



**UNIVERSITI KUALA LUMPUR  
Malaysia France Institute**

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**FINAL EXAMINATION  
JANUARY 2014 SESSION**

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**SUBJECT CODE** : FID 36302  
**SUBJECT TITLE** : INDUSTRIAL MAINTENANCE MANAGEMENT  
**LEVEL** : DIPLOMA  
**TIME / DURATION** : 2 HOURS  
**DATE** :

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**INSTRUCTIONS TO CANDIDATES**

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1. Please read the instructions given in the question paper **CAREFULLY**.
  2. This question paper is printed on both sides of the paper.
  3. Please write your answers on the answer booklet provided.
  4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
  5. This question paper consists of **TWO (2) sections**. Section A and B. Answer **ALL** questions in Section A. For Section B, answer **TWO (2)** questions only.
  6. Answer all questions in English.
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**THERE ARE 6 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.**

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**SECTION A (Total: 60 marks)****INSTRUCTION: Answer ALL questions.****Please use the answer booklet provided.****Question 1**

The term maintenance includes all work relating to economical preservation of facilities, equipment and systems. List four (4) maintenance general terms.

(4 marks)

**Question 2**

PM is performed to retain the equipment in a satisfactory operational condition: it is divided into time-based and condition-based maintenance. Briefly explain both concepts of maintenance listed.

(8 marks)

**Question 3**

Explain two (2) purpose of calculating Overall Equipment Effectiveness?

(6 marks)

**Question 4**

Autonomous maintenance is implemented in seven steps: List all the steps undertaken.

(7 marks)

**Question 5**

List the eight (8) pillars in Total Productive Maintenance (TPM).

(8 marks)

**Question 6**

Computerized Maintenance Management System (CMMS) is a software package that maintains a computer database of information about maintenance operations. List three (3) advantages of using the CMMS.

(6 marks)

**Question 7**

Describe the following maintenance tools and techniques.

a) Fault Tree Analysis (FTA)

(7 marks)

b) Failure Mode and Effects Criticality Analysis (FMECA)

(7 marks)

c) Ishikawa Diagram

(7 marks)

**SECTION B (Total: 40 marks)****INSTRUCTION: Answer TWO (2) questions only.****Please use the answer booklet provided.****Question 9**

A special purpose drilling and tapping machine which makes a range of electrical terminal blocks operates with two shifts working at 8 hours per shift for 5 days per week. At the beginning of the shift, 10 minutes are provided for autonomous maintenance exercise and 15 minutes for snap break at mid of every shift. The planned throughput is 60 units per hour and the actual output is 3151 units per week.

The following is a list of losses encountered during the machining process:

1. The circular saw blade, which cuts off the material shatters, has to be replaced. This happens once per week and takes 30 minutes.
2. The saw pivot arm gets so congested with chips and oil, it becomes stiff and will not function properly. It has to be dismantled and cleaned. This happens twice per week and takes 45 minutes.
3. Cutting fluid is sprayed onto the bar feeder causing the bar to slip and not feed properly with two consequences:
  - a) If a part feed occurs then the block is cut off too short. This happens three times per day, takes 10 minutes to clear and 3 parts are lost.
  - b) If the bar does not feed then the machine stops, it has to be cleared and re-set. This happens twice per week and takes 45 minutes.
4. On the second tapping head, the tap breaks and it is undetected, which means the parts have to be tapped again by hand. This happens once every day, 20 parts have to be re-worked, 10 parts are scrapped and it takes 15 minutes to replace the tap.
5. Chips build up at the rear of the machine and have to be shoveled into a barrow. The operator has to stop the machine while doing this. This happens 3 times per day and takes 10 minutes each time.

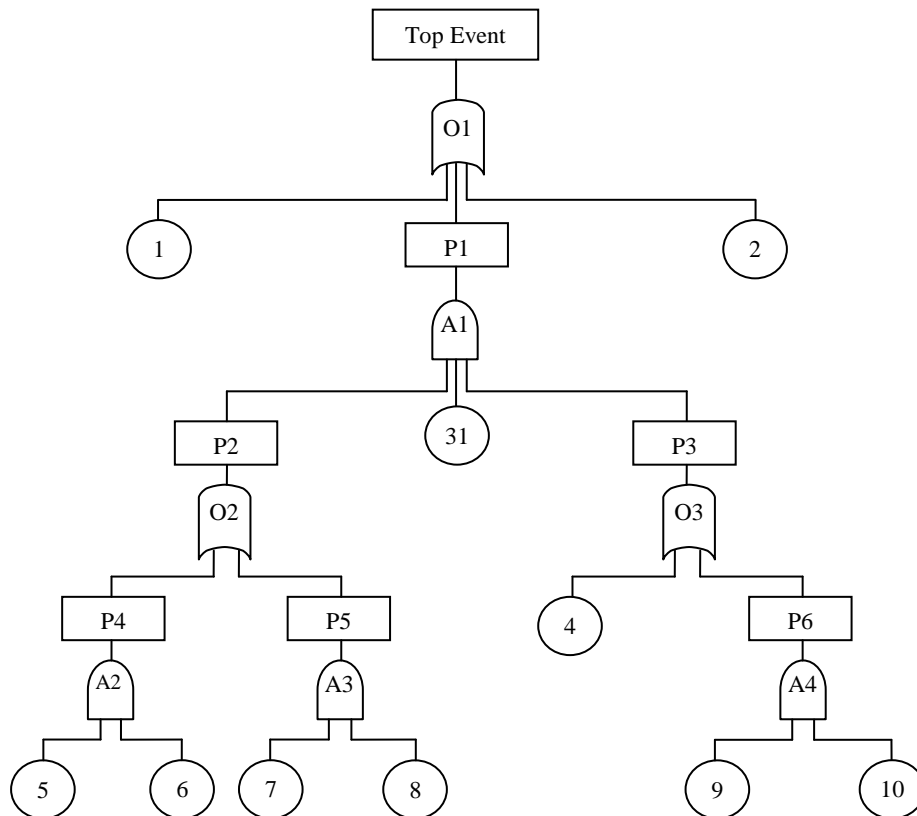
Calculate the following:

- |  |           |
|--|-----------|
| a) Availability rate                   | (8 marks) |
| b) Performance rate                    | (5 marks) |
| c) Quality Rate                        | (5 marks) |
| d) Overall Equipment Efficiency (OEE). | (2marks)  |

**Question 10**

Refer to Figure 1, calculate the system's failure probability. You may assume following probabilities as given in Table 1.

(20 marks)



**Note: O - OR Gate      A - AND Gate      P – Probability of fault**

Figure 1: Fault Tree Analysis of system's failure

Table 1: Probability of Failure

Event no.	Probability of failure
1	0.01
2	0.01
3	0.05
4	0.05
5	0.05
6	0.01
7	0.07
8	0.03
9	0.03
10	0.03

**Question 11**

Briefly explain the evolution of the maintenance concept and changes of maintenance techniques throughout the years from the first generation until third generation.

(20 marks)

**END OF QUESTIONS**