Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
400 Level 1st Semester Examination – June/July 2017
SCT 419-2 Quality Assurance and Control

Uva Wellassa University

Instructions to candidates.
Duration: Two (02) hours
Number of questions: Four (04) essay questions
Mark allocation: 100 mark
Answer All Questions.

1.
a. Compare and contrast Quality Assurance and Quality Control. (5 mark)

b. **Briefly** discuss David Garvin's **service** quality dimensions. (8 mark)

c. Explian the four pillars of Total Quality Management. (12 mark)

2.
a. What is Kaizen? (5 mark)

b. List the seven "mudas" identified in Kaizen. (5 mark)

c. Discuss how a particular manufacturer can increase profit by eleminating the above mudas. (15 mark)

3.
a. **Briefly** discuss various type of "causes". (5 mark)

b. What is/are the main purpose/s of a control chart? (4 mark)

c. Explain the use of p-charts and c-charts. When would you use one rather than the other? Give examples of measurements for both p-charts and c-charts. (6 mark)

d. Describe the concept of Six Sigma quality. Why such a high quality level is important? (5 mark)

(40)

(28)

4.

a. The following table shows the data obtained from 15 samples, each of size n = 4 taken from a production line whose output is nominally 200 gram packets of tacks. Extend the table to show the mean ($\bar{x}$) and the range ($\bar{R}$) of each sample. Find the grand mean $\bar{\bar{x}}$, the upper and lower control limits and plot the $\bar{x}$ and $\bar{R}$ control charts. Discuss briefly whether you agree with the fact that the production process is in control. Give reasons for your answer.

(18 mark)

Sample	Weight 1	Weight 2	Weight 3	Weight 4
1	201.3	199.8	201.4	200.3
2	198.6	201.3	199.7	201.8
3	198.9	199.8	200.1	199.8
4	202.4	203.1	199.6	199.2
5	194.7	201.2	197.5	201.1
6	200.8	199.8	200.3	196.2
7	199.5	201.4	200.6	199.2
8	202.3	203.1	199.2	201.3
9	205.4	198.3	197.9	198.5
10	199.0	202.2	197.1	202.8
11	189.7	200.1	202.6	201.9
12	201.6	197.5	204.5	196.4
13	198.6	198.8	199.7	200.4
14	202.6	199.2	199.0	199.2
15	203.3	203.1	200.8	201.7

b. The Perfect Circle Company manufactures bushings as their product. Once in every hour a sample of 125 finished bushings is drawn from the output and each bushing is examined by a technician. Those which fail are classified as defective; the rest are considered satisfactory. Here are data on ten consecutive samples taken in one week.

Sample no.	1	2	3	4	5	6	7	8	9	10
Defective	15	13	16	11	13	14	20	25	30	45

I. What type of control chart should be used here?
II. Develop the control chart/s and plot it.
III. Is the process in control? Explain
IV. What should the Quality Control Engineer do?

(12 mark)

Table of Control Chart Constants

X-bar Chart for sigma R Chart Constants S Chart Constants Constants estimate

Sample Size = m	A2	A3	d2	D3	D4	B3	B4
2	1.880	2.659	1.128	0	3.267	0	3.267
3	1.023	1.954	1.693	0	2.574	0	2.568
4	0.729	1.628	2.059	0	2.282	0	2.266
5	0.577	1.427	2.326	0	2.114	0	2.089
6	0.483	1.287	2.534	0	2.004	0.030	1.970
7	0.419	1.182	2.704	0.076	1.924	0.118	1.882
8	0.373	1.099	2.847	0.136	1.864	0.185	1.815
9	0.337	1.032	2.970	0.184	1.816	0.239	1.761
10	0.308	0.975	3.078	0.223	1.777	0.284	1.716
11	0.285	0.927	3.173	0.256	1.744	0.321	1.679
12	0.266	0.886	3.258	0.283	1.717	0.354	1.646
13	0.249	0.850	3.336	0.307	1.693	0.382	1.618
14	0.235	0.817	3.407	0.328	1.672	0.406	1.594
15	0.223	0.789	3.472	0.347	1.653	0.428	1.572
16	0.212	0.763	3.532	0.363	1.637	0.448	1.552
17	0.203	0.739	3.588	0.378	1.622	0.466	1.534
18	0.194	0.718	3.640	0.391	1.608	0.482	1.518
19	0.187	0.698	3.689	0.403	1.597	0.497	1.503
20	0.180	0.680	3.735	0.415	1.585	0.510	1.490
21	0.173	0.663	3.778	0.425	1.575	0.523	1.477
22	0.167	0.647	3.819	0.434	1.566	0.534	1.466
23	0.162	0.633	3.858	0.443	1.557	0.545	1.455
24	0.157	0.619	3.895	0.451	1.548	0.555	1.445
25	0.153	0.606	3.931	0.459	1.541	0.565	1.435

Control chart constants for X-bar, R, S, Individuals (called "X" or "I" charts), and MR (Moving Range) Charts. NOTES: To construct the "X" and "MR" charts (these are companions) we compute the Moving Ranges as: R_2 = range of 1st and 2nd observations, R_3 = range of 2nd and 3rd observations, R_4 = range of 3rd and 4th observations, etc. with the "average" moving range or "MR-bar" being the average of these ranges with the "sample size" for each of these ranges being n = 2 since each is based on consecutive observations ... this should provide an estimated standard deviation (needed for the "I" chart) of just a UCL.

σ = (MR-bar)/d_2 where the value of d_2 is based on, as just stated, m = 2. Similarly, the UCL and LCL for the MR chart will be: UCL = D_4(MR-bar) and LCL = D_3(MR-bar) but, since D_3 = 0 when n = 0 (or, more accurately, is "not applicable") there will be no LCL for the MR chart,