Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2021/2022

COURSE NAME	:	TOTAL QUALITY MANAGEMENT
COURSE CODE	:	BPB 20803
PROGRAMME CODE	:	BPA
EXAMINATION DATE	:	JULY 2022
DURATION	:	3 HOURS

INSTRUCTIONS

1. ANSWER ALL QUESTIONS
2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK**
3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

Q2 Armada Sports is a manufacturer of tennis shoes. During a recent quality management retreat, the management noticed that the number of warranty claims filed by the customers is on the rise. The management have assigned Nadia (Head of Customer Service) to lead a team to find out what are the reasons for the many warranty claims filed and how the company should address the issues related to the claims. She sets out and collected some data as shown in **Table Q2**:

Table Q2: Types of Defects (Warranty Claim)

No	Defect	Claims Filed
1	Laces	2
2	Worn out colour	2
3	Leather issues	3
4	Size Issues	1
5	Peeled based	1
6	Cushion issues	20
7	Durability of rubber material	30
8	Others	3

(a) Supposed that Nadia and her team have limited time and resources to analyse the problems with the defective product and based on the data that she had collected **(Table Q2),** Propose and justify the right and most effective quality tool that is appropriate for this case.

(5 marks)

(b) Based on your answer in **Q2(a)**, Prepare the proper chart and explain to Nadia what would be the next course of actions needed to be taken.

(15 marks)

Q3 Sunhose is a manufacturer of brake discs for cars. In order to increase process capabilities within its manufacturing plant, the company has decided to adopt statistical process control philosophy by establishing a new SPC unit to monitor and stabilize processes within the manufacturing plant. The newly established SPC unit collected 20 sets of disc thickness samples with a subgroup size of 4.

Table Q3: Brake Disc Thickness

Sample	Measurement Values			
	1	2	3	4
1	22	13	12	17
2	25	24	26	25
3	16	27	26	19
4	26	3	10	13
5	8	18	19	15
6	18	18	17	15
7	16	10	11	11
8	13	23	22	6
9	12	11	11	22
10	9	12	12	23
11	12	10	13	9
12	10	11	13	14
13	4	5	6	5
14	12	9	13	10
15	28	26	28	18
16	16	11	9	12
17	4	6	5	9
18	25	26	28	25
19	15	14	17	10
20	18	18	17	15

(a) Using the data compiled in **Table Q3** by the SPC unit, construct a working Xbar Chart and Range chart

(20 marks)

(b) Based on your answer in **Q3(a)**, interpret the Xbar and Range chart that you have constructed. Suggest 2 **(TWO)** course of actions based on your interpretations

(10 marks)

Q4 People who are about to undertake the leadership of total quality implementation in their organizations invariably look to the published literature or the experiences of others for the recipe that will result in success for them. Unfortunately, that magic, succeed-every-time formula does not exist. Organizations and their cultures are all different, they are also staffed with people who are all different from each other, and that their business situations are always unique. Discuss with examples **FIVE (5)** necessary steps that should be taken by leaders that are responsible for implementing quality management in their organizations.

(25 marks)

– END OF QUESTIONS –

APPENDIX I

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APPENDIX I

Observations in Sample, n	Chart for Averages: Factors for Control Limits			Chart for Ranges: Factor for Central Line	Chart for Ranges: Factors for Control Limits				Chart for Standard Deviations: Factor for Central Line	Chart for Standard Deviations: Factors for Control Limits			
	A	A_2	A_3	d_2	d_1	D_1	D_2	D_3	D_4	c_4	B_3	B_4	B_5	B_6
2	2.121	1.880	2.659	1.128	0.853	0	3.686	0	3.267	0.7979	0	3.267	0	2.606
3	1.732	1.023	1.954	1.693	0.888	0	4.358	0	2.574	0.8862	0	2.568	0	2.276
4	1.500	0.729	1.628	2.059	0.880	0	4.698	0	2.282	0.9213	0	2.266	0	2.088
5	1.342	0.577	1.427	2.326	0.864	0	4.918	0	2.114	0.9400	0	2.089	0	1.964
6	1.225	0.483	1.287	2.534	0.848	0	5.078	0	2.004	0.9515	0.030	1.970	0.029	1.874
7	1.134	0.419	1.182	2.704	0.833	0.204	5.204	0.076	1.924	0.9594	0.118	1.882	0.113	1.806
8	1.061	0.373	1.099	2.847	0.820	0.388	5.306	0.136	1.864	0.9650	0.185	1.815	0.179	1.751
9	1.000	0.337	1.032	2.970	0.808	0.547	5.393	0.184	1.816	0.9693	0.239	1.761	0.232	1.707
10	0.949	0.308	0.975	3.078	0.797	0.687	5.469	0.223	1.777	0.9727	0.284	1.716	0.276	1.669
11	0.905	0.285	0.927	3.173	0.787	0.811	5.535	0.256	1.744	0.9754	0.321	1.679	0.313	1.637
12	0.866	0.266	0.886	3.258	0.778	0.922	5.594	0.283	1.717	0.9776	0.354	1.646	0.346	1.610
13	0.832	0.249	0.850	3.336	0.770	1.025	5.647	0.307	1.693	0.9794	0.382	1.618	0.374	1.585
14	0.802	0.235	0.817	3.407	0.763	1.118	5.696	0.328	1.672	0.9810	0.406	1.594	0.399	1.563
15	0.775	0.223	0.789	3.472	0.756	1.203	5.741	0.347	1.653	0.9823	0.428	1.572	0.421	1.544
16	0.750	0.212	0.763	3.532	0.750	1.282	5.782	0.363	1.637	0.9835	0.448	1.552	0.440	1.526
17	0.728	0.203	0.739	3.588	0.744	1.356	5.820	0.378	1.622	0.9845	0.466	1.534	0.458	1.511
18	0.707	0.194	0.718	3.640	0.739	1.424	5.856	0.391	1.608	0.9854	0.482	1.518	0.475	1.496
19	0.688	0.187	0.698	3.689	0.734	1.487	5.891	0.403	1.597	0.9862	0.497	1.503	0.490	1.483
20	0.671	0.180	0.680	3.735	0.729	1.549	5.921	0.415	1.585	0.9869	0.510	1.490	0.504	1.470

Factors for Computing Central Lines and 3σ Control Limits for $\bar{X}$, s, and R Charts

APPENDIX II

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APPENDIX II

Trial Central Lines for the X-bar and R-chart

$$\overline{\overline{X}} = \frac{\sum_{i=1}^{g} \overline{X}_i}{g} \quad \text{and} \quad \overline{R} = \frac{\sum_{i=1}^{g} R_i}{g}$$

$$\text{UCL}_{\overline{X}} = \overline{\overline{X}} + A_2\overline{R} \quad \text{UCL}_R = D_4\overline{R}$$
$$\text{LCL}_{\overline{X}} = \overline{\overline{X}} - A_2\overline{R} \quad \text{LCL}_R = D_3\overline{R}$$

Revised Central Line and Control Limits

$$\overline{\overline{X}}_{\text{new}} = \frac{\sum\overline{X} - \overline{X}_d}{g - g_d} \qquad \overline{R}_{\text{new}} = \frac{\sum R - R_d}{g - g_d}$$

Trial Central Lines for the X-bar and s-chart

$$\overline{s} = \frac{\sum_{i=1}^{g} \overline{s}_i}{g} \qquad \overline{\overline{X}} = \frac{\sum_{i=1}^{g} \overline{X}_i}{g}$$
$$\text{UCL}_{\overline{X}} = \overline{\overline{X}} + A_3\overline{s} \quad \text{UCL}_s = B_4\overline{s}$$
$$\text{LCL}_{\overline{X}} = \overline{\overline{X}} - A_3\overline{s} \quad \text{LCL}_s = B_3\overline{s}$$

Trial Central Line and Control Limits for p-chart

$$\overline{p} = \frac{\sum np}{\sum n}$$

$$\text{UCL} = \overline{p} + 3\sqrt{\frac{\overline{p}(1-\overline{p})}{n}}$$
$$\text{LCL} = \overline{p} - 3\sqrt{\frac{\overline{p}(1-\overline{p})}{n}}$$

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Trial Central Line and Control Limits for np-chart

$$\text{Centerline } n\bar{p} = \frac{\sum_{i=1}^{n} np}{m}$$

$$UCL_{np} = n\bar{p} + 3\sqrt{n\bar{p}(1-\bar{p})}$$
$$LCL_{np} = n\bar{p} - 3\sqrt{n\bar{p}(1-\bar{p})}$$

Trial Central Line and Control Limits for c-chart

$$\bar{c} = \frac{\sum c}{g}$$

$$UCL = \bar{c} + 3\sqrt{\bar{c}}$$
$$LCL = \bar{c} - 3\sqrt{\bar{c}}$$

U Chart Formula

$$u = \frac{c}{n}$$

$$\bar{u} = \frac{\sum c}{\sum n}$$

$$UCL_u = \bar{u} + 3\frac{\sqrt{\bar{u}}}{\sqrt{n_i}}$$

$$LCL_u = \bar{u} - 3\frac{\sqrt{\bar{u}}}{\sqrt{n_i}}$$

C Chart Formula

$$\bar{c} = \frac{\sum c}{k}$$

$$UCL_c = \bar{c} + 3\sqrt{\bar{c}}$$
$$LCL_c = \bar{c} - 3\sqrt{\bar{c}}$$