TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR DEGREE OF:

BACHELOR OF SCIENCE IN STATISTICS & COMPUTER SCIENCE (BSSC 14G)

AMA 4107: PROBABILITY & STATISTICS I

END OF SEMESTER EXAMINATION
SERIES: APRIL 2015
TIME ALLOWED: 2 HOURS

<u>**Instructions to Candidates:**</u>
You should have the following for this examination
- *Mathematical tables*
- *Scientific Calculator*

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

Question One (Compulsory)

a) Give a brief explanation of the following terms:
  (i) Population   **(1 mark)**
  (ii) Sample   **(1 mark)**
  (iii) Census   **(1 mark)**
  (iv) Survey   **(1 mark)**

b) Explain why it is often impossible to collect all the relevant data   **(4 marks)**

c) Give and explanation of THREE common methods of how questionnaires can be completed
                                                                                                                                       (5 marks)

d) Eggs are graded by size. This frequency table shows the distribution of the makes of some size 2 eggs.

(i) Draw a histogram to illustrate this distribution **(5 marks)**
(ii) Find the number of eggs with a mass that is:
- Less than 66 grams **(4 marks)**
- Move than 68.5gram **(4 marks**
- Between 64 grams and 68 grams **(4 marks)**

Question Two

a) The frequency distribution table below is for the distribution of masses of apples:

Mass, m grams	Frequency
$85.5 \le m \le 84.5$	13
$87.5 \le m \le 89.5$	16
$89.5 \le m \le 91.5$	14
$91.5 \le m \le 93.5$	27
$93.5 \le m \le 95.5$	14
$95.5 \le m \le 97.5$	11

(i) Draw a cumulative frequency curve for the distribution of the masses of 95 apples
(8 marks)
(ii) Draw a box and whisker plot **(6 marks)**
(iii) Read the values of the median, the range and interquartile range from the cumulative frequency curve **(3 marks)**
(iv) Explain why the interquartile range might be a better indicator of the spread of the masses than the range **(3 marks)**

b) Imperfections in computer circuit boards and computer chips lend themselves to statistical treatment. For a particular type of board the probability of a diode failure is 0.03 and the board contains 200 diodes:
(i) What is the main number of failure among the diodes? **(2 marks)**
(ii) What is the variance **(2 marks)**
(iii) The board will work if there are no defective diodes. What is the probability that a board will work **(3 marks)**

c) A certain area of the Eastern United States is on average hit by 6 hurricanes a year. Find the probability that in a given year that area will be hit by:
(i) Fewer than 4 hurricanes **(2 marks)**
(ii) Exactly 6 hurricanes **(2 marks)**

Question Three

a) (i) Estimate the mean and standard deviation of this distribution of the weights, in kg to the nearest kg, of the male rowers taking part in an international competition in 1991.

Weight (kg)	71 – 80	81 – 90	91 – 100	101 - 110	111 - 120	121 – 130
Frequency	8	33	45	29	15	3

(17 marks)

b) In 1990, the distribution of the weights of the male rower had a mean of 97.1kg and standard deviation of 9.3kg. Compare the two distributions **(3 marks)**

Question Four

a) Two ordinary dice red and black are rolled together. Assuming the dice to be unbiased.
    (i) List the possibility space of the outcomes **(4 marks)**
    (ii) Find the probability that at least one 6 or a double is rolled **(3 marks)**

b) Three dice, each numbered 1 to 6 are thrown. Two of the dice are biased so that a 6 on either of them is twice as likely as any other score. The third die is fair. Draw a tree diagram with the information. Find the probability that:
    (i) Exactly one 6 is thrown **(3 marks)**
    (ii) When one 6 is thrown, it turns up on the fair die **(4 marks)**

Question Five

The observations taken for two variables follows:

X_i	1	2	3	4	5
Y_i	3	7	5	11	14

a) Draw a scatter diagram for these data **(2 marks)**
b) Using the scatter diagram, deduce the relationship that exit between the two variables **(2 marks)**
c) Draw a straight line to approximate the relationship between the two variable **(2 marks)**

d) Develop the estimated regression equation **(11 marks)**

e) Use the estimated regression equation to predict the value of y when x = 4 **(3 marks)**