(K*nowledge for Development)*

KIBABII UNIVERSITY COLLEGE

A CONSTITUENT COLLEGE OFMASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

UNIVERSITY EXAMINATIONS

2014/2015 ACADEMIC YEAR

THIRD YEAR SECOND SEMESTER

MAIN EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE AND BACHELOR OF EDUCATION

COURSE CODE: STA 346

COURSE TITLE: QUALITY CONTROL

DATE: 27/4/15 **TIME: 3.00PM -5.00PM**

INSTRUCTIONS TO CANDIDATES

Answer Question One in and Any other TWO Questions

TIME: 2 Hours

QUESTION 1

(a) It is known in control charts that all points may lie within the specified control limits but the manufacturing process is still out of control. Explain situations in real life that may lead to this, stating the remedies to such anomalies. (5 marks)

(b) State and explain the two main causes of variation in a manufacturing process. (4 marks)

(c) Define the following terms;

i) Acceptance sampling (2 marks)

ii) Average outgoing quality (AOQ) (2 marks)

iii) Rectifying inspection (2 marks)

iv) Process capability ratio (2 marks)

(d) The target fill weight for a box of cereal is 350g.Each day a sample of 300 boxes is taken and the number that are underweight boxes for each of the last 10 days is as follows:

23 12 19 19 20 19 21 27 26 23

i) Compute the upper and lower $3\pm$ limits for a p-chart (7 marks)

ii) Is the process in control? If not, when is it first detected to be out of control (6 marks)

QUESTION 2

To maintain control on dissolved iron content of a dyestuff formulation in parts per million (ppm), twenty-five subgroups of 5 measurements were taken, the following results were obtained.

$$\sum_{i=1}^{25} \bar{x}_i = 390 \qquad \text{and} \qquad \sum_{i=1}^{25} R_i = 84$$

Where $\bar{x}_i$ is the mean of the i^{th} subgroup,

R_i is the range of the i^{th} subgroup

(a) Design the ,

i) R- Chart (6 marks)

ii) $\bar{X}$ - Chart for this case (6 marks)

(b) The specification of the process requires that no more than 18 ppm dissolved iron be present in the formulation. What proportion of the individual measurements may be expected to exceed this specification? (8 marks)

QUESTION 3

(a) List four sampling plans (4 marks)

(b) Suppose that a single-sampling plan with n=150 and the acceptance number, C=2 is used for receiving inspection where the supplier ships the product in lots of size N= 3000.

i) Draw the OC curve for this plan (4 marks)

ii) Draw the AOQ curve and find the AOQL (8 marks)

iii) Draw the ATI curve for this plan (4 marks)

(Hint: use lot fraction defectives to be p= 1%, 2%, 3%, 4%)

QUESTION 4

(a) The number of weekly customer complaints are monitored at a large hotel using a C-chart. Complaints have been recorded over the past twenty weeks. Develop a three-sigma control limits using the following data (6 marks)

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
No. of complaints	3	2	3	1	3	3	2	1	3	1	3	4	2	1	1	1	3	2	2	3

Plot the corresponding C- control chart and comment on the result (4 + 3 marks)

(b) The bottling machines in Bungoma County are being evaluated for their capability:

Bottling machine	Std deviation
A	0.05
B	0.1
C	0.2

If specifications are set between 15.8 and 16.2 litres, determine which of the machines are capable of producing within the specifications.

QUESTION

(a) Illustrate how double sampling plan is carried out (10 marks)

(b) In a sequential sampling plan, let $X_1, X_2, X_3, \ldots\ldots, X_m$ be the random sample selected up to the m-th stage and $X_{i's}$ be identically and independently distributed with joint probability density or mass function, $f(x,\bar{})$.

Perform wald's sequential probability ratio test (S.P.R.T)

$H_0: P=P_0$

$H_1: P=P_1$ $\quad P_0 < P_1$

Where P is the unknown proportion of defectives in the lot (10 marks)