Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2023/2024

COURSE NAME	:	TOTAL QUALITY MANAGEMENT
COURSE CODE	:	BPB 20803
PROGRAMME CODE	:	BPA
EXAMINATION DATE	:	JANUARY/FEBRUARY 2024
DURATION	:	3 HOURS
INSTRUCTIONS	:	1. ANSWER ALL QUESTIONS 2. THIS FINAL EXAMINATION IS CONDUCTED VIA ☐ Open book ☒ 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 **SEVEN (7)** PAGES

Q1 Global Tech Solution is a global leader in providing IT solutions and services to a diverse range of clients. Recognizing the dynamic nature of the technology industry and the importance of exceeding client expectations, the company has decided to embark on a Total Quality Management (TQM) initiative. The leadership team at Global Tech Solution is dedicated to implementing TQM principles in a manner that maximizes effectiveness while steering clear of common missteps.

(a) Discuss **THREE (3)** approaches to be avoided by Global Tech Solution for successful TQM implementation.

(9 marks)

(b) Elaborate **FOUR (4)** roles of top management of Global Tech Solution, since the leadership team has decided to implement TQM.

(8 marks)

Q2 (a) ABC Electronics is a leading manufacturer of consumer electronic products. The company is committed to maintaining high-quality standards and continuously improving their products. They've recently implemented the seven quality tools to enhance their quality management processes. One of their popular product lines, the Smart Tech X, has been experiencing irregular complaints from customers about battery life. The quality assurance team decided to apply the seven quality tools to address this issue.

Explain the implementation of the seven quality tools in addressing the battery life issue with the Smart Tech X.

(14 marks)

(b) Quick Bite Burgers is a popular fast-food chain known for its delicious burgers, crispy fries, and refreshing beverages. With locations spread across the country, Quick Bite has become a go-to spot for families, students, and busy professionals looking for a tasty and convenient meal option. The management team at Quick Bite Burgers is dedicated to maintaining high standards of food quality, service efficiency, and customer satisfaction. They are always on the lookout for ways to improve the overall dining experience for their loyal customers. Recently, Quick Bite Burgers has received feedback from customers about longer-than-desired waiting times during peak hours. Additionally, there have been occasional concerns about the accuracy of orders. The management team recognizes the importance of addressing these issues promptly to ensure customer loyalty and continued success.

Quick Bite Burgers is looking to address issues related to longer waiting times during peak hours and occasional order accuracy concerns. To tackle these challenges, they use the 4M1E approach (Manpower, Machinery, Materials, Methods, Environment) along with a cause and cause-and-effect diagram.

Illustrate the cause-and-effect diagram with the explanation of 4M1E approach.

(10 marks)

Q3 Luxxe, a renowned manufacturer of premium hair care products, takes pride in delivering high-quality solutions to its customers. With a commitment to innovation, Luxxe has recently introduced a new line of organic shampoos specially formulated for sensitive scalps. The quality control department at Luxxe understands the critical importance of maintaining precise product specifications, especially when catering to customers with specific needs. Based on data in **Table Q(3)**, they have initiated a thorough quality control process to monitor the weights of the newly introduced organic shampoo for sensitive scalps.

Table Q3: Data for Organic Shampoo

Subgroup Number	Samples		
	X1	X2	X3
1	5.0	5.8	6.1
2	5.3	6.9	6.4
3	5.4	5.2	5.5
4	5.0	5.7	5.0
5	6.0	6.5	6.7
6	6.2	5.8	6.0
7	5.2	5.1	5.1
8	5.0	5.8	6.1
9	5.3	6.9	6.4
10	6.2	6.0	7.0
11	6.5	6.9	6.1
12	6.3	6.4	7.0
13	6.8	6.5	5.4
14	6.0	5.4	6.7
15	6.5	6.5	6.8
16	5.0	5.8	6.1
17	5.3	6.9	6.4
18	6.5	6.5	7.0
19	6.0	7.0	6.6
20	6.2	5.3	5.5

(a) Calculate:

(i) The centerline for X-bar chart and R-chart.

(12 marks)

(ii) The control limit for X-bar chart.

(4 marks)

(iii) The control limit for R-chart.

(4 marks)

(b) Attributes and variables are two different types of data that are commonly used in statistical analysis and quality control.

(i) Differentiate between attributes and variables.

(9 marks)

(ii) Elaborate **TWO (2)** types of process variation which commonly occur.

(6 marks)

Q4 Green Eco Manufacturing is a company specializing in environmentally friendly household cleaning products. Green Eco has proactively gathered financial data for themselves and a competing firm, Eco Clean Solutions, as shown in **Table Q4.** This data is intended to serve as a basis for comparing productivity and identifying potential areas for improvement. By leveraging benchmarking techniques, Green Eco aims to optimize their operations and maintain a competitive edge in the eco-friendly cleaning products market.

Table Q4: Financial Data for Green Eco Manufacturing and Eco Clean Solution.

Category	Green Eco Manufacturing	Eco Clean Solution
Labor	RM 40 000	RM 30 000
Plant and equipment	RM 250 000	RM 200 000
Energy	RM 15 000	RM 18 000
Materials	RM 180 000	RM 160 000
Sales	RM 1 500 000	RM 1 200 000

(a) List **SIX (6)** types of benchmarking.

(6 marks)

(b) Compute total factor productivity measures for Green Eco Manufacturing and Eco Clean Solutions.

(10 marks)

(c) Explain the findings in terms of the financial benchmarking approach, based on your answer in **Q2(b).**

(8 marks)

- END OF QUESTIONS -

APPENDIX A

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 B

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

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

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

Revised Central Line and Control Limits

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

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

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

Trial Central Line and Control Limits for p-chart

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

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

Revised Central Line and Control Limits for p-chart

$$\bar{p}_{new} = \frac{\sum_{i=1}^{n} np - np_d}{\sum_{i=1}^{n} n - n_d}$$

$$UCL_{p_{new}} = \bar{p}_{new} + 3\frac{\sqrt{\bar{p}_{new}(1 - \bar{p}_{new})}}{\sqrt{n}}$$

$$LCL_{p_{new}} = \bar{p}_{new} - 3\frac{\sqrt{\bar{p}_{new}(1 - \bar{p}_{new})}}{\sqrt{n}}$$

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

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

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