UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019

COURSE NAME	:	TOTAL QUALITY MANAGEMENT
COURSE CODE	:	BPB 20803
PROGRAMME CODE	:	BPA
EXAMINATION DATE	:	DECEMBER 2018 / JANUARY 2019
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1   Table Q1 tabulates the quantities of rejected product from a production line which require investigation. The data were captured from a production run which lasted $k = 13$ shifts, where five samples were taken during each shift.

Table Q1: Observations of rejected product

Shift Number	Observation				
	1	2	3	4	5
1	18	17	18	19	19
2	18	18	21	20	22
3	19	19	20	20	19
4	21	22	20	20	18
5	22	21	21	22	22
6	22	19	19	20	21
7	20	21	22	20	22
8	23	21	22	21	20
9	22	21	20	20	22
10	19	20	20	18	19
11	19	20	20	19	20
12	22	21	22	21	20
13	20	22	22	20	20

(a)   Given $A_2 = 0.58$, $D_3 = 0.00$ and $D_4 = 2.11$

Calculate:

(i)   x-bar

(1 mark)

(ii)   x-double bar

(1 mark)

(iii)   R

(1 mark)

(iv)   R-bar

(1 mark)

(v)   LCL x-bar

(1.5 marks)

(vi)   UCL x-bar

(1.5 marks)

(vii) LCL_R

(1.5 marks)

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(viii) ULC_R

(1.5 marks)

(b)   Plot the data from **Table Q1** on the x-bar chart.

(5 marks)

(c)   Plot the data from **Table Q1** on the R chart.

(5 marks)

(d)   Analyze both the x-bar chart and R chart drawn in **Q1(b)** and **Q1(c)**.

(5 marks)

Q2   (a)   Define with example the statistical process control (SPC).

(3 marks)

(b)   List **TWO (2)** types of variable control charts and attribute control charts.

(4 marks)

(c)   Distinguish **THREE (3)** characteristics of run chart and control chart.

(6 marks)

(d)   Explain **FOUR (4)** reasons for the control chart applications in a manufacturing company.

(12 marks)

Q3 $\overline{Z}$ and W charts are very good for short runs, where the central line and control limits are derived from the traditional formulas.

(a)   Table **Q3** tabulates the results of 3 subgroup X_1, X_2 and X_3. If the target $\overline{X}$ is 25 and the target $\overline{R}$ is 0.08:

Table Q3: Results of 3 subgroups

Subgroup	X_1	X_2	X_3
1.	24.97	25.01	25.00
2.	25.08	25.06	25.09
3.	25.03	25.04	24.98

Calculate:

(i)   The central lines and control limits for $\overline{Z}$ chart, and draw the graph.

(5 marks)

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     (ii)   The central lines and control limits for W chart, and draw the graph.

                                      (5 marks)

     (iii)   Determine whether all the points are in controlled.

                                        (3 marks)

(b)   The $\overline{X}$ is 3.0 and the target $\overline{Z}$ is 0.05.

     (i)   Plot the W and $\overline{Z}$ where the where points for $X_1 = 3.06$, $X_2 = 2.91$, and $X_3 = 3.01$.

                                      (10 marks)

     (ii)   Determine whether the points are out of control.

                                        (2 marks)

Q4   (a)   Explain **FOUR (4)** requirements of total quality implementation.

                                      (10 marks)

    (b)   Explain each phase in total quality implementation.

                                      (10 marks)

    (c)   Relate ISO 9001 with total quality.

                                      (5 marks)

– END OF QUESTIONS –

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Table Q3 (a)
Table of Control Chart Constants

Sample Size = m	X-bar Chart Constants		for sigma estimate	R Chart Constants		S Chart Constants	
	A_2	A_3	d_2	D_3	D_4	B_3	B_4
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

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