TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN ANALYTCAL CHEMISTRY

AMA 2202 : STATISTICAL TECHNIQUES

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: 9 May 2016

<u>**Instructions to Candidates**</u>
You should have the following for this examination
  -*Answer Booklet, examination pass and student ID*
This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.
Do not write on the question paper.

Question ONE

a) Define the following terms as used in statistics

     (i) Observation   (1 mark)

     (ii) degrees of freedom   (1 mark)

     (iii) Confidence interval   (1 mark)

     (iv)Treatment group   (1 mark)

     (v) Population   (1 mark)

b) State five forms of data   (5 marks)

c) Differentiate between qualitative and quantitative data   (2 marks)

d) State four post ANOVA tests   (4 marks)

e) In a certain drug study, males and females each form 50% of the patients subjected to the drug efficacy test. It is noted that 20% of the males and 5% of the females develop resistance to the drug.

(i) A researcher studying the drug selects a resistant patient at random. What is the probability that the patient selected is:

     (a) a male   (1 marks)

     (b) a female   (1 mark)

(ii) The researcher selects a female at random. What is the probability that the female selected is not resistant to the drug   (1 mark)

(iii) Two patients are selected at random, what is the probability that both are resistant   (1 mark)

f) A group of 100 farmers were introduced to a new crop variety.60 approved use of the new crop variety while 40 disapproved. Using a Chi square test, with the hypothesis that 50 would approve the use of the new crop variety while 50 would not approve the use of the new crop variety

(i) Construct a contingency table for the responses   (3 marks)

(ii) Calculate the chi square value for the responses   (3 marks)

(iii) Determine the degrees of freedom   (1 mark)

(iv) Test whether those who approved were a significant majority at $p = 0.05$ (3 marks)

Question TWO

    a) A researcher was testing a new diet for anemic youth patients. He randomly selected 20 patients, divided them into two groups each of 10 patients and subjected them to the diet test, taking their weights each day for ten days. The weights of the two groups x and y on the last day of the experiment are as shown in the table below.

patient no.	1	2	3	4	5	6	7	8	9	10
Group x	40	43	48	43	45	47	43	50	45	43
Group Y	47	45	46	44	46	48	49	47	46	43

(i) Using the student's t-test, test the null hypothesis that there is no significant difference between the patients in group X and those in group Y at 95% confidence interval.

(8 marks)

(ii) Why is t-test not a good test? (1 marks)

b) Given the data 5,4,6,3,6,8,9,3,10. Compute

(i) Median (1 mark)

(ii) Range (1 mark)

(iii) Mean (1 mark)

(iv) Variance (2 marks)

(v) Standard deviation (1 mark)

Question THREE

Briefly explain the following types of experimental designs

a) Randomized block design (2 marks)
b) Completely randomized block design (3 marks)
c) Latin square design (2 marks)
d) Randomized complete block design (3 marks)
e) Split plot design (3 marks)
f) Strip plot design (2 marks)

Question FOUR

a) A 1000 packets of milk were subjected to test for contamination with clostridium perfrigens. It was observed that the average colony forming units (cfu) for the bacteria was 100 and a standard deviation of 20. Assuming that the colony forming units are normally distributed, find the number of packets whose:

(i) Colony forming units exceeded 125 (3 marks)
(ii) Colony forming units were between 90 and 130 (3 marks)

b) Two factories manufacture the same machine part. Each part is classified as having 0, 1, 2 or 3 manufacturing defects. The joint probability distribution for this is as shown in the table below

No of defects	0	1	2	3	Total
manufacturer A	0.125	0.0625	0.1875	0.125	0.5
manufacturer B	0.0625	0.0625	0.125	0.25	0.5
total	0.1875	0.125	0.3125	0.375	1

(i) A machine part was chosen at random and found to have 2 defects. Find the probability that it was manufactured by B (2 marks)

(ii) A part is observed to have no defects. What is the conditional probability that it was produced by manufacturer A? (2 marks)

(iii) A part is known to have been produced by manufacturer A. What is the conditional probability that that part has no defects (2 marks)

(iv) Two parts are randomly selected and found to have 3 defects. What is the probability that they are both from manufacturer B? (3 marks)

Question FIVE

The data below represents performance of 50 students in a statistics cat in percentage

30	42	36	58	28	56	76	55	69	84
36	68	38	63	58	55	58	32	58	15
38	74	60	52	21	49	39	43	73	55
58	80	58	46	17	58	74	47	52	40
52	46	38	58	63	70	29	58	29	39

Using the data:

a) Draw a frequency distribution table of five classes (2 marks)
b) Compute
    (i)   the mean for the data (3 marks)
    (ii)   the median for the data (3marks)
    (iii)   the variance of the given data (3 marks)
    (iv)   the standard deviation (2 marks)
    (v)   the interquartile range for the data (2 marks)