



THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

MAIN EXAMINATION

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AUGUST - DECEMBER 2016 TRIMESTER

FACULTY OF ARTS AND SOCIAL SCIENCES

DEPARTMENT OF SOCIAL SCIENCES

REGULAR PROGRAMME

SEC 313: ADVANCED ECONOMIC STATISTIC

Date: DECEMBER 2016

Duration: 2 Hours

INSTRUCTIONS: Answer Question ONE and ANY other TWO Questions

- Q1. a) To estimate the mean age of a population of 4000 employees a simple random sample of 50 employees is selected. Would you use finite population correction factor in calculating standard error of the mean? Explain **(3 Marks)**
- b) Distinguish between consistency and efficiency in reference to statistical estimator **(4 Marks)**
- c) Highlight conditions necessary for the students – t distribution to be used **(3 Marks)**
- d) In the United States the mean monthly internet bill is \$32.79 per household (CNBC, January. 2016). A sample of 50 households in a southern state showed a sample mean of \$30.63 with a population standard deviation of $\delta = \$5.60$.
- i) Formulate hypothesis for a test to determine whether the sample data supports the conclusion that the mean monthly internet bill in the southern state is less than the national mean of \$32.79 **(2 Marks)**

ii What is the value of the test statistic and the P- value **(4 Marks)**

iii) At $\alpha = 0.01$, what is your conclusion **(4 marks)**

iv)

e) Consider the following data for two variables x (independent) and y (dependent)

x	1	2	3	4	5
y	3	7	5	11	14

Develop the estimated regression equation for these data and interpret the coefficient **(4 Marks)**

f) The following 3x3 contingency table contains observed frequencies for a sample of 240. Test the independence of the row and column variables with $\alpha = 0.05$

	Column variable		
Row variable	A	B	C
P	20	30	20
Q	30	60	25
R	10	15	30

(6 Marks)

Q2. a) Fertile areas of Nyanza region had relatively high population growth rates during 1990s. Data were collected from residents living on the fertile and as well non fertile locations of Nyanza. Assume that the following sample results were obtained on the ages of individuals in two populations.

Fertile Areas

$n_1 = 150$

$\bar{X}_1 = 39.3 \text{ years}$

$S_1 = 16.8 \text{ years}$

Non Fertile areas

$n_2 = 175$

$\bar{X}_2 = 35.4 \text{ years}$

$S_2 = 15.2 \text{ years}$

Test the hypothesis of no difference between two population means. Use $\alpha = 0.05$

(5 Marks)

a) A population proportion is 0.4 . A simple random sample of size 200 will be taken and mean of sample proportions will be used to estimate the population proportion .What is the probability that the sample proportions will be within ± 0.03 of the population proportion? **(5 Marks)**

- b) Which one would produce a larger confidence interval under the same circumstances? Explain and illustrate
- i) A 90% or 95% confidence level **(3 Marks)**
- ii) A student t- distribution or a normal distribution **(3 Marks)**
- c) Briefly explain the steps that need to be followed while testing hypothesis **(4 Marks)**

- Q3. a) As more Kenyans seek to escape from urban pressures, the burden on our parks has shown a marked increase in the number of weekend campers. Lion magazine recently reported that Buffalo National park in Kajiado Hired a third year Economist from CUEA to study the financial position of the park. Part of his effort required the comparison of park revenues from various sources. Including camping fees, fishing licenses and canoe rentals. Displayed here are the data for several randomly selected visitors. Determine if there is a difference in the mean revenues the park receives from these three activities.

Visitor	Camping	Fishing	Canoeing
1	\$47	\$30	\$19
2	32	18	25
3	35	27	20
4	25	35	22
5	38	-	25
6	35	-	-

(12arks)

- b) You are studying the time it takes for an air controller to read a complex radar display and react to it under certain standardized conditions. By conducting one trial with each randomly selected controllers, you obtain the following statistics

$$\bar{X} = 3.15 \text{ Seconds}$$

$$\sum (X - \bar{X})^2 = 20$$

$$n = 25$$

what is the 90% confidence interval for mean time to read and react to the display? **(5 Marks)**

- a) Distinguish between simple and multiple regression **(3 Marks)**

Q4. a) In hypothesis testing one can commit either type I or Type II errors. Use the relevant illustrations to explain how this is possible **(4 marks)**

b) A state of Washington’s public interest research group (PIRG) study showed that 46% of full time college students work for 25 or more hour per week. The PIRG study provided data on the effects of working on grades (*USA Today April 1st 2002*). A sample of 200 students included 90 who worked 1 -15 hours per week and 50 who worked 25 – 34 hour per week. The sample number of students indicating their work had a positive effect, no effect or a negative on grades as follows

<i>Effects on Grades</i>				
Hours worked per week	Positive	None	Negative	Total
<i>1 – 15 hours</i>	26	50	14	90
<i>16 – 24 hours</i>	16	27	17	60
<i>25 – 34 hours</i>	11	19	20	50

Conduct a test of independence to determine whether the effects on grades are independent of the hours worked per week. Use $\alpha = 0.05$. What is your conclusion? **(10 Marks)**

c) Distinguish between the following terms

i) Null and Alternative hypothesis **(3 Marks)**

ii) One – tailed test and Two – tailed test **(3 Marks)**

Q5. a) The following data shows the number of shares covered by option grants and the number of shares outstanding for 13 companies (*Bloomberg Personal Finance January .2000*)

Companies	<i>Share of option Grants outstanding(millions)</i>	<i>Common shares Outstanding (Millions)</i>
<i>Adobe systems</i>	20.3	61.8
<i>Apple compute</i>	52.7	160.9
<i>Applied materials</i>	109.1	375.5
<i>Auto Desk</i>	15.7	58.9
<i>Best Buy</i>	44.2	203.8
<i>Fruit of the loom</i>	14.2	66.9

<i>ITT industries</i>	18.0	87.9
<i>Merril lynch</i>	89.9	365.5
<i>Novel</i>	120.2	335.0
<i>Parametric technology</i>	78.3	269.3
<i>Reebok international</i>	12.8	56.1
<i>Silicon graphics</i>	52.6	188.8
<i>Toy world</i>	54.8	247.6

Required

- i) Develop the estimated regression equation that could be used to estimate the number of shares of option grants outstanding given the number of common shares outstanding **(8 Marks)**
- ii) Use the estimated regression equation to estimate the number of shares of option grants outstanding for a company that has 150 million shares of common stock outstanding **(2 Marks)**
- iii) Do you believe the estimated the estimated regression equation would provide a good prediction of the number of shares of option grants outstanding? use r^2 to support your answer **(4 Marks)**
- a) Distinguish between the following terms as used in statistics
 - i) Central limit theorem and finite population correction factor **(3 Marks)**
 - ii) Sampling error and standard error **(3 Marks)**

END