UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

COURSE NAME	:	PLANT ENGINEERING & QUALITY MANAGEMENT
COURSE CODE	:	BDJ 31003
PROGRAMME CODE	:	BDJ
EXAMINATION DATE	:	JULY/ AUGUST 2023
DURATION	:	3 HOURS
INSTRUCTION	:	1.ANSWERS **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 **SEVEN (7)** PAGES

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Q1 (a) State the definitions of Plant engineers and Industrial engineers from your understanding.

(2 marks)

(b) There are several techniques that can be used to evaluate location alternatives, such as Location Breakeven Analysis, Minisum Model, and Transportation Method. Distinguish the main objective of each technique in evaluating location alternatives.

(3 marks)

(c) The owner of a small manufacturing plant has forecasted their sales and this forecast has been illustrated graphically, as shown in **Figure Q1(c).**

(i) Calculate the profit being made at 50,000 units.

(2 marks)

(ii) Using the data provided, estimate the selling price and the variable cost per unit.

(3 marks)

(iii) Using the answer from **Q1 (c)(ii)**, analyze the profit if sales grow to 65 000 units.

(5 marks)

(iv) Determine whether to charge RM 6 as the selling price decreases demand from 40,000 to 30,000 units. Should the company raise prices or not? Explain the reason.

(5 marks)

Q2 (a) Forecasting for production planning (PP) involves using data to predict the future effects of various scenarios. The objective is to collect as much information as possible in order to make accurate predictions about how different scenarios will impact operations. List down and describe **THREE (3)** types of forecasting by time horizon and provide an example of when each type could be applied.

(6 marks)

(b) The sales of Perodua's popular Axia have steadily increased over the past 10 years, as shown in **Table Q2(b).** In 2000, the sales manager predicted that 2001 sales would be 820. Using exponential smoothing with $\alpha = 0.1$, calculate the forecast for the year 2010.

(5 marks)

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(c) **Table Q2(c)** shows data on the sales of 20-inch televisions and unemployment rates for Company X. Based on the given facts,

    (i) Derive predictive equation for sales based on unemployment levels using linear regression model technique.

                (7 marks)

    (ii) Using predictive equation derived from **Q2(c)(i)**, predict how many units sold by Company X if the unemployment is 2.8%.

                (2 marks)

Q3 (a) The project management lifecycle is a step-by-step framework of best practices used to guide a project from beginning to end, providing project managers with a structured way to create, execute, and finish a project. This process generally includes four phases. List **THREE (3)** stages and discuss the activities performed in each stage.

                (6 marks)

(b) Finance is one of the criteria used in selecting projects. Overall, there are three categories of projects.

    (i) Determine each category and provide an example of when it should be applied.

                (6 marks)

    (ii) Due to increased demand, the management of Rani Beverage Company is considering purchasing new equipment to increase production and revenue. The useful life of the equipment is 10 years, and the company's maximum desired payback period is 4 years. The cash inflow associated with the new equipment is given below. Using the payback method, determine whether Rani Beverage Company should purchase the new equipment. The given values for the initial equipment cost, annual cash inflows, annual cash outflows, and non-cash expenses are as follows:

        Initial cost of equipment: RM 37 500

        Annual cash inflows:
        Sales: RM 75 000

        Annual cash Outflows:
        Cost of ingredients: RM 45 000
        Salaries expenses: RM 13 500
        Maintenance expenses: RM 1 500

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Non-cash expenses:
Depreciation expense: RM 5 000

(8 marks)

Q4 (a) List **TWO (2)** quality elements and describe the differences between them in the old and new cultures of Total Quality Management (TQM).

(6 marks)

(b) Quality is classified into prevention and detection. Organize the quality hierarchy with its explanation.

(8 marks)

(c) Six Sigma is a set of management techniques intended to improve business processes by greatly reducing the probability that an error or defect will occur. One of the methods/ models made up for Six Sigma is DMAIC. This stands for define, measure, analyze, improve and control. Describe **SIX (6)** criteria involved in the analysis phase.

(6 marks)

Q5 (a) There are several factors that might contribute to variation. List **FOUR (4)** sources of variation along with **TWO (2)** examples for each.

(4 marks)

(b) The ABC Manufacturing Company aims to monitor and control the dimensions of its products during the casting process. The measurement data is summarized in **Table Q5(a)**. The values given for A2, D3, and D4 are 0.577, 0, and 2.114, respectively. Based on this information,

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

(8 marks)

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

(2 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)

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(v) Based on the X-bar chart plot, discuss the quality condition of the dimension measurements.

(2 marks)

-END OF QUESTIONS –

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                     MANAGEMENT

Margin of safety

RM (THOUSAND)

Output 000 units
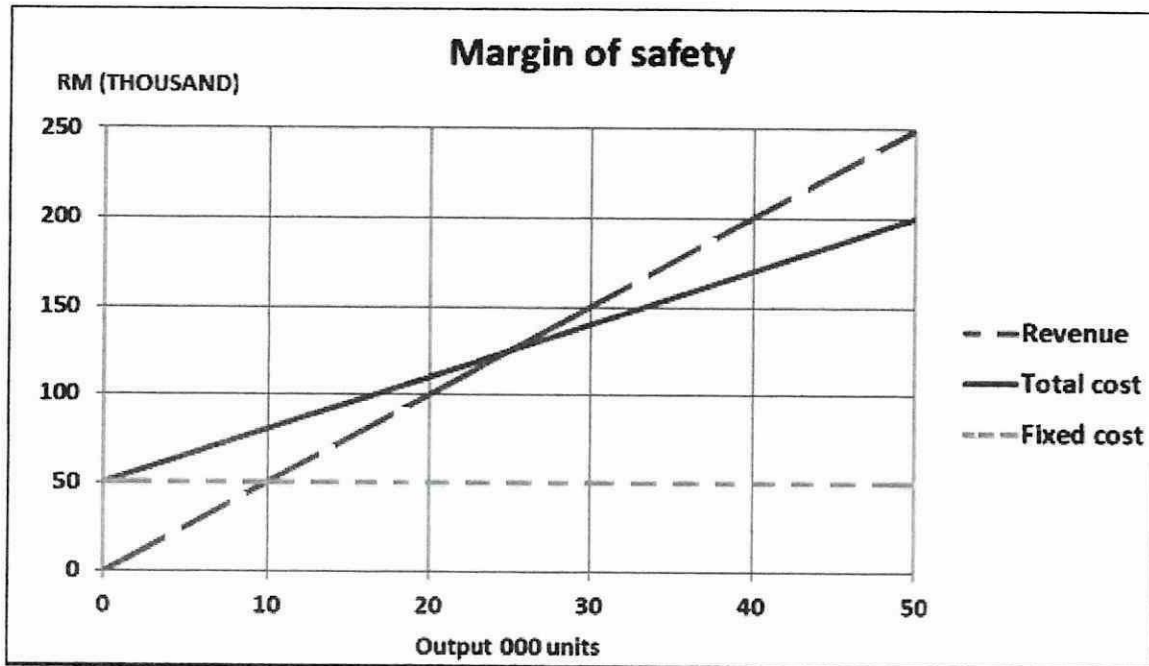
Figure Q1(c): Forecasted sales in small manufacturing plant

Table Q2 (b): Years and sales of Perodua from 2001 to 2009

WEEK	DEMAND
2001	820
2002	775
2003	680
2004	655
2005	750
2006	802
2007	789
2008	689
2009	775
2010	?

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Table Q2(c): Sales of 20" TV and unemployment for Company X

PERIOD	UNIT SOLD	UNEMPLOYMENT (%)
1	20	7.2
2	41	4.0
3	17	7.3
4	35	5.5
5	25	6.8
6	31	6.0
7	38	5.4
8	50	3.6
9	15	8.4
10	19	7.0
11	14	9.0

Table Q5(a): Data collected during measurements

Subgroup Number	Date	Time	Measurements (mm)				
			X_1	X_2	X_3	X_4	X_5
1	April 1	00:00	8.0	9.4	7.6	8.8	8.9
2		02:00	9.3	8.8	9.2	9.2	8.2
3		04:00	7.4	7.4	7.9	9.0	8.1
4		06:00	9.3	8.0	7.4	7.9	8.2
5		08:00	9.4	7.9	9.6	9.4	9.2
6	April 2	00:00	8.7	9.3	8.8	8.9	8.7
7		02:00	8.0	8.5	8.1	8.4	8.4
8		04:00	9.6	8.3	8.3	7.9	8.9
9		06:00	8.4	7.6	8.7	8.5	8.0
10		08:00	9.4	8.7	9.0	9.6	9.4
11	April 3	00:00	8.5	8.1	9.6	8.3	8.2
12		02:00	8.5	8.5	8.0	9.0	9.4
13		04:00	8.0	9.2	8.2	8.5	8.4
14		06:00	8.1	8.8	9.4	8.4	7.9
15		08:00	7.8	9.6	9.0	8.0	8.3