UNIVERSITI KUALA LUMPUR
MALAYSIA ITALY DESIGN INSTITUTE

FINAL EXAMINATION

MARCH 2026 SEMESTER

COURSE CODE	:	PMB40203
COURSE TITLE	:	MAINTENANCE AND RELIABILITY SYSTEMS
PROGRAMME NAME	:	BACHELOR OF ENGINEERING TECHNOLOGY WITH HONOURS
DATE	:	24 JUNE 2026
TIME	:	2:00PM - 4:00PM
DURATION	:	2 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consist of ONE sections.
4. Section A consist of five questions. Answer FOUR (4) questions only.
5. Please write your answer on the answer booklet provided.
6. Please answer all questions in English only.
7. Refer to the attached Formula/ Appendies. ☐ *Tick if applicable*

THERE ARE 7 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 100 marks)

Answer FOUR (4) questions.

Please use the answer booklet provided.

Question 1

Calculate the Overall Equipment Efficiency for the following machine which is used for mass production of a component. Table 1 shows data related to the machine.
Refer Below - Table1 : Production Data .

(25 marks)

Table 1: Production Data

PRODUCTION DATA	
SHIFT LENGTH	8 HOURS = 480 MINUTES
SHORT BREAKS	2 x 15 MINS = 30 MINS
MEAL BREAK	1 x 30 MINS = 30 MINS
DOWNTIME	47 MINS
IDEAL RUN RATE	60 PIECES/MIN
TOTAL PIECES	19271 PIECES
REJECTED PIECES	423 PIECES

Question 2

Maintenance Planning and Scheduling is very important in ensuring the efficency in the production management system.

(a) Define maintenance planning and explain its importance in industrial operations.

(5 marks)

(b) What are the key steps in the maintenance planning process?

(5 marks)

(c) What is the role of a maintenance planner, and what skills are essential for this role?

(5 marks)

(d) Differentiate between preventive and predictive maintenance. Which is more effective?

(5 marks)

(e) How do you prioritize maintenance tasks in a busy plant?

(5 marks)

Question 3

Reliability in maintenance planning is essential to ensure the ability of an asset, equipment, or system to perform its intended function under specified conditions for a designated period of time without failure. Reliability is a critical factor in ensuring efficient and effective maintenance practices.

(a) Define Maintenance and Reliability and explain how the maintenance function of a manufacturing company is related to the Reliability of its products.

(5 marks)

(b) List down any FOUR (4) principal objectives of a Maintenance department in a manufacturing unit and specify the components of Maintenance cost.

(5 marks)

(c) Explain with an example how planned maintenance activities can reduce real costs in a manufacturing or service firm.

(5 marks)

(d) List down the categories of Maintenance and further explain the two types of Corrective Maintenance.

(5 marks)

(e) List down four modern approaches to Preventive Maintenance which focus on responsibilities of maintenance outside the Maintenance Department Staff.

(5 marks)

Question 4

Overall Equipment Effectiveness (OEE) is a metric used to measure the productivity and efficiency of manufacturing equipment. It evaluates how effectively a manufacturing operation is utilized compared to its full potential during the scheduled time. OEE is a key performance indicator (KPI) commonly used in industries to identify losses, improve processes, and maximize production efficiency.

(a) Explain OEE with its mathematical expression and elaborate on each component of the OEE formula.

(5 marks)

(b) Define Reliability, Failure and Failure Rate with their mathematical expressions.

(5 marks)

(c) Describe the three major elements of Failure Modes Effects Analysis (FMEA) to determine the Risk Priority Number.

(5 marks)

(e) What are the key goals of Total Productive Maintenance (TPM)?

(5 marks)

(d) How does TPM contribute to lean manufacturing?

(5 marks)

Question 5

Santex Sdn. Bhd. is a vendor company to the country's largest automaker. Santex supplies Sheet Metal parts, Injection Moulded parts, Mass Produced Aluminium cast and machined parts to the automaker. The Organisation structure of the Production Dept. at Santex is shown in Figure 2.0. You are appointed as a Consultant for Santex to derive a Maintenance Master Plan for the company.

Refer Below - Figure1 : Organisation Chart .

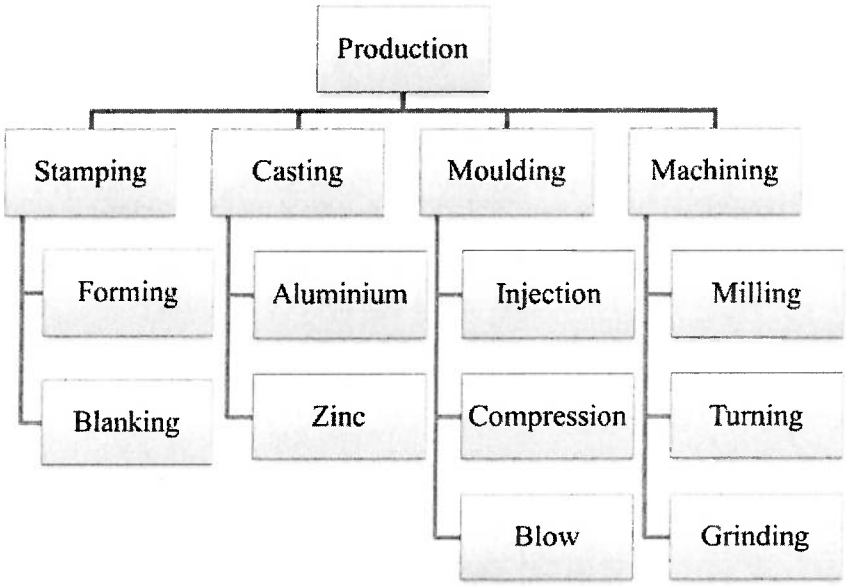


Figure 1: Organisation Chart

(a) Decide on the appropriate Maintenance Management Organisation (Centralized or Decentralized).

(5 marks)

(b) Modify the Organisation Structure to add the Maintenance Function.

(10 marks)

(c) Below are the list of machines available in the Production Department.
Forming: F1, F2
Blanking: B1, B2, B3
Aluminium Casting: AC1, AC2
Zinc Casting: ZC1
Injection Moulding: IM 1, IM 2
Compression Moulding: CM1
Blow Moulding: BM 1
Milling: M1, M2, M3, M4
Turning: T1, T2, T3
Grinding: G1, G2
Design a Preventive Maintenance Schedule for the month of June 2015 such that maintenance work (2 hours/ machine) is carried out for every machine at least twice every month with an equal time gap between the first and the second maintenance for every machine.
Example: If F1 is Maintained on the 1st of the month then the next maintenance will be on the 15th of the month and if F2 is maintained on the 2nd of the month then the next maintenance will be on the 16th of the month.

(10 marks)

END OF EXAMINATION PAPER

PMB 40203 - Maintenance & Reliability Systems – Final Exam March 2026
Formulae Sheet

Support Variables

Planned Production Time: Planned Production Time = Shift Length – Breaks

Operating Time: Operating Time = Planned Production Time – Down Time

Good Pieces: Good Pieces = Total Pieces – Reject Pieces

OEE Factors

Availability: Availability = Operating Time / Planned Production Time
Availability (%) = (Operating Time / Planned Production Time) × 100

Performance: Performance = (Total Pieces / Operating Time) / Ideal Run Rate
Performance = Total Pieces / (Operating Time × Ideal Run Rate)
Performance (%) = [(Total Pieces / Operating Time) / Ideal Run Rate] × 100

Quality: Quality = Good Pieces / Total Pieces
Quality (%) = (Good Pieces / Total Pieces) × 100

Overall Equipment Effectiveness (OEE): OEE = Availability × Performance × Quality
OEE (%) = Availability × Performance × Quality × 100