(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS 2019/2020 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER SPECIAL/SUPPLEMENTARY EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE IN BIOLOGY AND BACHELOR OF SCIENCE IN BIORESOURCE MANAGEMENT AND CONSERVATION

COURSE CODE: SBL 311

COURSE TITLE: BIOSTATISTICS

DATE: 16TH FEBRUARY, 2021　　**TIME:** 11:00-1:00 P.M.

INSTRUCTIONS TO CANDIDATES

Answer Question one (1) and any other two (2) Questions. Question one is compulsory and carries 30 marks, the other Questions carry 20 marks each.

TIME: 2 Hours

This paper consists of 4 printed pages. Please Turn Over

1. (a) Define the following terms (i) Type I error (ii) Type II errors (iii) Nonparametric statistics (4 mks)

   (b) State the importance of the three basic techniques fundamental to experimental design (6 mks)

   (c) Discuss the distinctive features of a binomial distribution (6 mks)

   (d) Two factories A and B produce light bulbs. An inspection was done in factory A and found 9 units from a sample of 400 to be defective, 640 units from factory B were inspected and 9 were found to defective. Can it be concluded at 5% level of significance that production at factory B is better than in the first factory? (5 mks)

   (e) Plot the data below on a scatter graph

x	13	17	22	28	31	33	43	51	62	69	75	78
y	31	56	38	51	59	49	82	67	72	95	81	95

   Find the equation of the regretion line y on x. You can use these summary statistics

   $$\sum x = 522, \sum x^2 = 28540, \sum y = 776, \sum y^2 = 55032, \sum xy = 38512$$

   (5 mks)

   (f) Four different drugs have been developed for Covid-19. These drugs are used under three different environments (it is assumed that the environment might affect the efficiency of the drugs). The number of cases of recovery from the disease per 100 people who have taken the drugs is tabulated as follows:

	DRUGS			
EXPERIMENT	A	B	C	D
I	19	8	23	8
II	10	9	12	6
III	11	10	13	16

Test whether the drugs differ in their efficacy to treat the disease at 5% level of significance. (4 mks)

2. (a) A manufacturer of medicine bottles, finds that 0.02% of the bottles are defective. The bottles are packed in boxes containing 100 bottles. Using a suitable model, find how many boxes will contain:

   i. no defective (3 mks)

   ii. at least two defective (3 mks)

(b) Out of 2000 families with 4 children each, how many would you expect to have (assume that the probability of a male birth is 0.5) (a) at least 1 boy (b) 2 boys (c) 1 or 2 girls (6 mks)

(c) In order to study the conditions under which a particular type of commercially raised fish reach maximum weight, an experiment is conducted at four water treatment temperatures 16^0C, 18^0C, 22^0C, 24^0C and the water salinity levels $(1\%, 5\%, 10\%, 15\%)$. Fish are raised in tanks with specific salinity levels and temperature levels. There are 32 tanks and one of the four temperatures and one of the four salinity levels assigned randomly to each tank. The weights are recorded at the beginning of the experiment and after 2 months. Identify each of the following elements: response, and factors and factor type(s). Write all the treatments from the factor-level combinations. (8 mks)

3. The ages of new applicants for mortgages were recorded by an estate agency. The results were:

$$25, 29, 27, 32, 45, 34, 26, 28, 30, 42, 26, 51, 29, 27, 33, 27$$

(a) Find the mean age of applicants (3 mks)

(b) Draw a stem and leaf diagram (5 mks)

(c) Find the median age (4 mks)

(d) On the graph paper draw a box plot to represent these data. Show your scale clearly. (4 mks)

(e) Comment on the skewness of the distribution of ages of applicant for mortgages. Justify your answer. (4 mks)

4. Blue tits are small birds. Simiyu claims that they gain weight during the day so that they have some fat to burn off during the cold night. The table below shows the weight, w grams, of a sample of birds and the time, t, recorded as a decimal in hours, at which measurement was taken.

Time, t(h)	9.9	10.2	11.3	11.1	11.8	10.8	11.4	9.3	10.9	10.3
Weight, w(g)	10	11	11	10	11	8	12	9	6	13

(a) Code this data by $T = t - 9$ and $W = w - 5$ (4 mks)

(b) Calculate the correlation coefficient between T and W.   (7 mks)

$$\sum T = 17, \sum T^2 = 34.18, \sum W = 51, \sum W^2 = 297, \sum TW = 88.5$$

(c) Comment on Simiyus' claim.   (3 mks)

(d) Calculate the coefficient of determination   (3 mks)

(e) How could the data collection have been improved to make it easier to investigate Simiyus' claim?   (3 mks)

5. We are planning a 5-year study of cataract in a population of 5000 people 60 years of age and older. We know that from census data that 40% of this population are ages 60-64, 28% are ages 65-69, 20% are ages 70-74, and 7% are age 75 or older. We also know from the Framingham Eye study that 2.4%, 4.6%, 8.8%, and 15.3%, of the people in these respective age groups will develop cataract over the next 5 years.

(a) What percentage of our population will develop cataract over the next 5 years, and   (12 mks)

(b) How many with cataract does this percentage represent? (8 mks)