# TECHNICAL UNIVERSITY OF MOMBASA

# Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:

**DEGREE IN BACHELOR OF MEDICAL LABORATORY SCIENCE (BMLS)**

AMA 4320: BIOSTATISTICS

**END OF SEMESTER EXAMINATION**
SERIES: AUGUST 2014
**TIME ALLOWED:** 2 HOURS

**Instructions to Candidates:**
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 **FOUR** printed pages

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**Question One (Compulsory)**

**a)** Define the following terms:
- **(i)** Biostatistics **(1 mark)**
- **(ii)** Random variable **(1 mark)**

**b)** State any FOUR measurement scales **(4 marks)**

**c)** List any THREE properties of the median **(3 marks)**

**d)** The following table shows the number of hours 45 hospital patients slept following the administration of a certain aesthetic:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 10 | 12 | 4 | 7 | 3 | 8 | 5 |
| 12 | 11 | 3 | 8 | 1 | 13 | 10 | 4 |
| 4 | 5 | 5 | 8 | 7 | 3 | 2 | 3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8 | 13 | 1 | 7 | 3 | 4 | 5 | 5 |
| 3 | 1 | 17 | 10 | 7 | 7 | 11 | 8 |

From this data:

**(i)** Calculate the median **(2 marks)**
**(ii)** Calculate the mean **(2 marks)**
**(iii)** Determine the mode **(1 mark)**
**(iv)** Determine the range **(1 mark)**

**e)** Suppose it is known that 10 percent of a certain population is color kind. If a random sample of 25 people is drawn from this population, find the probability that three or fewer will be color blind. **(4 marks)**

**f)** A sample of low apparently normal adult males, 25 years old, had a mean systolic blood pressure of 125. It is believed that the population standard deviation is 15. Construct an interval estimate for the mean systolic blood pressure at 95% confidence level **(4 marks)**

**g)** State any FOUR methods of sampling. **(4 marks)**

**h)** The following are the number of babies born during a year in 60 community hospital.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 30 | 55 | 27 | 45 | 56 | 48 | 45 | 49 |
| 37 | 55 | 52 | 34 | 54 | 42 | 32 | 59 |
| 32 | 26 | 40 | 28 | 53 | 54 | 29 | 42 |
| 39 | 56 | 59 | 58 | 49 | 53 | 30 | 53 |
| 52 | 57 | 43 | 46 | 54 | 31 | 22 | 31 |
| 32 | 35 | 42 | 21 | 24 | 57 | 46 | 54 |
| 34 | 24 | 47 | 24 | 53 | 28 | 57 | 56 |
| 57 | 59 | 50 | 29 | | | | |

Starting with a class of 20 – 29, 30 – 39, 40 – 49 etc. Construct a frequency distribution table. **(3 marks)**

**Question Two**

The following table gives the age distribution for the number of deaths in New York state due to accidents:

| Age | Number of Deaths |
|---|---|
| 25 - 34 | 393 |
| 35 – 44 | 514 |
| 45 – 54 | 460 |
| 55 – 64 | 341 |
| 65 – 74 | 365 |
| 75 – 84 | 626 |
| 85 – 94 | 618 |

Using the above data, calculate:

(i) Mean **(4 marks)**
(ii) Median **(2 marks)**
(iii) Mode **(2 marks)**
(iv) Variance **(4 marks)**

(v) Quartile deviation **(4 marks)**
(vi) Co efficient of variation **(2 marks)**
(vii) $69^{th}$ percentile **(2 marks)**

**Question Three**

The following table shows the methyl mercury intake and whole blood mercury values in 2 subjects exposed to methyl mercury through consumption of contaminated fish:

| Methyl mercury intake (x) | Mercury in whole blood (y) |
|---|---|
| 18 | 9 |
| 20 | 12 |
| 23 | 12.5 |
| 41 | 29 |
| 60 | 31 |
| 55 | 29 |
| 58 | 37.5 |
| 25 | 10.5 |
| 46 | 20.5 |
| 65 | 48 |

(i) Draw a scatter diagram and interpret you plot . **(4 marks)**
(ii) Determine the correlation coefficient between X and Y **(5 marks)**
(iii) Determine the coefficient of determination between X and Y and interpret your answer. **(3 marks)**
(iv) Construct a linear regression model between X and Y **(5 marks)**
(v) Estimate the value of Y given X is 41 hence determine the resultant error term. **(3 marks)**

**Question Four**

**a)** Define the following terms:
**(i)** Hypothesis testing **(1 mark)**
**(ii)** Type 1 error **(1 mark)**

**b)** Suppose it is know that the 1Q scores of a certain population of adults are approximately normally distributed with a standard deviation of 15. A simple random sample of 25 adults drawn from this population had a mean of 1Q score of 105. On the basis of this data can we conclude that the mean 1Q for the population si not 100 at 5% level of significance? **(10 marks)**

**c)** Explain the properties of a good estimator. **(8 marks)**

**Question Five**

a) A scores made on a certain amplitude test by nursing students are approximately normally distributed with a mean of 500 and a variance of 10,000:
(i) What is the proportion of those taking the score that score below 200? **(3 marks)**

(ii) A person is about to take the test, what is the probability that he or she will make a score of 650 or more. **(3 marks)**

(iii) What proportion of scores fall between 350 and 675. **(3 marks)**

b) In a certain population an average of 13 new cases of esophageal cancer are diagnosed each year. If the annual incidence of esophageal cancer follows a Poisson distribution, find the probability that in a given year the number of newly diagnosed cases of esophagael cancer will be 15 **(3 marks)**

c) Explain any FOUR methods of collecting data. **(8 marks)**