UGANDA MARTYRS UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS/ STATISTICS

UNIVERSITY EXAMINATIONS
SEMESTER I, 2013/14

SECOND YEAR EXAMINATIONS FOR BACHELOR OF SCIENCE
(B.ECON & GEN)

STA 2102: STATISTICAL QUALITY CONTROL

DATE: 19TH DECEMBER 2013

TIME: 2:00 – 5:00 PM

Instructions:

*i) Attempt only **4 (four)** questions in **All.***

Qn.1 (a) Define statistical quality control (SQC)

(b) State the causes of variations in any process

© Consider the data below as collected from the industries

		READINGS			
		1	2	3	4
	9:00 am	40	50	55	39
	9:30 am	44	42	38	38
TIME	10:00 am	41	45	47	43
	10:30 am	39	39	41	41
	11:00 am	37	42	46	41
	11:30 am	39	40	39	40

n= 4 A_2 =0.729 d_2 =2.059 D_3 =0 D_4 =2.282

(i) Design a mean chart and interpret it.

(ii) On the same diagram, design the range chart and interpret it.

Qn.2. (a) List and explain different control charts that are commonly used in different processes.

(b) A random sample of 100 ball pens was taken from a firm which produces pens and a number of defective pens were noted. This was repeated for 10 times as shown below. Using the information given prepare a 'P' control chart and comment on the results

Sample	1	2	3	4	5	6	7	8	9	10
No. of defectives	8	11	13	8	17	7	7	14	6	9

Q3. An automatic machine produces 5.0 millimeter bolts at a high rate of speed. A quality-control program has been started to control the number of defectives. The quality-control inspector selects 50 bolts at random and determines how many defectives are. The numbers defectives for the first 10 samples follow.

Sample number	1	2	3	4	5	6	7	8	9	10
Size of the sample	50	50	50	50	50	50	50	50	50	50
Number of defectives	3	5	0	4	1	2	6	5	7	7

(a) Design a percent defective chart, insert bar p, LCL and the percents defectives on the chart.

(b) Plot the number of defects for the first 10 samples on the chart.

(c) Interpret the chart.

Q4. (a) Define the following terms as applied to SQC

(i) process capability

(ii) process capability ratio

(b) In a sample of 10 units, the lower and upper specification limits were given as 1 and 2 respectively. If the average range in the experiment is 0.325. Estimate the process capability of the machine ($\mathbf{d_2 = 3.078}$).

© consider the table of sample observations

Sample number	X_1	X_2	X_3
1	6.0	5.8	6.1
2	5.2	6.4	6.9
3	5.5	5.8	5.2
4	5.0	5.7	6.5
5	6.7	6.5	5.5
6	5.8	5.2	5.0
7	5.6	5.1	5.2
8	6.0	5.8	6.0
9	5.5	4.9	5.7
10	4.3	6.4	6.3
11	6.2	6.9	5.0
12	6.7	7.1	6.2

(i) Plot the sample standard deviations against the sample numbers

(ii) Draw the s-chart and comment on the results.

Qn.5 (a) Define the following terms as applied to SQC

(i) OC curve

(ii) Producers risk

(iii) Consumers risk

(iv) Acceptance sampling

(b)A firm purchases diskettes from diskettes international. The diskettes are packed in lots of 1000 each. The manager has agreed to accept lots with 10% or fewer defective diskettes. He has directed his inspection department to select a sample of 20 diskettes and examine them carefully. He will accept the lot if it has 2 or fewer defectives in the sample. Develop an OC curve for this inspection plan. What is the probability of accepting a lot that is 10% defective?

END