



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2010 SESSION

SUBJECT CODE : FID 36302
SUBJECT TITLE : INDUSTRIAL MAINTENANCE MANAGEMENT
LEVEL : DIPLOMA
TIME / DURATION : 4.00pm – 6.30pm
(2.5 HOURS)
DATE : 28 APRIL 2010

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. Please write your answer on the answer booklet provided.
4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
5. This questions paper consists of TWO (2) sections. Sections A and B. Answer ALL questions in section A. For section B, answer TWO (2) questions only.
6. Answer all questions in English.

THERE ARE 5 PAGES OF QUESTIONS AND 1 PAGE OF APPENDIX, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

INSTRUCTION: Answer ALL questions.

Please use the answer booklet provided.

Question 1

List three (3) methods/tools used for analysing the causes of failure.

(3 marks)

Question 2

List four (4) maintenance planning areas.

(4 marks)

Question 3

What is the purpose to carry out periodic inspection through Preventive Maintenance practice?

(5 marks)

Question 4

List four (4) causes of breakdown in new equipment

(4 marks)

Question 5

Explain the purpose of following maintenance records:-

a) Equipment Logs record.

(4 marks)

b) Maintainability Improvement record.

(4 marks)

Question 6

Give three (3) requirements for effective maintenance planning which need to be performed by a maintenance personnel.

(6 marks)

Question 7

The major categories of possible causes are arranged as branches which a typical causes of the top event include the four "4 M's".

a) Name one (1) type of analysis method used.

(2 marks)

b) Sketch the branches and state the four "4 M's" as a top event of causes.

(6 marks)

Question 8

There are three (3) categories of an item's criticality when using Failure Mode Effects and Criticality Analysis (FMECA). Explain the three (3) categories.

(6 marks)

Question 9

Give two (2) comparisons of Centralized Maintenance and Decentralized Maintenance.

(8 marks)

Question 10

Explain the following:

a) Minor stoppage losses

(4 marks)

b) Speed losses

(4 marks)

SECTION B (Total: 40 marks)

INSTRUCTION: Answer TWO (2) questions only.

Please use the answer booklet provided.

Question 11

Refer to Figure 1, establish Why-why Analysis for Motor Failure.

- a) Arrange the following correctly in the box no.1,2,3,4 and 5 of Why-Why Analysis diagram as shown in Figure 1

- Conveyor jammed**
- Motor burnt**
- Short circuits**
- Bearing jammed**
- Overheat.**

(5 marks)

- b) Give three (3) answers for events of failure for the following "Why?". Answer given should be logical and reasonable.

(15 marks)

Copy the diagram (figure 1) into the answer booklet

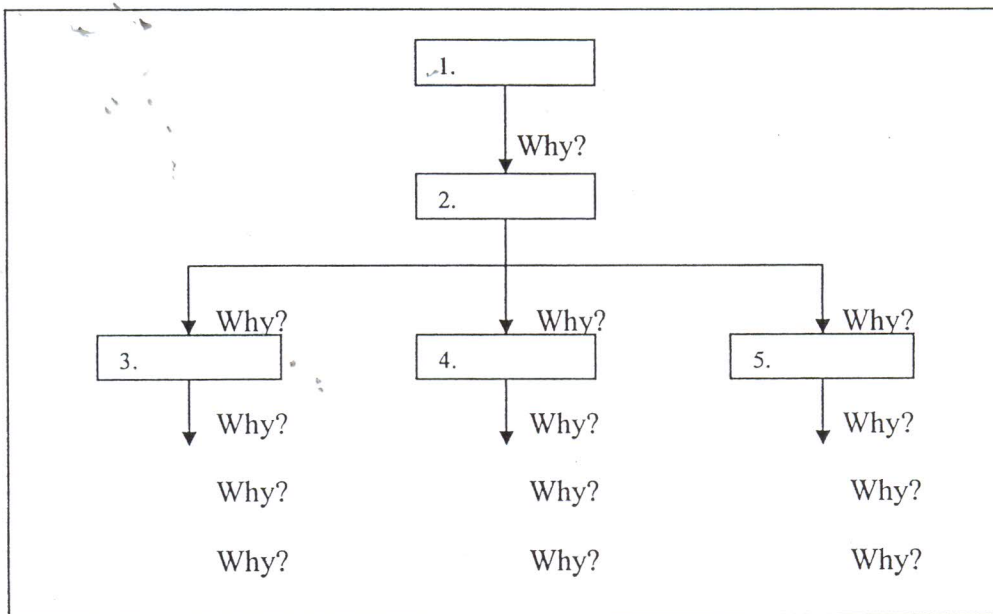


Figure 1: Why-Why Analysis of Motor Failure

Question 12

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 13

Table 1, shows the Failure Mode Effect and Criticality Analysis of Control Valve.

- a) Define for each failure mode; the Criticality (column 12) and the Criticality Category (column 13).

(14 marks)

- b) List the entire failure modes (ranked by criticality) under its criticality category level.

(6 marks)

Note: Copy column no.12 and 13 of Table 1 in your answer booklet and fill in the answers.

END OF QUESTIONS

Table 1: FMEA Results for Control Valve

SYSTEM SUB-SYSTEM ASSEMBLY SUB-ASSEMBLY PARTS LIST NO	Missile Control Actuator (C3) Control Valve (C31) ACV126 A/1234	DRAWING NO/ISSUE DRAWING NO/ISSUE DRAWING NO/ISSUE DRAWING NO/ISSUE DRAWING NO/ISSUE	N/A MC 1346 Issue 2 MC/A/196 Issue 2	ITEM REF NO ITEM REF NO MC/A/2521	N/A A.654 ITEM REF NO	PROJECT ARM 7/1 ANALYSIS NO 7/1/4 (a) ISSUE 1 DATE 30th June ANALYST J. Norman	ITEM	REF NO	CODE NO	FUNCTION	FAILURE MODE	FAILURE MODE FREQUENCY (α)	FAILURE RATE (10 ⁶ hrs) (λ)	FAILURE EFFECT		SYMPTOMS	SEVERITY LEVEL (S)	CRITICALITY (C)	CRITICALITY CATEGORY
														IMMEDIATE LEVEL	NEXT LEVEL				
1										4	5	6	7	8	9	10	11	12	13
Solenoid						Open winding	0.60	1.50						Inlet valve permanently open under gas pressure	Actuator 'hardcover' right		1.0		
Solenoid						Insulation	0.30	1.50						Reduced force to operate vvs	Slower actuator drive		1.0		
Compression Spring						Fracture	0.70	0.1						Incorrect metering	Slower Actuator Drive		0.4		
Inlet and Exhaust Valves						Sticking	0.40	3.0						Incorrect metering	Slower Actuator Drive		0.4		
						Degraded vvs seals	0.50	3.0						Incorrect metering	Slower Actuator Drive		0.4		
Valve Body						Restricted gas passages	0.45	0.7						Incorrect metering	In worst case (le blockage) no drive or 'hardover' left		1.0		
Valve Body						Fracture	0.40	0.7						Gas loss	Slow actuator drive and drive will cease early		0.7		

Note: w (valve), vvs (valve system)