



# MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)  
University Examinations for 2015/2016 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECOND SEMESTER EXAMINATION FOR DEGREE IN  
BACHELOR OF SCIENCE IN BIOLOGY  
BACHELOR OF EDUCATION SCIENCE

**SZL300: BIOSTATISTICS**

**DATE: 3/8/2016**

**TIME: 2:00 – 4:00 PM**

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## INSTRUCTIONS:

**Answer Question One and Any Other Two Questions**

### QUESTION ONE (30 MARKS)

- a) Distinguish the following terms as used in statistics
- Sample and Population
  - Descriptive statistics and inferential statistics (4 marks)
- b) Suppose the time taken by a herd of animals to leave a den is assumed to be normally distributed with mean time of 10 minutes and standard deviation 4 minutes. If an animal is randomly taken from the herd determine the probability that
- It takes exactly 6 minutes
  - If the herd has 300 animals, determine the number of animals taking between 6 to 12 minutes to leave the den (6 marks)
- c) A sample of 200 persons with a particular disease was selected. Out of these, 100 were given a drug and the others were not given any drug. The results are as follows:
- d)

	Number of Persons		
	Drug	No Drug	Total
Cured	65	55	120
Not cured	35	45	80
Total	100	100	200

Tests, whether the drug is effective or not at  $\alpha=0.05$  (7 marks)

- e) Briefly describe the three principles of experimentation designs as used in the biological Experiments (6 marks)
- f) A quality control officer in NCPB store claims that 70% of the cereals in the store are bad. A random sample of 50 bags showed that 35 of them were bad. Are these sample results consistent with the claim of the officer? Use  $\alpha = 0.05$  (4 marks)
- g) Given that  $\bar{X} = 60$ ,  $\bar{Y} = 4$ ,  $\sum(X - \bar{X})(Y - \bar{Y})=130$ , and  $\sum(X - \bar{X})^2=2400$  determine the regression equation of y on x (3 marks)

## QUESTION TWO (20 MARKS)

Given below is the random sample of the number of students visiting the University clinic per week in the year 2015

<i>Students</i>	11-20	21-30	31-40	41-50	51-60
Frequency (weeks)	3	6	11	3	2

- a) Using the data above determine;
- Average visits per week
  - Median
  - Mode and
  - Standard deviation.
  - Spearman's coefficient of skewness (16 marks)
- b) Test whether the sample mean of the measures differed significantly from the hypothesized population mean of 45 using ( $\alpha$ -level = 5%). (4 marks)

**QUESTION THREE (20 MARKS)**

- a) By citing examples define the term test statistics (4 marks)
- b) Distinguish the following terms as they apply in test of hypothesis
  - i) Null and alternative hypothesis
  - ii) One tailed and two tailed hypothesis testing
  - iii) Type I and Type II error in Hypothesis testing
  - iv) Critical region and acceptance region (8 marks)
  - v) An examination of eight applicants for an accountant post was taken by a firm. From the

- c) Marks obtained by the applicants in the Accountancy and Aptitude tests, compute Rank coefficient of correlation. (8 marks)

Applicant	A	B	C	D	E	F	G	H
Marks in Accountancy	15	20	28	12	40	60	20	80
Marks in Aptitude test	40	30	50	30	20	10	30	60

**QUESTION FOUR (20 MARKS)**

- a) By using the least square method and the data below

<b>X:</b>	1	2	3	4	5
<b>Y:</b>	2	5	3	8	7

- i) Determine the equation connecting Y on X
  - ii) Calculate the value of Y given X=11
  - iii) Determine the residue values using the  $\hat{y} = a + bx$  obtained in (i) (8 marks)
- b) The information relates health records from County XYZ randomly selected

Gender	Males	Females
Average lifespan	50	58
Standard deviation	12	9
Sample size	100	150

- Determine; i) The gender with the higher dispersion lifespan
- ii) The combined standard deviation

iii) State the hypotheses for testing life expectancy for the two genders

iv) Do the life span differ significantly for the two gender (use  $\alpha$ -level = 1%).

(12 marks)

**QUESTION FIVE (20 MARKS)**

a) Ten ladies were recruited for slim possible exercise, their weights were noted before and after the exercise as shown below.

Ladies	A	B	C	D	E	F	G	H	I	J
Before exercise	80	76	92	60	70	56	74	56	70	56
After exercise	84	70	96	80	70	52	84	72	72	50

i) State the hypotheses for the above tests (2 marks)

ii) By applying the t-test, can it be concluded that the ladies lost weight significantly? use  $\alpha=5\%$

(9 marks)

b) A random sample is selected from three makes of rope and their breaking strength (KG) are measured, with the following results:

Rope type	Breaking strength						
I	70	72	75	80	83		
II	100	110	108	112	113	120	107
III	60	65	57	84	87	73	

Test whether the breaking strength of the ropes differs significantly and if it does which type, present the findings in an ANOVA table and use  $\alpha = 0.01$  (9 marks)