TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN FOOD TECHNOLOGY AND QUALITY

ASSURANCE (BSFQ 13S & 14S$_2$)

AMA 4320: BIOSTATISTICS – PAPER 2

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: Pick Date 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 (30 marks)

a) Define the following terms
   (i) Parameter   (1 mark)
   (ii) Statistic   (1 mark)

b) Explain the application of the following statistical tests in Biostatistics;
   (i) Student t- test   (2 marks)
   (ii) F- test   (2 marks)

c) The data below represents weight (g) from a sample of oranges obtained from Kongowea Market for use in juice extraction:
        44, 38, 41, 50, 34, 37, 43, 42, 49, 48, 35, 40, 36, 41, 43,
Determine the;
i)   Median   (1 mark)
ii) Mode   (1 mark)
iii) Mean   (2 marks)
iv) Standard deviation   (3 marks)

d) Using illustrations, describe the THREE types of distribution curves in
   i) skewness   (3 marks)
   ii) kurtosis   (3 marks)

e) i) In a study on a congenital disease in a certain family, there were 8 females and 6 males. What is the probability that a female and a male will be picked for the study? (2 marks)

   ii) 40% of all adults in Turkana North are suspected to have cancer. If two adults are randomly chosen, what is the probability that both will have cancer? Attach 95% confidence (3 marks)

f) 1000 cockroaches were trapped at Majengo market. They were then tested for the presence Plague pathogens. The mean pathogen count was 100 and the standard deviation was 10. Assuming normal distribution, find the number of cockroaches;
   (i) with a pathogen count exceeding 125 (2 marks)
   (ii) with a viral count of between 90 and 130 (2 marks)

g) IQ test scores are normally distributed with a mean of 100 and a standard deviation of 15. If an individual's IQ score was found to be 120, find the z-score corresponding to this value (2 marks)

Question TWO

a) Give the reasons for sampling in research (4 marks)

b) Discuss the types of Probability sampling (12 marks)

c) A local brewer used 1000 people to obtain information about a combination required to make the best Chang'aa for consumption at his village backyard:

Combination	Number of people
Sugar only	200
Sugar + Mollases	240
Sugar + Mollasses + Yeast	210
Sugar + Mollasses + Yeast + ARVs	350

Use the data to estimate the probability of each combination being chosen if each person was selected at random (4 marks)

Question THREE

a) The data below is outcome from a study on the effects of the drug Mesalamine on 131 patients with mild ulcer problems after a period of six weeks.

Outcome	Treatment Group		
	Placebo	Low Dose	High Dose
In remission	2	6	6
Improved	8	13	15
Maintained	12	11	14
Worsened	22	14	8

   (i)   What proportion of the patients were their ulcers in remission?   (2 marks)
   (ii) Of those patients who received a high dose, what proportion had their condition
         worsen?   (2 marks)
   (iii) What proportion of all patients took a placebo and either had their ulcers go into
         remission or improve?   (3 marks)
   (iv) What proportion of patients whose condition was maintained took the placebo?   (1 mark)

b) Using the Chi-Square, test the hypothesis that there is no relationship between treatment group and outcome obtained at 5% significance level.   (12 marks)

Question FOUR

a) Differentiate between one-tailed test and two-tailed test   (2 marks)

b) A water bottling facility established near the railway terminus in Mombasa sales average of 500 packets of water per day. Due to the establishment of the Standard Gauge Railway (SGR) terminus, it expects to increase the sales. If during the first 12 days of the new terminus operation, the sales were as below;
      550, 570, 490, 615, 505, 580, 570, 460, 600, 580, 530 and 525.

   Using the student t-test at $p = 0.05$, prove the null hypothesis that the sales average of 500 packets per day will not increased.   (10 marks)

c) A group of 200 women and men entrepreneurs were introduced to a new method of making yoghurt. Eight (80) women and 60 men approved use of the new method. If there were equal number of women and men, use the Chi-Square test at $p = 0.05$, to test the hypothesis that those who approved the method were a significant majority   (8 marks)

Question FIVE

A farmer applied four types planted three varieties of wheat, each on three different fields, A, B and C. The yields obtained are shown in the table below.

Field No	Wheat Variety and Yield (Metric tones)		
	A	**B**	**C**
1	6	5	5
2	7	5	4
3	3	3	3
4	8	7	4

Using the ANOVA test at 5% significance level, show whether the farmer can be advised to plant variety A, B or C by;

a) computing the:
   (i) correction mean (CM) for the treatments   (2 marks)
   (ii) sum of squares (SS Total) between treatments   (3 marks)
   (iii) sum of squares among treatments (SST)   (3 marks)
   (iv) error sum of squares within treatments (SSE)   (2 marks)
   (v) mean sum of squares among treatments (MST)   (2 marks)
   (vi) error mean squares within treatments (MSE)   (2 marks)
   (vii) F-ratio   (1 mark)
b) Constructing an ANOVA table for the test   (3 marks)
c) Interpreting the results based on the F-value for the advise   (2 marks)