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

Instructions to Candidates

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

    (i) Statistics   (1 mark)

    (ii) Variable   (1 mark)

    (iii) Population   (1 mark)

    (iv) Sample   (1 mark)

    (v) Dispersion   (1 mark)

b) Differentiate between the following terms

    (i) Differential statistics and inferential statistics   (2 marks)

    (ii) Skewness and kurtosis   (2 marks)

c) State four major levels of measurements   (2 marks)

d) State three differences between t-test and anova   (6 marks)

e) State four practical applications of Chi square   (4 marks)

f) The data below represents performance of 30 students in a statistics test for a class in Technical University of Mombasa.

45,64,58,57,56,56,48,38,35,36,48,56,54,63,68,54,48,46,56,60,69,67,85,39,72,76,

54,78,82,60

    (i)   Use the data to draw a frequency distribution table of five classes

                                                       (2 marks)
    (ii)   Plot a histogram to represent the data   (3 marks)
    (iii)   On the histogram, plot a frequency distribution polygon   (1 mark)
    (iv)   What does the shape of the ogive suggest about the performance

                                                       (1 mark)
    (v)   Determine the interquartile range for the data   (2 marks)

Question TWO

The following are nutrient values (in mg) obtained from 8 mice in an animal house after feeding them on a new diet.

Mice No.	1	2	3	4	5	6	7	8

Carbohydrates	55	40	30	35	20	15	25	33
Proteins	50	45	40	30	15	20	42	35

(i) Construct a scatter diagram for the given data

(1 mark)

(ii) Compute a person correlation coefficient (r_{xy})between carbohydrates and proteins values
(6 marks)

(iii) Explain the interpretation of the correlation coefficient obtained in (ii) above
(2 marks)

(iv) Using the data obtained above, compute the slope b for predicting the amount of protein from the carbohydrate (2 marks)

(v) Determine the intercept of regression equation a based on the data
(2 marks)

(vi) Calculate the predicted protein value for a carbohydrate value of 50
(2 marks)

Question THREE

a) An analytical chemistry student from technical University of Mombasa is carrying out a research on oil degrading bacteria. He collects random samples from the pipeline. The probability that he will isolate bacteria from his samples is 1/3. If he isolates the bacteria, the probability that he will identify it correctly is 4/5. Otherwise the probability that he does not identify any bacteria is 7/8**.**
(i) Draw a probability tree diagram to represent the data (2 marks)
(ii) Find the probability that he will identify a bacteria correctly from the isolates (2 marks)
(iii) Find the probability that he will identify a bacteria (3 marks)

b) A batch of 1500 lemonade bottles has an average content of 753ml and a standard deviation of 1.8ml. If the volumes of the contents are normally distributed, find the number of bottles likely to contain
(i) Less than 750ml lemonade (2 marks)
(ii) Between 750ml and 754 ml lemonade (2 marks)
(iii) More than 757 ml lemonade (2 marks)
(iv) 750ml and 751ml lemonade (2 marks)

Question FOUR

The data below represents highway fuel consumption in miles per gallon for a random sample of 55 models of passenger cars.

30	27	22	25	24	25	24	15
35	35	33	52	49	10	27	18
20	23	24	25	30	24	24	24
18	20	25	27	24	32	29	27
24	27	26	25	24	28	33	30
13	13	21	28	37	35	32	33
29	31	28	28	25	29	31	

a) Draw a frequency distribution table of five classes   (3 marks)

b) Compute
- (i) the mean for the data given an assumed mean of 30   (4 marks)
- (ii) the median for the data   (3marks)
- (iii) the variance of the given data   (3 marks)
- (iv) the standard deviation   (2 marks)

Question FIVE

A student wants to compare growth of three bacteria species on blood agar. He therefore cultures the three bacteria species on blood agar, replicating each treatment three times and obtains colony forming units (cfu) counts as shown below. Use the results to compute the F value for a one way analysis of variance (ANOVA)

Replicate	Bacteria A	Bacteria B	Bacteria C
1	12	20	40
2	15	19	35
3	9	23	42

Using the results, compute
- a) The correction mean (CM)   (2 marks)
- b) The sum of squares (SS Total)   (2 marks)
- c) The treatment sum of squares (SST)   (2 marks)
- d) The error sum of squares (SSE)   (2 marks)
- e) The mean square of treatments (MST)   (2 marks)
- f) The mean square of errors (MSE)   (2 marks)
- g) The F value   (1 mark)
- h) Use the F value obtained to determine whether there is a significant difference in the growth of the three bacteria species on blood agar at P=0.05   (2 marks)