment is given below.

E_1 E_2 E_3

NO of staff	100	150	250
$\overline{X}$	50	55	60
S^2	100	121	144

Find the combined mean and the combined standard deviation. **(8 marks)**

d) Determine the percentile coefficient of Kurtosis of the data given below:

Mass	492 – 495	496 – 499	500 – 503	504 – 507	508 – 511
Freq	4	11	18	10	7

(6 marks)