ALUPE UNIVERSITY COLLEGE
...Bastion of Knowledge...
P. O.Box 845-50400 Busia(K)
principal@auc.ac.ke
Tel: +254 741 217 185
+254 736 044 469
off Busia-Malaba road

OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2020 /2021 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER REGULAR EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE (APPLIED STATISTICS WITH COMPUTING)

COURSE CODE: STA 217

COURSE TITLE: PRINCIPLES OF STATISTICAL INFERENCE

DATE: 29/7/2021 **TIME: 0800-1100HRS**

INSTRUCTION TO CANDIDATES

- SEE INSIDE

THIS PAPER CONSISTS OF 3 PRINTED PAGES **PLEASE TURN OVER**

REGULAR – MAIN EXAM

STA 217: PRINCIPLES OF STATISTICAL INFERENCE

STREAM: ASC **DURATION: 3 Hours**

INSTRUCTION TO CANDIDATES

Answer **ALL** questions from section A and any **THREE** from section B.

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SECTION A [31 Marks]. Answer ALL questions.

QUESTION ONE [15 Marks]

a) Define the following terms as used in statistical inference [4 Marks]
   i) Sample
   ii) Population
   iii) Random sample
   iv) Experiment

b) Distinguish between the following scales [4 Marks]
   i) Nominal and ordinal.
   ii) Interval and ratio

c) Describe some of the important questions or considerations that has to be made when one has to draw a sample [3 Marks]

d) Identify and explain the different types of estimation. Cite examples for each case [4 Marks]

QUESTION TWO [16 Marks]

a) Discuss how simple random sampling (SRS) is conducted [4 Marks]

b) What do you understand by an interval estimate? [2 Marks]

c) If a random sample of 50 non-smokers have a mean life of 76 years with a standard deviation of 8 years, and a random sample of 65 smokers live 68 years with a standard deviation of 9 years,

   i) What is the point estimate for the difference of the population means? [1 Mark]

   ii) Find a 95% C.I. for the difference of mean lifetime of non-smokers and smokers. [3 Marks]

d) Describe three properties of inference methods. [6 Marks]

SECTION B [39 Marks] Answer any THREE questions]

QUESTION THREE [13 Marks]

a) Let $X_1, X_2, ..., X_n$ be a random sample of size n from a population with mean μ and variance σ^2. Compute $E(\bar{X})$ and $Var(\bar{X})$ [5 Marks]

b) Suppose that the tensile strength of a glued joint is related to the glue thickness. A sample of six values gave the following results;

Glue Thickness (inches)	0.12	0.12	0.13	0.13	0.14	0.14
Strength (lbs.)	49.8	46.1	46.5	45.8	44.3	45.9

   Calculate the sample correlation coefficient r for these data. [8 Marks]

QUESTION FOUR [13 Marks]

a) A random sample of 17 employees in company A has a mean annual income of \$35,800 and a standard deviation of \$7,800. In company B, a random sample of 18 employees has a mean annual income of \$35,100 and a standard deviation of \$7,375. Test the claim at $\alpha = 0.01$ that the mean annual incomes in the two companies are not the same. [6 Marks]

b) A reading center claims that students will perform better on a standardized reading test after going through the reading course offered by their center. The table shows reading scores of six students before and after the course. [7 Marks]

Score before	85	96	70	76	81	78
Score after	88	85	89	86	92	89

Test whether there is enough evidence to conclude that students' scores after the course are better than the scores before the course? [Use $\alpha = 0.05$]

QUESTION FIVE [13 Marks]

a) With an example explain how non-parametric differs from parametric tests. Describe benefits for the non-parametric tests. [5 Marks]

b) i) Give an assumption for Wilcoxon signed-rank test [2 Marks]

ii) Assume from a group of twelve students, the changes in heart rate (beats per minute) when standing up from lying down are: –2, 4, 8, 25, –5, 16, 3, 1, 12, 17, 20 and 9

Using the test in part i) above, test to test whether changes in heart is more than 15 or not. $[\alpha = 0.05]$ [6 Marks]

QUESTION SIX [13 Marks]

a) Given the five pairs of points (x, y) shown in table below

x	4	0	-2	3	1
y	5	0	0	6	3

What is the line of the form $y = x + b$ that best fits the data by method of least squares? [6 Marks]

b) Suppose the line $y = kx + 1$, is fit by the method of least squares to the 3 data points.

x	1	2	4
y	2	2	0

What is the value of the constant k? [7 Marks]

QUESTION SEVEN [13 Marks]

Given the following three samples; P, Q and R from the two data sets 1 and 2, perform analysis of variance and test the null hypothesis at 0.05 level of significance. [13 Marks]

Data set 1			Data set 2		
P	Q	R	P	Q	R
8.1	8.0	14.8	9.2	9.9	9.4
9.9	10.4	7.9	14.4	9.6	8.3
6.2	9.8	7.4	11.8	9.7	15.5

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