UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2018/2019

COURSE NAME	:	INDUSTRIAL ENGINEERING AND QUALITY MANAGEMENT
COURSE CODE	:	BNM 31903 / BNJ 30403
PROGRAMME CODE	:	BNM / BNL
EXAMINATION DATE	:	JUNE / JULY 2019
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES ONLY

Q1 (a) Describe briefly the definition of industrial engineering (IE).

(2 marks)

(b) The design or improvement of a system of people, machines, information, and money to achieve some goal with efficiency, quality and safety. Explain how IE can be applied to efficiency, quality and safety of a system.

(3 marks)

(c) Cumulative Trauma Disorders (CTDs) or Repetitive Strain Injuries (RSIs) are work related injuries that caused by physical stressors that place pressure or stress on parts of the body including joints, muscles, nerves, tendons and bones. Classify the risk factors for office-related CTDs by using the aid of sketching diagram.

(3 marks)

(d) An organization would like to improve the workstation of clerks in the administration department considering ergonomics concern. As a job analyst, suggest **SIX (6)** tips for computer workstation design based on ergonomics point of view.

(6 marks)

(e) List **TWO (2)** neutral postures and **FOUR (4)** risks factors that might cause awkward positions.

(6 marks)

Q2 (a) Identify **TWO (2)** factors that contribute to improper facilities utilization.

(2 marks)

(b) Identify **FOUR (4)** problems of location identification occurred among entrepreneurs.

(4 marks)

(c) Hamid's Video, a major rental and TV sales chain headquartered in Johor Bahru, is about to open its first outlet in Kulai. He wants to select a site that will place the new outlet in the center of Kulai's population base. Hamid examines the seven census tract in Kulai, plots the coordinates of the center of each from a map. He looks up the population base in each to use as a weighting. The information gathered shown in **Table Q2 (c)**. Determine the coordinates that represent a central location for the new outlet by using Minisum Model.

(4 marks)

(d) Tailwind, Inc. produces high-quality but expensive training shoes for runner. Manufacturing the shoes requires 10 separate tasks. There are 400 minutes available for manufacturing the shoes in the plant each day. Daily demand is 60 units. The information for the task is shown in **Table Q2 (d)**.

    (i) Draw the precedence diagram.

(2 marks)

    (ii) Calculate the cycle time.

(1 mark)

    (iii) Calculate the theoretical minimum number of workstation, TM.

(1 mark)

    (iv) Construct tasks to the minimum feasible number of workstation.

(5 marks)

    (v) Calculate the overall efficiency of the assembly line if 5 workstations were implemented.

(1 mark)

Q3 (a) A project is a temporary endeavor undertaken to create a unit product, service or results. Generalize **TWO (2)** major characteristics of a project to satisfy a customer's need.

(2 marks)

(b) Explain **FIVE (5)** steps on defining the project in Project Management.

(10 marks)

(c) A successful Six Sigma Program will yield the benefits to the management of the organizations. List **FOUR (4)** benefits of Six Sigma Management.

(4 marks)

(d) The model that is used to improve a process in Six Sigma management is called the DMAIC Model, which is stand for Define, Measure, Analyze, Improve and Control. Explain the Improve phase of DMAIC Model.

(4 marks)

Q4 (a) Total Quality Management (TQM) is generally acknowledged as an enhancement to the traditional way of doing business. Investigate **FOUR (4)** purposes of TQM.

(4 marks)

(b) Business Excellence Model (BEM) highlighted customer focus and workforce focus in its model. Distinguish **TWO (2)** criteria for both customer focus and workforce focus.

(4 marks)

(c) Give **TWO (2)** purposes of Pareto Diagram and **TWO (2)** purposes of Ishikawa Diagram.

(4 marks)

(d) **Table Q4 (d)** provides a list of 16 issues that led to incorrect formulation in Richard Dulski's jam manufacturing unit. Classify the issues given by using Ishikawa Diagram based on 4Ms method.

(8 marks)

Q5 (a) Variable Control Chart known as a graphical record of a particular quality characteristic. List **FOUR (4)** objectives of Variable Control Chart.

(4 marks)

(b) The XYZ Manufacturing wishes to monitor and control the product's dimension during machining process. Each data are taken based on data of measurements as summarized in **Table Q5 (b).** [Refer Table B for the value of A_2, D_3 and D_4].

(i) Determine the control limits for the X-bar chart.

(6 marks)

(ii) Determine the control limits for the R-chart.

(5 marks)

(iii) Plot the X-bar chart for preliminary data with trial control limits

(2 marks)

(iv) Plot the R-chart for preliminary data with trial control limits.

(2 marks)

(v) Discuss the quality condition of the dimension measurements.

(1 mark)

- **END OF QUESTIONS** -

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       QUALITY MANAGEMENT

Table Q2 (c)

Kulai Tract	Coordinate (x,y)	Population (000)
101	(25,45)	2
102	(25,25)	5
103	(55,45)	10
104	(50,20)	7
105	(80,50)	10
106	(70,20)	20
107	(90,25)	14

Table Q2 (d)

Task	Performance Time (min)	Predecessors
A	1	-
B	3	A
C	2	B
D	4	B
E	1	C, D
F	3	A
G	2	F
H	5	G
I	1	E, H
J	3	I

Table Q4 (d)

1. Incorrect measurement	9. Variablity
2. Antiquated scales	10. Equipment in disrepair
3. Lack of clear instructions	11. Technician calculation off
4. Damage raw materials	12. Jars mislabeled
5. Operator mislead display	13. Temperature controls off
6. Inadequate cleanup	14. Incorrect weight
7. Incorrect maintenance	15. Priority miscommunication
8. Inadequate flow controls	16. Inadequate instructions

Table Q5 (b)

Subgroup Number	Date	Time	Measurements (mm)				
			X_1	X_2	X_3	X_4	X_5
1	03/09	08:00	6.0	5.8	6.1	6.9	7.4
2		14:00	6.2	6.2	6.5	5.9	5.7
3	04/09	08:00	6.0	6.5	7.3	6.1	5.9
4		14:00	6.6	5.8	7.4	5.3	7.3
5	05/09	08:00	5.8	6.5	5.8	6.6	7.4
6		14:00	6.8	7.3	6.4	5.9	5.8
7	06/09	08:00	6.9	6.1	6.2	5.9	5.8
8		14:00	7.2	5.9	5.3	5.8	6.4
9	07/09	08:00	5.9	5.7	6.6	6.5	6.2
10		14:00	6.7	6.9	5.9	7.3	6.0

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TABLE B Factors for Computing Central Lines and 3σ Control Limits for $\underline{X}$, 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 | | | | |
n	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

Table B: Value of A_2, D_3 and D_4