UNIVERSITY OF EMBU

2017/2018 ACADEMIC YEAR

SECOND SEMESTER EXAMINATIONS

SECOND YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE, BACHELOR OF SCIENCE IN STATISTICS

STA204: QUALITY CONTROL AND SAMPLING INSPECTION

DATE: APRIL 9, 2018   TIME: 11:00 AM – 1:00 PM

INSTRUCTIONS:

Answer Question ONE and ANY other two Questions

QUESTION ONE (30 MARKS)

a) The DMAIC is the classic Six sigma problem-solving process. Describe this DMAIC's five steps as a process improvement approach.   (5 marks)

b) Table below shows the number of defects on the surface of bus bodies in a bus depot.

Body number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Number of defects	2	2	4	7	5	6	7	14	2	9	3	0	5	1	3	10	4	3	12	6

Compute:

  i)   The average number of defects   (1 mark)

  ii) The trial control limits   (4 marks)

c) Explain the dimensions under which a quality of a product is evaluated   (4 marks)

d) Explain causes for Process Out of Control in quality control   (3 marks)

e) Differentiate between Producer's risks and Consumer's risks as applied in the sampling plans

(4marks)

f) Describe a control chart for attributes in quality control   (4marks)

g) Ten pieces of cloth out of different rolls of equal length contained the following number of defects: 3, 0, 2, 8, 4, 2, 1, 3, 7, 1

     i) Determine the central line, lower and upper control limits for a C-chart

(2marks)

     ii) Plot the C- chart and comment on production process   (3marks)

QUESTION TWO (20 MARKS)

a) Illustrate and explain a control chart for variables   (4 marks)

b) A sample of 5 measurements of jeep valve produced by a machine was taken at random from lot size of 50 for the critical dimension of jeep valve stem diameter which is taken every hour. The table below shows the result for sample:

No. of samples	Five measurements per sample					$\bar{Y}$	R
	a	B	c	d	e		
1	9.484	9.483	9.485	9.485	9.492	9.4876	0.009
2	9.483	9.484	9.490	9.484	9.485	9.4830	0.007
3	9.483	9.492	9.483	9.486	4.490	9.4872	0.009
4	9.486	9.481	9.487	9.490	9.490	9.4868	0.009
5	9.486	9.491	9.484	9.487	9.490	9.4876	0.007
6	9.490	9.491	9.489	9.491	9.483	9.4886	0.008
7	9.482	9.486	9.483	9.484	9.486	9.4842	0.004
8	9.484	9.487	9.487	9.485	9.488	9.4838	0.004
9	9.485	9.488	9.486	9.484	9.487	9.4860	0.003
10	9.484	9.481	9.482	9.485	9.483	9.4830	0.004
11	9.485	9.482	9.490	9.487	9.484	9.4856	0.008

12	9.485	9.487	9.481	9.482	9.478	9.4826	0.009
13	9.488	9.477	9.482	9.485	9.484	9.4832	0.011
14	9.485	9.491	9.477	9.490	9.487	9.4860	0.014
15	9.474	9.483	9.487	9.488	9.490	9.4844	0.016

    i) Calculate the control limits of the products   (5 marks)

    ii) Make plot and give your interpretation of the plot.   (4 marks)

c) Explain the two examples of control charts for attributes.

    i) P- Chart   (3 marks)

    ii) C – Chart   (3 marks)

QUESTION THREE (20 MARKS)

a)

    i)   Describe process capability analysis using a control chart.   (4 marks)

    ii)   Explain the major applications of the data/information from process capability analysis.   (5 marks)

b)

    i)   Explain the basic principles of Cusum Control Chart for Monitoring the Process Mean of products.   (3 marks)

    ii)   The table below shows the mean weight of items picked at random and weighed.

Observation	1	2	3	4	5	6	7	8	9
Weight (kg)	0.806	0.814	0.810	0.820	0.819	0.815	0.817	0.810	0.811

Observation	10	11	12	13	14	15	16	17	18
Weight (kg)	0.809	0.808	0.810	0.812	0.810	0.809	0.807	0.807	0.800

Set up a moving average (MA) control chart for data with w=3 and comment on the system

    (8 marks)

QUESTION FOUR (20 MARKS)

a) Explain the acceptance sampling process in quality control (3 marks)

b)

    i) Discuss the classes of products inspection (8 marks)

    ii) Name and explains the designs of inspection (3 marks)

c)

    i) Differentiate between X-chart and R-chart control charts (4 marks)

    ii) Sketch the R-chart for 25 samples of size 5 wafers whose sum of R_i is 8.1303

       (2 marks)

QUESTION FIVE (20 MARKS)

a) Distinguish between fraction Nonconforming Control Chart for Standard given and Non-Standard Given. (4 marks)

b) There are 25 samples each with n_i items for which sketching of fraction Nonconforming Control Chart required.

       If $\sum n_i = 2450$ and $\sum D_i = 234$

    i)   Calculate the control limits (6 marks)

    ii)   Sketch fraction Nonconforming Control Chart (2 marks)

c)

    i) Give reasons for not conducting 100% acceptance sampling inspection

       (4 marks)

    ii) Discuss the advantages and disadvantages of lot by lot acceptance sampling

       (4 marks)

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