TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

DIPLOMA IN ANALYTICAL CHEMISTRY (DAC 12S)

AMA 2202: STATISTICAL TECHNIQUES

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2013
TIME ALLOWED: 2 HOURS

<u>**Instructions to Candidates:**</u>
You should have the following for this examination
    -    *Answer Booklet*
This paper consist of **FIVE** questions
Answer question **ONE (COMPULSORY)** and any other **TWO** questions
<u>Maximum marks for each part of a question are as shown</u>

This paper consists of **FOUR** printed pages

Question One (Compulsory)

a) Define the following terms as used in statistics:
   (i)   Descriptive statistics   **(1 mark)**
   (ii)   Quantitative data   **(1 mark)**
   (iii)   Histogram   **(1 mark)**
   (iv)   Coefficient of variation   **(1 mark)**

b) Discuss the measures of central tendency   **(4 marks)**

c) The heights of a sample of 80 female students:

$$\sum_{i=1}^{n}(x-160) = 240 \qquad \sum_{i=1}^{n}(x-160)^2 = 8720$$
$$\text{and} \qquad \textbf{(4 marks)}$$

   Find the standard deviation of the heights of the 80 female students   **(4 marks)**

d) In a series of 100 individuals, the mean blood glucose in mg/dl was found to be 155 with standard deviation 52. In the same individuals the mean serum cholesterol levels in mg/dl was found to be 210 with standard deviation 36. Find which character shows greater variation   **(4 marks)**

e) Show that variance of a random sample of a given population can also be given by:

$$\text{var}(x) = \frac{1}{n}\sum_{i}^{n} x_i^2 - \bar{x}^2$$

                                                                          (7 marks)

f) There are 12 boys and 13 girls, in a class of 25 students who were given a test. The mean mark for the 12 boys was 31, and the standard deviation of the boys marks was 6.2. The mean mark for girls was 36 and the standard deviation of the girls marks was 4.3. Find the mean mark and the standard deviation of the marks of the whole class of 25 students.   **(7 marks)**

Question Two

a) Define the following term upper quartile   **(2 marks)**

b) The table below shows values of X and y obtained from an experiment.

X	1	2	3	4	5	6	7	8	9
Y	8	9	11	10	12	14	13	15	16

   (i)   Determine the coefficient of linear correlation using the product moment formular. **(5 marks)**
   (ii) Determine the equation of regression line of Y on X   **(4 marks)**

c) When do we say that two events are mutually exclusive   **(1 mark)**

d) A fair dice is thrown 3 times. Getting a '3'3 or '6' s considered a success. Find the probability of at least two successes.   **(5 marks)**

e) Pretty visits her aunt who stays 30km away. She travels to her aunt's house by a bicycle with an average of 10km/hr, she returns in her friend's car an average speed of 30km/hr. What is her average speed for the round trip. **(3 marks)**

Question Three

a) 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) The size of work force in a factory **(1 mark)**
   (iv) The speed of notation of a shaft **(1 mark)**
   (v) The temperature of a coolant **(1 mark)**

b) List FOUR advantages of median **(4 marks)**

c) The following data gives the distribution of male and female students in different classes in a certain university:

Groups	A	B	C	D	E	F
Men	25	21	25	25	71	1
Women	33	35	43	43	113	9

Display this data using pie charts **(6 marks)**

d) Let $X_1, X_2, X_3 \ldots X_n$ be a random sample from a given population.

Show that the sum of squares of the deviations of a set of data from any number say β is least only when
$$\beta - \overline{X} = 0$$
(4 marks)

e) Define the term "A statistic **(1 mark)**

Question Four

a) 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
Frequency	6	12	17	11	3	1

b) The probability of a patient recovering from a diseased is 0.6. Ten patients are suffering from the same disease. Find the probability that:
   (i) 2 will recover **(2 marks)**
   (ii) utmost 2 will recover **(2 marks)**
   (iii) at least 2 will recover **(2 marks)**

c) For the following set of scores, show that the sum of squares of deviations about the mean $\left(\overline{X} = 7.4\right)$ is smaller than the sum of squares of deviations about the value X = 7 **(5 marks)**

d) List any FOUR disadvantages of the mean   **(4 marks)**

Question Five

a) A manital bliss inventory was given to a sample of married persons with and without children. The following data were obtained.

	n	$\overline{X}$	Serial Number
Male, no children	48	84.3	1
Female no children	63	76.3	2
Male no children	56	58.8	3
Female with children	67	62.6	4

(i)   Find the mean for the total group   **(2 marks)**
(ii) Find the mean for the males and the mean for females   **(4 marks)**
(iii) Find the mean for the married persons with children and the mean for those without children.
                                                                                    (2 marks)

b) An examination of 8 applicants for clerical post was taken by a firm. From the marks obtained by the applicants in the accountancy and statistics compute the rank coefficient correlation.

Applicant	A	B	C	D	E	F	G	H
Marks in Accountancy	15	20	28	12	40	60	20	80
Marks in Statistics	40	30	50	30	20	10	30	60

                                                                                    (7 marks)
c) List any THREE uses of regression analysis   **(3 marks)**