



**JARAMOGI OGINGA ODONGA UNIVERSITY OF SCIENCE AND  
TECHNOLOGY  
SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES  
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR  
OF EDUCATION (SCIENCE)  
3<sup>RD</sup> YEAR 1<sup>ST</sup> SEMESTER 2013/2014 ACADEMIC YEAR  
REGULAR**

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**COURSE CODE: SZL 302**

**COURSE TITLE: BIOSTATISTICS**

**EXAM VENUE: LAB 6**

**STREAM: (BSc. Science)**

**DATE: 15/8/14**

**EXAM SESSION: 2.00 – 4.00PM**

**TIME: 2 HOURS**

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**Instructions:**

- 1. Answer question 1 (compulsory) in Section A and any other 2 questions in Section B .**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

**SECTION A (30 marks)**

1. Funding organizations are demanding that clinical trials include diverse study populations, from the standpoint of age, gender, and ethnicity. What do you think is the reasoning behind this demand? (3 marks)
2. Why would a convenience sample of college students on vacation in JOOUST not be representative of the JOOUST students? (3 marks)
3. The following terms relate to frequency tables. Define each term.
  - a) Class interval (1 mark)
  - b) Class frequency (1 mark)
  - c) Cumulative relative frequency (1 mark)
4. Areas of sprayable surfaces with DDT from a sample of 15 houses are as follows in  $m^2$ : 101, 105, 110, 114, 115, 124, 125, 125, 130, 133, 135, 136, 137, 140, 145. Compute the coefficient of variation for these data. (3 marks)
5. What are three important properties of a normal distribution curve. (3 marks)
6. Suppose we randomly select 20 third year students enrolled in an introductory course in biostatistics and measure their resting heart rates and obtain a mean of 66.9 ( $S = 9.02$ ). Calculate a 95% confidence interval for the population mean and give an interpretation of the interval you obtain. (3 marks)
7. Severe anemia is a complication of malaria. The number of cases of severe anemia among a control group of 35 malaria patients was 12. Among a group of 11 patients who were taking an oral agent to prevent severe anemia, there were three cases of severe anemia. Is the proportion of patients with severe anemia in both groups statistically significant? Perform the proportion test at  $\alpha = 0.05$ . (3 marks)
8. Give in your own words definitions of the following terms that pertain to bivariate regression and correlation:
  - a) Correlation versus association (1 mark).
  - b) Correlation coefficient (1 mark).
  - c) Regression (1 mark).
9. Suppose that a local study finds that 90% of people aged over 60 years in Bondo town suffer from at least one common cold during a one-year period, and 20%

suffer from heartburn at least once in the same period of time. What is the probability that any person over 60 years of age will suffer from either common cold or heartburn? (3 marks)

10. State any three characteristics of statistical data. (3 marks)

### **SECTION B (40 marks)**

11. We suspect that the average blood pressure of JOOUST students is 108 mmHg. A random sample of 225 clinic patients (all JOOUST students) yields a mean blood pressure level of 119 ( $S^2 = 100$ ). Test the hypothesis that  $\mu = 108$ .

- a) What is the hypothesis set for a two-tailed test? (2 marks)
- b) Find the estimated Standard Error of the Mean. (4 marks).
- c) Find the **Z** statistic. (8 marks)
- d) What decision should we make, i.e., reject or accept **H<sub>0</sub>** at the
  - I.  $\alpha = 0.05$  level? (3 marks)
  - II.  $\alpha = 0.01$  level? (3 marks)

12. Here is a dataset for mortality due to work-related injuries among Kenyan women during 2013: {15–24 years (9); 25–34 years (12); 35–44 years (15); 45–54 years (7); 55–64 years (5)}.

- a) Identify the modal class. (1mark).
- b) Calculate the estimated median (3mark).
- c) Compute the variance and standard deviation for this data set (16 marks).

13.

- a) Research papers in medical journals often cite variables that are correlated with one another.
  - I. Using a health-related example, indicate what investigators mean when they say that variables are correlated. (1 marks).
  - II. Give examples of variables in the medical field that are likely to be correlated. (2 marks).
  - III. Give two examples of variables that are positively correlated and two

variables that are negatively correlated. (2 marks).

IV. What are some examples of medical variables that are not correlated? (2 marks)

V. Provide a rationale for the lack of correlation among these variables. (2 marks)

VI. Give an example of two variables that are strongly related but have a correlation of zero (as measured by a Pearson correlation coefficient). (2 marks)

b) Provide the following information regarding outliers.

I. What is the definition of an outlier. (1 mark).

II. Are outliers indicators of errors in the data. (2 marks).

III. Can outliers sometimes be errors. (2 marks).

IV. Give an example of outliers that represent erroneous data. (2 marks).

V. Give an example of outliers that are not errors. (2 marks).

14. Three lecturers in JOOUST are compared to determine whether they are similar or different in their grading practices. Using Kruskal–Wallis test; determine whether the association between instructors and grades assigned to students in the table below is statistically significant? (20 marks)

<b>Grade Counts for Students by Instructor</b>					
	<b>Instructor</b>				
<b>Grade</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>Row totals</b>	<b>Rank</b>
A	4	10	6		
B	14	6	7		
C	17	9	8		
D	6	7	6		
E	2	6	1		
Total no. of students					