UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

COURSE NAME	:	INDUSTRIAL ENGINEERING AND QUALITY MANAGEMENT
COURSE CODE	:	BNM 31903
PROGRAMME CODE	:	BNM
EXAMINATION DATE	:	JULY /AUGUST 2023
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER **ALL** QUESTIONS 2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSE 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 **NINE (9) PAGES** ONLY

TERBUKA

Q1 (a) List down **TWO (2)** factors that contribute to improper facilities utilization.

(2 marks)

(b) Determine **THREE (3)** factors effecting the location identification.

(3 marks)

(c) The objective of transportation model is for finding the lowest cost plan for distributing stocks of goods or supplies from multiple destinations that demand the goods.

(i) Explain **THREE (3)** important factors for implementing transportation model.

(6 marks)

(ii) The Sara Clothing Group in Johor own factories in three towns (Johor Bahru, Batu Pahat and Muar), which distribute to three retail dress shops in three other cities namely Kulai Jaya, Segamat and Pengerang. **Table Q1(c)** summarizes factory availabilities, projected store demands and unit shipping costs. Determine the optimal solution for shipping at the Sara Clothing Group.

(5 marks)

(iii) From **Q1(c)(ii)**, retrieve the value of optimal solution for shipping at the Sara Clothing Group.

(2 marks)

(iv) From **Q1(c)(iii)**, interpret the value of the optimal solution related to the cheapest shipping cost.

(2 marks)

TERBUKA

Q2 (a) List down **FOUR (4)** examples of ergonomics risk factors.

(2 marks)

(b) Ergonomics is classified into three main domains, which is physical, cognitive, and organizational. Describe the physical and cognitive domains of ergonomics.

(4 marks)

(c) Improper lifting techniques might cause a worker to obtain lower back pain disorder (LBD). With the aid of diagram, explain **THREE (3)** techniques for reducing the LBD potential among workers involving lifting activities.

(9 marks)

(d) As an industrial engineer at Keretapi Tanah Melayu Berhad (KTMB), construct **FIVE (5)** prevention strategies to avoid eyestrain for a boardman, who works 12-hours shift in a control room.

(5 marks)

TERBUKA

Q3 (a) 7 QC tools is one of the TQM principles, which are used in improvement activities. Explain the purpose of using scatter diagram and check sheet, respectively.

(4 marks)

(b) Pareto diagram is a tool for organizing cases such as errors, problems, or defects to help focus on resolving the most important cases and leaving the less important cases. A data on defects found in a production line was recorded by the quality inspection team using a check sheet. The recorded data is shown in **Table Q3 (b)**.

(i) Calculate the cumulative percentage for each type of the defects.

(5 marks)

(ii) Construct a pareto diagram for the defects with proper labelling.

(5 marks)

(iii) Identify the type of defects that requires attention to be resolved first.

(2 marks)

(c) By referring to scatter plots shown in **Figure Q3 (c)**, interpret the correlation between two variables under investigation.

(4 marks)

TERBUKA

Q4 (a) Variation exists in all process output generated. Define **TWO (2)** categories of variation in a part production with an example for each category.

(6 marks)

(b) The results of inspection of 10 samples with its average and range are tabulated in the **Table Q4 (b)**. Use **Appendix A** to find the respective values of A and D.

(i) Compute the control limits for the X-bar and R charts.

(4 marks)

(ii) Plot X-bar chart for the inspection data.

(4 marks)

(iii) Plot R chart for the inspection data.

(4 marks)

(iv) Interpret the quality of the inspection data.

(2 marks)

TERBUKA

Q5 (a) Name **ONE (1)** international body and **ONE (1)** national body who manage the implementation and certification of the management standards such as ISO 9001 Quality Management Standard (QMS).

(2 marks)

(b) Explain **TWO (2)** reasons why industries and service providers should implement and certify to the management standards.

(4 marks)

(c) ISO 9000 series is the standard used for quality management and quality assurance in an organization. It focuses on what an organization does to ensure that its products or services conform to its customers' requirements.

(i) List down **FOUR (4)** quality management principles that ISO 9000 series focuses to enhance success.

(4 marks)

(ii) Explain the ISO 9001: 2015 requirements for Clause 9: Performance evaluation, and Clause 10: Improvement.

(4 marks)

(d) Mr Arman, a Quality Assurance Manager in Top Products Sdn Bhd, is planning for the ISO9001:2015 certification for the company. Determine proper steps that Mr Arman needs to follow for the certification purpose.

(6 marks)

- END OF QUESTIONS -

TERBUKA

FINAL EXAMINATION

SEMESTER / SESSION : SEMESTER II, 2022/2023 PROGRAMME CODE : BNM
COURSE NAME : INDUSTRIAL ENGINEERING AND QUALITY MANAGEMENT COURSE CODE : BNM31903

Table Q1(c)

From / To	Kulai Jaya	Segamat	Pengerang	Factory availability
Johor Bahru	RM 4	RM 3	RM 3	35
Batu Pahat	RM 6	RM 7	RM 6	50
Muar	RM 8	RM 2	RM 5	50
Store demand	30	65	40	135

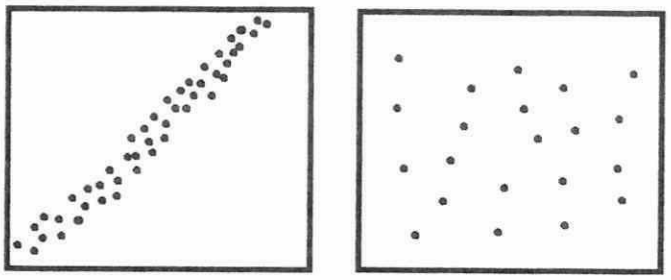
Table Q3 (b)

Time	Types of defects					Total
	Missing label	Off-centre	Smeared print	Loose or folded	Other	
8 - 9	||||	||				6
9 – 10		|||				3
10 – 11	|	|||	|			5
11 – 12		|		|	|	3
1 – 2		|				1
2 – 3		||	|||	|		6
3 – 4		||	||||			6
Total	5	14	8	2	1	30

TERBUKA

FINAL EXAMINATION

SEMESTER / SESSION : SEMESTER II, 2022/2023
COURSE NAME : INDUSTRIAL ENGINEERING AND QUALITY MANAGEMENT
PROGRAMME CODE : BNM
COURSE CODE : BNM31903



(i) (ii)

Figure Q3 (c)

Table Q4 (b)

Sample no. (Sample size = 5)	X-bar (Mean)	R (Range)
1	7.0	2
2	7.5	3
3	8.0	2
4	10.0	2
5	9.5	3
6	11.0	4
7	11.5	3
8	4.0	2
9	3.5	3
10	4.0	2

TERBUKA

FINAL EXAMINATION

SEMESTER / SESSION : SEMESTER II, 2022/2023
COURSE NAME : INDUSTRIAL ENGINEERING AND QUALITY MANAGEMENT
PROGRAMME CODE : BNM
COURSE CODE : BNM31903

Appendix A

TABLE B1 Factors for Computing Central Lines and 3σ Control Limits for $\bar{X}$, s, and R Charts

OBSERVATIONS IN SAMPLE, n	CHART FOR AVERAGES			CHART FOR STANDARD DEVIATIONS					CHART FOR RANGES					
	FACTORS FOR CONTROL LIMITS			FACTOR FOR CENTRAL LINE	FACTORS FOR CONTROL LIMITS				FACTOR FOR CENTRAL LINE	FACTORS FOR CONTROL LIMITS				
	A	A_2	A_3	C_4	B_3	B_4	B_5	B_6	d_2	d_3	D_1	D_2	D_3	D_4
2	2.121	1.880	2.659	0.7979	0	3.267	0	2.606	1.128	0.853	0	3.686	0	3.267
3	1.732	1.023	1.954	0.8862	0	2.568	0	2.276	1.693	0.888	0	4.358	0	2.574
4	1.500	0.729	1.628	0.9213	0	2.266	0	2.088	2.059	0.880	0	4.698	0	2.282
5	1.342	0.577	1.427	0.9400	0	2.089	0	1.964	2.326	0.864	0	4.918	0	2.114
6	1.225	0.483	1.287	0.9515	0.030	1.970	0.029	1.874	2.534	0.848	0	5.078	0	2.004
7	1.134	0.419	1.182	0.9594	0.118	1.882	0.113	1.806	2.704	0.833	0.204	5.204	0.076	1.924
8	1.061	0.373	1.099	0.9650	0.185	1.815	0.179	1.751	2.847	0.820	0.388	5.306	0.136	1.864
9	1.000	0.337	1.032	0.9693	0.239	1.761	0.232	1.707	2.970	0.808	0.547	5.393	0.184	1.816
10	0.949	0.308	0.975	0.9727	0.284	1.716	0.276	1.669	3.078	0.797	0.687	5.469	0.223	1.777
11	0.905	0.285	0.927	0.9754	0.321	1.679	0.313	1.637	3.173	0.787	0.811	5.535	0.256	1.744
12	0.866	0.266	0.886	0.9776	0.354	1.646	0.346	1.610	3.258	0.778	0.922	5.594	0.283	1.717
13	0.832	0.249	0.850	0.9794	0.382	1.618	0.374	1.585	3.336	0.770	1.025	5.647	0.307	1.693
14	0.802	0.235	0.817	0.9810	0.406	1.594	0.399	1.563	3.407	0.763	1.118	5.696	0.328	1.672
15	0.775	0.223	0.789	0.9823	0.428	1.572	0.421	1.544	3.472	0.756	1.203	5.741	0.347	1.653
16	0.750	0.212	0.763	0.9835	0.448	1.552	0.440	1.526	3.532	0.750	1.282	5.782	0.363	1.637
17	0.728	0.203	0.739	0.9845	0.466	1.534	0.458	1.511	3.588	0.744	1.356	5.820	0.378	1.622
18	0.707	0.194	0.718	0.9854	0.482	1.518	0.475	1.496	3.640	0.739	1.424	5.856	0.391	1.608
19	0.688	0.187	0.698	0.9862	0.497	1.503	0.490	1.483	3.689	0.734	1.487	5.891	0.403	1.597
20	0.671	0.180	0.680	0.9869	0.510	1.490	0.504	1.470	3.735	0.729	1.549	5.921	0.415	1.585

Copyright ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428

TERBUKA