TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR THE BACHELOR OF SCIENCE IN MEDICAL LABORATORY

AMA 4320: BIOSTATISTICS

END OF SEMESTER EXAMINATION
SERIES: APRIL 2013
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*

This paper consist of **FIVE** questions in **TWO** sections **A** & **B**
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

SECTION A (COMPULSORY)

Question One

a) Define the following terms:
(i) Data **(1 mark)**
(ii) Statistics **(1 mark)**

b) (i) State any two sources of data **(2 marks)**
(ii) State any **FOUR** factors affecting data collection methods. **(4 marks)**

c) Discuss various levels of measurements. **(4 marks)**

d) Discuss the various types of quantitative data. **(2 marks)**

e) Use the data below to construct a histogram and a frequency polygon on the same edge.

Marks	**Frequency**
60 -62	5
63 – 65	18
66 – 68	42
69 – 71	27
72 – 74	8

f) Explain any **THREE** methods of sampling. **(6 marks)**

g) It is known that 30% of a certain population are immune to some disease. If a random sample of size 10 selected from this population, what is the probability that it will contain exactly **FOUR** immune persons? **(4 marks)**

SECTION B (Answer any TWO questions from this section)

Question Two

The ages of 169 students who participated in a study spartine mehenytoin oxidation is given in the table below:

Class interval	Class frequency
10 – 19	4
20 – 29	66
30 – 39	47
40 – 49	36
50 – 59	12
60 – 69	4

Using the above data estimate:

(i) Mean **(4 marks)**
(ii) Median **(3 marks)**
(iii) Mode **(3 marks)**
(iv) The 35^{th} percentile **(3 marks)**
(v) The variance **(5 marks)**
(vi) The standard deviation **(2 marks)**

Question Three

a) Define the following terms as used in hypothesis testing:

(i) Type 1 error **(1 mark)**
(ii) Type 2 error **(1 mark)**
(iii) Critical region **(1 mark)**
(iv) Test of hypothesis **(2 marks)**

b) Researchers are interested in the mean of age of a certain population. The data available to the researchers are ages of a simple random sample of 10 individuals with a mean of 27 and a variance of 20. Can we conclude that the mean age of this population is different form 30 years at 95% level of confidence?

c) In the study of Malaria in some region it was reported that the brain weights of victims of the disease are normally distributed with a mean of 1076.8g and a standard deviation of 105.76g. Find the probability that a randomly selected victim of the disease will have a brain that weighs less than 800g. **(5 marks)**

Question Four

a) State the assumption underlying simple linear regression. **(4 marks)**

b) The table below shows the number of days after injection and the amount of viruses remaining in the blood.

Days (X)	Number of Viruses (Y)
15	60
24	45
25	50
30	35
35	42
40	46
45	28
65	20
70	22
75	15

(i) Draw a scatter diagram of the above data and interpret your plot. **(4 marks)**
(ii) Calculate the correlation coefficient between X and Y **(5 marks)**
(iii) Calculate the coefficient of determination and inteprete **(2 marks)**
(iv) Fit a regression model between X and Y **(5 marks)**

Question Five

a) Explain any **THREE** uses of graphs in statistics. **(6 marks)**

b) A physical therapist wished to estimate with 99% confidence the mean maximal strength of a particular muscle in a certain group of individuals. It is assumed that strength scores are approximately normally distributed with a variance of 144. A sample of 15 subjects who participated in the experiment yielded a mean of 84.3. Construct the confidence interval for the therapist. **(6 marks)**

c) The purpose of a study by Vermund was to investigate the hypothesis that HIV infected women who are also infected with HPV are more likely to have Cervical Cytologic abnormalities than the women with only one or neither virus. The data is given the table below:

		HIV		
	Seropositive symptomatic	**Seropositive asymptomatic**	**Seronegative**	**Total**
HPV				

Positive	23	4	10	37
Negative	10	14	35	59
Total	33	18	45	96

Is there any relationship between HPV status and state of HIV infection at 95% level of confidence

(8 marks)