ALUPE UNIVERSITY COLLEGE

...Bastion of Knowledge....

OFFICE OF THE DEPUTY PRINCIPAL

ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2019 /2020 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: 29TH OCTOBER, 2020   TIME: 0900 – 1200 HRS

INSTRUCTION TO CANDIDATES

- **SEE INSIDE**

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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 (Answer ALL Questions)

QUESTION ONE (16MARKS)

a) Distinguish between type I and type II error (2MKS)

b) Give two methods of inferential statistics (2MKS)

c) Given x is a binomial random variable with parameters n and p. Show that the sample proportion $\hat{p}$ is an unbiased estimator of p. (3MKS)

d) Find the standard error of the sample mean $\bar{x}$. (3MKS)

e) Let $x_1, x_2, \ldots, x_n$ be a random sample from a gamma distribution with parameters α and β having E(x)= αβ and var(x)= αβ²

   i)   Obtain the moment estimators of α and β. (3MKS)

   ii) The data below shows the survival time in weeks of male mouse exposed to gamma radiation. Assuming that it has gamma distribution, compute the value of α and β.

   152,115,109,94,88,137,152,79,100,160,165,125,40,128,123,136,101,62,153,83,69 (3MKS)

QUESTION TWO (15MARKS)

a) A sample of 40 students has a mean exam score of 70.7. The distribution of exam score is normally distributed with standard deviation 13. Calculate the 90% confidence interval for the population mean. (3MKS)

b) An algebra placement test was used to determine placement in Mathematics courses. A sample of 50 students gave the following scores. Calculate the 95% confidence interval of the population mean:
29,21,28,24,22,24,22,23,15,21,22,17,19,17,14,19,16,22,23,14,19,19,22,16,12,18,18,10,21 ,22,26,24,14,27,15,24,15,23,12,18,23,18,21,12.28,20,17,24,28,13. (3MKS)

c) The weight of 16 three month babies attending clinic are given as:
4.68,4.13,4.80,4.63,5.08,5.79,6.29,6.75,4.93,4.25,5.70,4.70,5.88,6.77,6.04,4.93. Compute the 95% confidence interval for the mean. (3MKS)

d) i) Distinguish between a null hypothesis and an alternative hypothesis. (2MKS)

ii) Give the steps in conducting a null hypothesis.   (4MKS)

SECTION B (39 MARKS):

Answer any THREE questions. All Questions carry equal marks

QUESTION THREE (13MARKS)

a) Recent information suggest that obesity is an increasing problem among all age groups. It was reported in 2014 that 1276 individuals in a sample of 4115 adults were found to be obese. The 2009 census reveal that 30% of Kenyan adults were found to be obese. Does the recent data suggests that the true proportion of obese is different from the census one 5% level of significance?   (6MKS)

b) A study was carried out to evaluate the efficacy of the polio vaccine in combating polio. The vaccine was administered to one group and a placebo to a controlled group. The results are indicated below

Vaccine: $m = 200,745$, x = number of polio cases = 33

Placebo: $n = 201,229$, y = number of polio cases = 110

Test the hypothesis that a vaccinated child is less likely to contact polio than unvaccinated child at 1% level of significance.   (7MKS)

QUESTION FOUR(13MARKS)

The following table shows the age and prices of various cars.(Prices are in $100)

Age	5	4	6	5	5	5	6	6	2	7	7
Price	85	103	70	82	59	98	66	95	169	70	48

   a) Determine the regression equation of price on age and estimate the price of an 8 year old car (6MKS)
   b) Compute both the Pearson's and Spearman's correlation coefficient   (7MKS)

QUESTION FIVE (13MARKS)

Four groups of students were subjected to different teaching techniques and tested at the end of the semester. The marks obtained are given below

TEACHING METHOD			
I	II	III	IV
65	75	59	94
87	69	78	89
73	83	67	80
79	81	62	88
81	72	83	

69	79	76	
	90		

Perform the Kruskal Wallis test and give the necessary conclusion   (13MKS)

QUESTION SIX (13MARKS)

a) An administrator tries out a new crime prevention strategy in an area. The following data represents crimes rate for one yare before and after the implementation of the strategy. Perform the Wilcoxon signed rank test.   (8MKS)

Month	1	2	3	4	5	6	7	8	9	10	11	12
Before	8.2	9.8	10.2	10.5	14.2	12.4	11.8	15.5	6.1	11.9	8.6	17.6
After	8.5	7.8	11.2	1.1	7.5	3.9	8.2	3.1	10.3	10.2	4.5	11.3

b) The following contingency table represents the incidents of three types of malaria in three tropical regions. Test the hypothesis of independence between the type of malaria and the tropical region.   (5MKS)

Type of Malaria	TROPICAL REGION		
	Asia	Africa	South America
A	31	14	45
B	2	5	53
C	53	45	2

QUESTION SEVEN (13MARKS)

Consider the hardness testing experiment; there are four tips and four available metal coupons. Each tip is tested once on each coupon resulting in a randomized complete block design. The data obtained are repeated for convenience

Types of tips	Coupon (Block)			
	1	2	3	4
1	9.3	9.4	9.6	10.0
2	9.4	9.3	9.8	9.9
3	9.2	9.4	9.5	9.7
4	9.7	9.6	10.0	10.2

a) Construct an analysis of variance for the hardness testing experiment using $\alpha = 95\%$
                (10MKS)

b) Make necessary conclusions from analysis of variance   (3MKS)

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