SET A

UNIVERSITI KUALA LUMPUR
MALAYSIA FRANCE INSTITUTE

FINAL EXAMINATION
SEPTEMBER 2014 SESSION

SUBJECT CODE	:	**FTD32303**
SUBJECT TITLE	:	**WELDING METALLURGY**
LEVEL	:	**DIPLOMA**
DURATION	:	**9.00 AM – 11.30 AM** **(2.5 HOURS)**
DATE / TIME	:	**2 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 3 PRINTED 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

Give **THREE (3)** types of weld heat treatment.

(6 Marks)

Question 2

Explain the effects of nitrogen to microstructure and mechanical properties of carbon steel weldment

(8 Marks)

Question 3

Distinguish between non heat treatable and heat treatable aluminum alloys.

(6 marks)

Question 4

State **THREE (3)** contribute factors that produce internal stresses in weldment.

(6 Marks)

Question 5

Explain the side effect of post weld heat treatment (PWHT) to mechanical properties of weldment.

(6 Marks)

Question 6

Sketch and indicate clearly the regions of heat affected zone (HAZ) for double V butt joint.

(6 Marks)

Question 7

Compare the general properties obtain by stainless steels and carbon steels.

(10 Marks)

Question 8

Explain in detail the purposes of adding Molybdenum 2% and Nickel more than 14% in 316L stainless steel.

SECTION B (Total: 40 marks)

INSTRUCTION: Answer TWO (2) questions only.
Please use the answer booklet provided.

Question 1

One of critical factors to ensure good weldability of dissimilar joint is a correct filler metal selection. Assume 25% dilution was involved for dissimilar joint using GMAW process to weld stainless steel plates SS310 and mild steel plate A36.

    (a)   Determine the final percentage of ferrite for both filler metal ER308L and ER310.

(16 Marks)

    (b)   Choose the best filler metal and give your reason.

(4 Marks)

Note: Base and filler metal compositions refer to Table 1.

Table 1: Chemical compositions

	Base metal (%)		Filler Metal (%)	
	SS310	**A 36**	**ER308L**	**ER310**
Carbon	0.15	0.25	0.03	0.15
Manganese	2.0	1.0	2.5	2.5
Chromium	27.0	-	22.0	28.0
Silicon	0.4	0.28	0.65	0.65
Nickel	22.0	-	11.0	22.5
Molybdenum	0.4	-	0.75	0.75
Copper	-	0.2	0.75	-
Sulphur	0.03	0.03	0.030	0.03
Phosphorus	0.03	0.03	0.030	0.03
Iron	Balance	Balance	Balance	Balance

Question 2

Weld decay or intergranular corrosion occurs in austenitic stainless steels welded due to formation of chromium carbide precipitate ($Cr_{23}C_6$). These precipitate occurs within the sensitization temperature.

(a)   What is sensitization temperature?

(4 marks)

(b)   Explain in detail formation of chromium carbide precipitates.

(6 Marks)

(c)   How chromium carbide promote to weld decay.

(4 Marks)

(d)   State **THREE (3)** methods to prevent weld decay.

(6 Marks)

Question 3

Recently the uses of Aluminum alloys in welding applications are increase. There are a few problems associated with the welding of aluminum alloys such as porosity, solidification cracking and loss of strength that make it lower weldability than steels.

(a)   State **TWO (2)** physical properties that affect the weldablilty of aluminium alloys.

(4 Marks)

(b)   State **TWO (2)** sources of hydrogen that cause of formation of porosity.

(4 Marks)

(c)   Explain the causes of weld porosity and how to prevent it.

(8 Marks)

(d)   Explain the loss of strength occur in welded aluminium alloys of 2xxx, 6xxx and 7xxx series.

(4 Marks)

END OF QUESTIONS

Appendix 1