UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
SEPTEMBER 2014 SESSION

SUBJECT CODE	:	**FID36302**
SUBJECT TITLE	:	**INDUSTRIAL MAINTENANCE MANAGEMENT**
LEVEL	:	**DIPLOMA**
TIME / DURATION	:	**8.00 PM – 10.00 PM** **(2.0 HOURS)**
DATE	:	**09 JANUARY 2015**

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 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.

THERE ARE 6 PAGES OF QUESTIONS, 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 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

You as a Plant Superintendent are required to lead a group of operators as a TPM improvement team. You are alert of the following conditions and required to use the possible tools to report and to explain the existing conditions of processors in your plant.

Table 1 shows the information of Six Big losses encountered in your plant for 8 weeks.

Table 1: Six Big Losses data

Losses	Time (minutes)
Breakdown	1000
Setup & Adjustment	300
Idling & minor stoppages	3270
Speed loss	600
Defects & Rework	1380
Startup & yield loss	240

a) Create cumulative distribution and construct the Pareto Curve

(10 marks)

b) Give a recommendation to perform maintenance planning.

(10 marks)

Question 12

Company MFI Sdn Bhd produces chocolates. They have two production lines: Line One is a multi product line; Line Two is a mono-line. Line One is a mix of four (4) products is produce and because the optimization of this line will yield more results. It was decided to examine Line One for the period of January to September. The examine period is January to September with theoretical production time of 273 days that correspondence to 6552 hrs. Out of 273 days, the work was not plan on some days as follows;

Weekends	78 days
Holidays	8 days
Shutdown	11 days

There are two shifts of 8 hours per day. There are also work stoppages; one (1) hour per day. The lack of personnel and raw material causes the rest of time losses. Since there was no direct report available, estimation had to be made. The production leader decided upon 5% losses from the available production time. This lead to the following production output as illustrated in Table 2.

Table 2: Production Output

Product	Reference Throughput	Output
Type 1	1500kg/hr	720 tons
Type 2	750kg/hr	334 tons
Type 3	900kg/hr	160 tons
Type 4	680kg/hr	36 tons

From the table, 95% is transferred to the warehouse as a good stock, in other words 5% is rejected. The company kept records of its downtime during the examine period which is 551 hrs.

Calculate the following:

a) Availability rate

(8 marks)

b) Performance rate

(8 marks)

c) Overall Equipment Efficiency (OEE).

(4 marks)

Question 13

Table 3, 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).

(12 marks)

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

(8 marks)

Note: Copy column no.12 and 13 of Table 3 in your answer booklet and fill in the answers.

Table 3:   **FMEA Results for Control Valve**

SYSTEM	Missile	DRAWING NO/ISSUE	N/A			PROJECT	ARM 7/1
SUB-SYSTEM	Control	DRAWING NO/ISSUE	MC 1346 Issue 2	ITEM REF NO	N/A	ANALYSIS NO	7/1/4 (a)
ASSEMBLY	Actuator (C3)	DRAWING NO/ISSUE	MC/A/196 Issue 2	ITEM REF NO	A 654	ISSUE	1
SUB-ASSEMBLY	Control Valve (C31) ACV126	DRAWING NO/ISSUE		MC/A/2521	ITEM REF NO	DATE	30th June
PARTS LIST NO	A/1234 ISSUE 1					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)	CRITICALTY CATEGORY
							IMMEDIATE LEVEL	NEXT LEVEL				
1	2	3	4	5	6	7	8	9	10	11	12	13
Solenoid	cv6	C311	Operates Valves	Open winding	0.60	1.50	Inlet valve permanently open under gas pressure	Actuator 'hardcover' right	As in Column 9	1.0		
Solenoid	cv6	C311		Insulation	0.30	1.50				1.0		
Compression Spring	cv10	C312	Open exhaust vv Close inlet vv	Fracture	0.70	0.1	Reduced force to operate vvs	Slower actuator drive		0.4		
Inlet and Exhaust Valves	cv5	C313	Meter gas flow	Sticking	0.40	3.0	Incorrect metering	Slower Actuator Drive		0.4		
	cv5	C313		Degraded vv seats	0.50	3.0				0.4		
Valve Body	cv7	C314	Meter gas flow	Restricted gas passages	0.45	0.7	Incorrect metering	In worst case (ie blockage) no drive or 'hardover' left		1.0		
Valve Body	cv7	C314		Fracture	0.40	0.7	Gas loss	Slow actuator drive and drive will cease early		0.7		

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

END OF QUESTIONS