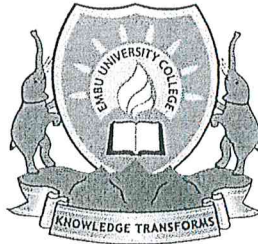


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**EMBU UNIVERSITY COLLEGE
(A CONSTITUENT COLLEGE OF THE UNIVERSITY OF NAIROBI)**

FIRST SEMESTER EXAMINATIONS 2013/2014

**FIRST YEAR EXAMINATION FOR THE MASTER OF SCIENCE IN AGRICULTURAL
RESOURCE MANAGEMENT, GENETICS AND PLANT ECOLOGY**

ACS 600/SBT 545: BIOMETRICS IN AGRICULTURAL SCIENCES/BIOMETRY

DATE: DECEMBER 3, 2013

TIME: 11.00 – 2.00 PM

INSTRUCTIONS:

Answer ANY FOUR Questions

QUESTION ONE

- a.) Classify the following variables whether they are discrete or continuous: bacteria count, number of genes, height of maize stalk, fresh weight of leaves. (2 marks)
- b.) Determine the sample size for estimating the true weight of cereal containers for the universe with $N=5000$ on the basis of the following information: (6 marks)
 - i.) The variance of weight = 4 ounces on the basis of past records
 - ii.) Estimate should be within 0.8 ounces of the true average weight with 99% probability.
- c.) Compute the quartile deviation from the following data set: (6 marks)

x	10-20	20-30	30-40	40-50	50-60	60-70
f	12	19	5	10	9	6
- d.) State three merits and three demerits of using the quartile deviation in data analysis (6 marks)
- e.) A construction company wants to determine the most preferred type of houses in the city of Bujumbura. Discuss the advantages and disadvantages of using mailed questionnaires, personal interviews, direct observation of the houses and telephone interviews for collecting data. (8 marks)

QUESTION TWO

The data shown below is a factorial experiment involving two levels of spacing and three levels of fertilizer in a RCBD with 3 replications.

Treatment combination	Rep 1	Rep 2	Rep 3
A1B1	46.50	55.90	78.70
A1B2	49.50	59.50	78.70
A1B3	127.70	134.10	137.10
A2B1	49.30	53.20	65.30
A2B2	65.50	65.00	74.00
A2B3	67.90	112.70	129.00

- Write the underlying statistical model (5 marks)
- Perform a two way ANOVA in randomized blocks (11 marks)
- Calculate the combined CV and SE (4 marks)
- When does type I error occur and what is type II error? State what effect these errors have on seed companies and farmers in cases where KEPHIS inspects seed quality, and approves or rejects seed lots (5 marks)

QUESTION THREE

- Twelve piglets were fed on a supplement of multipurpose food for a period of four months. Their skin-fold thickness was measured before commencement of the program and also at the end. The values obtained are given in the following table. Test if there is any change in the skin fold thickness and make statistical inferences at 5% level of significance

(10 marks)

Serial	Skin fold at the beginning	Skin fold at the end
1	6	8
2	8	8
3	8	10
4	6	7
5	5	6
6	9	10
7	6	9
8	7	8
9	6	5
10	6	7
11	4	4
12	8	6

- b.) Genetic theory states that children having one parent of blood group A and the other blood group B will always be one of the three types A, AB, B and the proportion of three types will on an average be as 1:2:1. A report states that out of 300 children having one A parent and one B parent, 30% were found to be types A, 45% type AB and the remainder type B. Test the hypothesis by χ^2 test. (5 marks)
- c.) Discuss three applications of chi-square test in research (6 marks)
- d.) A variable x follows a Poisson distribution with a mean of 6. Calculate:
- i.) $P(x=0)$ (2 marks)
- ii.) $P(x>2)$ (2 marks)

Given that $e^{-6} = 0.0024$

QUESTION FOUR

- a.) The data below was collected from five people on the basis of the daily expenditure (in USD) on food (x_1) and on clothing (x_2). Calculate the Euclidean distances and group the five people's expenditures in a tree diagram, based on the nearest neighbor (15 marks)

Person	x_1	x_2
A	2	4
B	8	2
C	9	3
D	1	5
E	8.5	1

- b.) Define the following terms in order to distinguish them from each other and show where they are applied (10 marks)
- i.) Multiple regression
- ii.) Multiple discriminant analysis
- iii.) Multivariate analysis of variance
- iv.) Canonical correlation analysis

QUESTION FIVE

The following data shows how the independent variables x_1 and x_2 affect the yield (y) of different varieties.

Variety	Yield	X_1	X_2
1	5755	110.5	14.5
2	5939	105.4	16.0
3	6010	118.1	14.6
4	6545	104.5	18.2
5	6730	93.6	15.4
6	6750	84.1	17.6
7	6899	77.8	17.9
8	7862	75.6	19.4

- a.) Write a multiple linear regression model for y as a function of x_1 and x_2 (5 marks)
- b.) Calculate the multiple linear regression equation for the data (15 marks)
- c.) Interpret the β coefficients in your model (5 marks)

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