UNIVERSITY OF KABIANGA

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

THIRD YEAR *FIRST* SEMESTER EXAMINATIONS FOR THE DEGREES OF
BACHELOR OF SCIENCE

IN AGRICULTURE AND HORTICULTURE

CRS 300: AGRICULTURAL BIOMETRY   TIME: 3 HOURS

INSTRUCTIONS: Answer ALL questions in section A and any THREE in section B

SECTION A [40 Marks]

Q1. (a) About 15% of tomato plants from a given green house are sterile (i.e produce no fruits).
   If the farmer buys 20 such seedlings to plant, calculate the following probabilities (Hint:
   use binomial distribution)

   (i) No tomato seedling will be sterile   (4 Marks)

   (ii) More than 2 tomatoes seedlings will be sterile   (4 Marks)

(b) Citric acid content (mg/100g) of 16 oranges of a given variety is given below:

   5.34 5.58 5.26 5.47 5.39 5.50 5.42 5.47 5.71 5.62 5.15 5.45 5.35 5.25 5.22 5.52

   Answer the following questions:

   (i) Calculate the mean and standard deviation   (4 Marks)

   (ii) Calculate a 95% confidence interval for mean citric acid content   (6 Marks)

   (iii) Interpret the result in (ii)   (4 Marks)

(c) In experiments how can we increase the "power of the test"   (4 Marks)

(d) Fourteen plants were randomly drawn from an acre of sorghum plants and the number of
   days to 50% flowing recorded. These results were as follows.

   86   88   83   93   87   71   91   76   82   88   100   92   97   78

These data was analyzed using proc univariate of SAS institute and results presented as below:

```
                    The UNIVARIATE Procedure
                    Variable:  gs

                        Moments
N                          14    Sum Weights              14
Mean                86.5714286    Sum Observations       1212
Std Deviation        8.06430202   Variance          65.032967
Skewness              -0.28302    Kurtosis         -0.2357294
Uncorrected SS          105770    Corrected SS     845.428571
Coeff Variation      9.31520035   Std Error Mean   2.15527537

                  Basic Statistical Measures
        Location                      Variability
   Mean     86.57143     Std Deviation        8.06430
   Median   87.50000     Variance            65.03297
   Mode     88.00000     Range               29.00000

            Tests for Location: Mu0=0
   Test            -Statistic-      -----p Value------
   Student's t    t  40.16722     Pr > |t|    <.0001
   Sign           M         7     Pr >= |M|   0.0001
   Signed Rank    S      52.5     Pr >= |S|   0.0001

               Quantiles (Definition 5)
            Quantile        Estimate
            100% Max         100.0
            99%              100.0
            95%              100.0
            90%               97.0
            75% Q3            92.0
            50% Median Q2     87.5
            25% Q1            82.0
            10%               76.0
            5%                71.0
            1%                71.0
            0% Min            71.0

        using proc means to do simple one t test
               The MEANS Procedure
            Analysis Variable : gs_muo
    N         Std Dev     t Value     Pr > |t|
ffffffffffffffffffffffffffffffffffffffffffffff
   14        8.0643020     -1.59       0.1357
ffffffffffffffffffffffffffffffffffffffffffffff
```

(i) Use proc means to test the hypothesis that population mean number of days to 50% flowering is 90. Use α=0.05.   (6 Marks)

(ii) Calculate inter-quartile range   (2 Marks)

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2. What statistic is considered the unbiased estimator of the following?:

(i) Population mean (μ)   (3 Marks)

(ii) Population variance (σ^2)   (3 Marks)

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SECTION B [60 Marks]

Q2. In an experiment involving heifers, the effect of vitamin A was measured on fourteen (14) animals, representing the entire population in a farm. Weight gained by these animals was recorded as follows:

Control	175	132	218	151	200	219	234	149	187	123	248	206	179	206
VitaminA	142	311	337	262	302	195	253	199	236	216	211	176	249	214

(a) Calculate the following statistics:

      (i) Calculate the sum of squares for the two populations   **(4 Marks)**

      (ii) Calculate sample variance (s^2)   **(4 Marks)**

      (iii) Calculate standard error (SE) for the control and vitamin A   **(4 Marks)**

(b) Test homogeneity of the variances for the two populations   **(8 Marks)**

Q3. (a) In a juice processing plant the effect of stirring rate on the amount of impurities was investigated. The data is as shown below:

Stirring rate, rpm	20	22	24	26	28	30	32	34	36	38	40	42
Impurity ,%	8	10	12	10	13	15	13	15	16	17	19	19

(i) Calculate the regression coefficient and the best estimate for α.   **(6 Marks)**

(ii) Calculate sum of squares for stirring rate and percent impurity   **(4 Marks)**

(iii) Use F-test to determine the significance of the regression coefficient, b

      (10 Marks)

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Q4. The following data was obtained from an animal nutrition experiment. The weight of the animals and fat depth were recorded after 20 days and are as follows:

Weight (Kg)	Fat depth (mm)
70	8.0
73	8.7
61	5.7
58	5.6
63	6.1
67	6.4
60	7.3
68	7.8
69	6.2
61	7.2

(i) Calculate the correlation coefficient between weight and fat depth　(12 Marks)

(ii) Test the significance of the correlation coefficient, r　(8 Marks)

Q5.　An experiment mounted by a foxtail millet breeder consisted of five elite lines tested in a randomized complete design replicated ten (10) times. The partial analysis of variance is given below:

Source of Variation	df	SS	MS	Fcalc.
Blocks		135		
Lines		100		
Error				
Total		307		

(a) Complete the analysis of variance (ANOVA) table　(8 Marks)

(b) Suggest the appropriate ~~line~~ model for the ANOVA table shown above　(4 Marks)

(c) Using the results shown in the ANOVA table in (b) answer the following questions:

　(i) Give the statistic for testing Ho: $T_1 = T_2 = T_3 = T_4 = T_5 = 0$　(4 Marks)

　(ii) Do foxtail millet lines significantly different from each other in terms of performance　(4 Marks)