THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

MAIN EXAMINATION

MAY – JULY 2015 TRIMESTER

FACULTY OF COMMERCE

MBA REGULAR/EVENING PROGRAMME

CMS 510: MANAGERIAL STATISTICS

Date: JULY 2015	**Duration: 3 Hours**
INSTRUCTIONS: Answer ANY FOUR Questions	

Q1. a) i With reference to specific statistical techniques provide THREE uses of statistics for a manager of a business firm. **(3 marks)**

ii A certain continuous probability distribution has played a central role in the development of inferential statistics and many real-world random variables exhibit frequency distributors that closely resemble its shape. Name the probability distribution describe its shape, and provide the TWO parameters (statistical) numerical measures) that determine its location and shape. **(4 marks)**

b) i The daily water consumption for Nairobi County is normally distributed with a mean consumption of 800,000 litres and a standard deviation of 80,000 litres. The county water system will experience a noticeable drop in water pressure when the daily water consumption exceeds 984,000 literes. What is the probability that such a drop in water pressure will not be experienced?

(4 marks)

ii Daily product at a local plant averages 7,300 tonnes with $\sigma = 125$ tons. On the average, out of 100 days how many times will output exceed 7000tons? Assume that the production can be approximated by a normal probability distribution. **(4 marks)**

ISO 9001:2008 Certified by the Kenya Bureau of Standards

iii   A tyre company has developed a new type of radial tyre. Extensive testing indicates the population of kilometers obtained by all tyres of this type is normally distributed with a mean of 40,000 km and a standard deviation of 4000km. The company wishes to offer a guarantee providing a discount on a new set of tyres if the original tyres purchased do not exceed the kilometers stated in the guarantee. What should the guarantees kilometer be if the tyre company desires that no more than 2% of the tyres will fail to meet the guaranteed mileage?   **(4 marks)**

c)   Weekly demand at a supermarket for brand of breakfast cereal is normally distributed with a standard deviation (σ) of 75 boxes and an unknown mean (μ)

    i   Given that the probability that weekly demand is 959 boxes or less is 0.9830 determine the mean (μ).   **(4 marks)**

    ii   What is the approximate largest number of boxes of cereal sold in a given week?   **(2 marks)**

Q2.   a)   i   What does the central limit theorem tell us bout the sampling distribution of the sample mean? Give one use of this concept (theorem)   **(2 marks)**

    ii   Suppose that we will take a random sample of size n from a population having mean (μ) and standard deviation (σ). For the following situation find the mean, standard deviation and variance of the sampling distribution of the sample mean $\left(\overline{x}\right)$; $\mu = 100$ $\sigma = 1$ n=1,600   **(6 marks)**

b)   i   Define the term 'sampling error' How can you minimize this error?   **(2 marks)**

    ii   The average retirement fund in TSC for a population of teachers is k£ 40,715 with aa standard deviation of £19,015. Find the probability that a sample of 75 teachers will yield a sampling error of less than £1,000   **(4 marks)**

    iii   If only those teachers that have averaged a retirement fund of more than £80,000 are expected to retire in any given year,

approximately how many out of a sample of 75 will retire?
(4 marks)

iv   The fund manager claimed that the fund averaged a return of 10.2 percent per year, with a standard deviation of 3.5 percentage for the teachers over the past several years. If the sample of 75 teachers reported a mean rate return of 9.6 percent are you inclined to believe the fund manager? Support your answer.

(4 marks)

c)   Provide at least THREE reasons where sampling is necessary in research and statistical analysis.   **(3 marks)**

Q3.   a)   i   Why is the calculation of a confidence interval important despite the calculation of a point estimate.   **(2 marks)**

ii   For each of the following changes, indicate whether a confidence interval for μ will become longer or shorter

i   An increase in the level of confidence

ii   An increase in the population and/or sample standard deviation.

iii   A decrease in the sample size.

iv   An increase in the sample size.   **(4 marks)**

b)   i   In their efficiency rating, 312 employees received an average wage of 13.9 with a sample standard deviation of 5.6. If a 93% confidence interval suggests that the average of all employees Is less than 15, management intends to implement a new training program. Will a new program be developed?   **(4 marks)**

ii   What sampling size would be required for the 93% confidence interval to be on the minimum boundary of qualification for the development of a new program?   **(4 marks)**

c)   A drug under consideration by the Kenya Medical Research Institue must reduce blood pressure in cardiac patients by 13 points before it will be accepted for general use. In a test on 51 patients it lowered pressure by an average of 12.2 points with a sample standard deviation of 2.3 points.

ISO 9001:2008 Certified by the Kenya Bureau of Standards

Required:

i   Set up an appropriate null and alternate hypothesis to investigate whether KEMRI should approve the drug. **(2 marks)**

ii   Define type I and type II errors and the consequences of committing the two types of errors in statistical (hypothesis) testing of the drugs performance. **(4 marks)**

iii   Using a 1% level of significance, test the appropriate hypothesis to determine whether KEMRI should approve the drug. Provide your conclusion. **(6 marks)**

Q4.   a)   Twenty six mutual funds, each with k£6,000 invested in them are selected for companies. Of the 26 funds, 12 are income oriented and yielded a mean return in pounds (£s) of 1,098.60 (including capital gains) The population standard deviation of this type of funds is estimated to be £43.20. The remaining funds are growth oriented and generated a mean return of £987.60 (including capital gains) The population standard deviation of this tyoe of funds is estimated to be £53.40.

Required:

Formulate and test appropriate hypothesis to determine if there is a significance difference in the mean return of the two types of funds. Use the 5% level of significance. **(9 marks)**

b)   A real estate developer is considering investing in a shopping mall on the outskirts of the city of Nairobi. Three parcels of land are being evaluated. Of particular importance is in the income in the area surrounding the proposed mall. A random sample of four families is selected near each proposed mall. Following are sample results.

Eastlands are (k£000)	Westlands area (k£000)	Southlands area (k£000)
64	74	75
68	71	80
70	69	76
60	70	78

ISO 9001:2008 Certified by the Kenya Bureau of Standards

Required:

At the 0.05 significance level, can the developer conclude there is a difference in the mean income? Perform an appropriate test of hypothesis by answering the list of questions below:

      i   State the null and alternate hypotheses.   **(2 marks)**

      ii   What is the decision rule?   **(2 marks)**

      iii   Compute the SS total and the SSE values?   **(5 marks)**

      iv   Develop an ANOVA table.   **(5 marks)**

      v   What is your decision regarding the null hypotheses and your conclusion.   **(2 marks)**

END

ISO 9001:2008 Certified by the Kenya Bureau of Standards