EGERTON **UNIVERSITY**

UNIVERSITY EXAMINATIONS

FIRST SEMESTER 2012/2013
FOURTH YEAR EXAMINATIONS FOR THE AWARD OF DEGREE OF BACHELOR
OF SCIENCE IN ENGINEERING

WEEN 410: ENGINEERING STATISTICS

STREAM: AGEN, WEEN, ICEN, CEEN   **TIME:** 2HRS

DAY: FRIDAY, 8.30 – 11.30 AM   **DATE:** 25/1/2013

INSTRUCTIONS
Answer question ONE and any other two questions.

Question One – compulsory (30 marks)

a) Distinguish between the following terms:

   i)   Qualitative and quantitative variables.

   ii)   Class limits and class boundaries

   iii)   Estimate and an estimator

   iv)   Null and alternative hypothesis   (8 marks)

b) A collar manufacturer is considering the production of a new style of collar to attract young men. The following statistics of neck circumstances are available based upon the measurements of a typical group of college students.

Circumferences(inches)	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16
No. of students	2	16	36	60	76	37	18	3	2

Calculate

i) Mean

ii) Standard deviation (5 marks)

c) A media survey resulted in the following classification of respondents according to sex and radio listening preference (Swahili or English service)

Sex	Swahili	English
Male	65,000	22,000
Female	24,000	19,000

Suppose that a respondent is selected at random. Let F denote the event that the person is female and S the event that the person is a Swahili listener. Calculate:

i) $P(F/S)$

ii) $P(F'/S')$ (5 marks)

d) A factory finds that on the average 20% of the bolts produced by a given machine will be defective. Suppose that ten bolts are selected at random from the day's production of this machine, find the probability that:

i) Exactly two will be defective

ii) At least three will be defective. (6 marks)

e) Suppose the mean weight gain of a population of pigs fed on a given ration during one month period is normally distributed with standard deviation of 5kgs. A random sample of 25 pigs is taken and it is found that the mean weight gain is 20 kgs. Find the 98% confidence interval for μ. (6 marks)

Question Two (20 marks)

a) To study the relationship between expenditure on accommodation (X) and expenditure on food and entertainment (Y), a random sample of 10 students were taken and the following observations were obtained.

Accommodation (X in kf)	18	19	20	21	22	23	24	25	26	27
Food & entertainment (Y in kf)	17	17	18	18	19	19	19	20	21	22

i) Find the least squares regression line of food and entertainment on accommodation.

ii) Predict the expenses of food and entertainment if accommodation is kf28

iii) Calculate the product-moment correlation coefficient and interpret your results.

(14 marks)

b) The frequency distribution of the annual salaries of district commissioners in a certain province is as follows:

Salaries (kf,000)	3-4	5-6	7-8	9-10	11-12	13-14	15-16
Frequency	2	4	6	17	8	3	1

Calculate:

i) Mean annual salary

ii) Standard deviation of the annual salary.   (6 marks)

Question Three (20 marks)

a) The time required to perform a certain job is a random variable having a normal distribution with mean 72 and standard deviation of 12 minutes. What is the probability that the job will take:

i) At least 60 minutes

ii) At most 70 minutes

iii) Between 63 and 78 minutes   (10 marks)

b) If the number of fish a person catches per hour in a certain lake is a random variable having a Poisson distribution function with $\lambda = 1.8$. Find the probability that a person fishing there for one hour will catch:

i) No fish

ii) At least four fish

iii) At most four fish given that there are at least two fish.   (10 marks)

Question Four (20 marks)

a) In investigating several complaints concerning the weight of the "NET WT. 500gm" jar of local brand of peanut butter, the Kenya bureau of standards (KEBS) selected a sample of 64 jars. The sample had a mean of 490 gms and a standard deviation of 2gms. Find
    i)   90%
    ii)   95%

Confidence interval for the true mean weight of the "net wt 500 gm" jar.

b) A purchaser of copper wires selected at random 10 specimens from a large lot and recorded their breaking strength (kg wt) as follows:

$$578, \quad 572, \quad 570, \quad 572, \quad 578, \quad 570, \quad 572, \quad 596, \quad 548$$

Let μ be the actual mean breaking strength of the copper wires. Test at 5% level of significance, the hypothesis.

$H_0 : \mu = 578$

Vs

$H_1 : \mu \neq 578$ (12 marks)

Question Five (20 marks)

a) Suppose a male and female are allowed to get married and in the long run they had four children. Find the probability that:
    i)   The last born child is a male
    ii)   The first three children are females
    iii)   The first three children are females and the last born is a male.
    iv)   The last born is a male if the first three children are females.   (8 marks)

b) A random sample of 400 families was taken and classified according to the number of children in a family and the total family monthly income. The results are as follows:

Total monthly income (ksh)	Number of children				
	0	1	2	3	Over 3
Less than 3,000	5	10	25	85	105
3,000 – 7,000	6	15	65	50	100
7,000 – 12,000	15	55	104	100	95
Over 12,000	30	80	110	92	65

Determine if there is sufficient evidence to conclude that the total family income affects the number of children in the family at 1% level of significance. (12 marks)