



**UNIVERSITI KUALA LUMPUR
MALAYSIA FRANCE INSTITUTE**

**FINAL EXAMINATION
JANUARY 2014 SESSION**

SUBJECT CODE : FTD32303
SUBJECT TITLE : WELDING METALLURGY
LEVEL : DIPLOMA
DURATION : 2 ½ HOURS
DATE / TIME :

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.
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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

Differentiate between austenitic and ferritic stainless steels.

(8 marks)

Question 2

State **TWO (2)** objectives of post weld heat treatment (PWHT).

(4 marks)

Question 3

Explain why stainless steels are more difficult to weld compare to the carbon steels?

(8 marks)

Question 4

Distinguish between hot and cold cracking.

(8 Marks)

Question 5

Knife line attack is one of intergranular corrosion that occurs in welded stabilized stainless steels such as 321 and 347. Sketch the location of knife line attack and how to prevent it.

(10 Marks)

Question 6

Describe the tempering process with aid of sketching diagram temperature versus time.

(10 Marks)

Question 7

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

(12 Marks)

SECTION B (Total: 40 marks)**INSTRUCTION: Answer TWO (2) questions only.****Please use the answer booklet provided.****Question 1**

Selection of filler metal is a critical factor that influences weldability of welding dissimilar material. Choose the best filler metals E308LMo or E310 for welding lifting lugs (A508) and head (SS 304) of pressure vessel. Assume 30% dilution was involved and give your reasons for your selection. Use the calculation method to solve this problem.

Note: Chemical compositions of base metal and filler metal as Table 1 below.

(20 Marks)

Table 1: Chemical compositions

	Base metal (%)		Filler Metal (%)	
	SS304	A 508	E308LMo	E310
Carbon	0.05	0.27	0.02	0.15
Manganese	2.0	1.0	2.0	2.5
Chromium	20.0	0.45	22.0	28.0
Silicon	1.0	0.4	0.65	0.8
Nickel	9.0	1.0	11.0	22.5
Molybdenum	-	0.7	2.0	0.75
Sulphur	0.030	0.025	0.030	0.03
Phosphorus	0.030	0.025	0.030	0.03
Iron	Balance	Balance	Balance	Balance

Question 2

The formation of chromium carbide precipitate adjacent to grain boundary and promote to corrosion in stainless steels is known as weld decay or intergranular corrosion. This phenomenon seriously occur in austenitic stainless steels contain carbon more than 0.05%C.

- (a) Sketch the weld decay region for double V butt joint. (4 Marks)
- (b) Distinguish the weld decay in austenitic and ferritic stainless steels. (6 marks)
- (c) Explain how chromium carbide precipitate occurs. (10 Marks)

Question 3

Recently the uses of Aluminum alloys in welding applications are increase due to good corrosion resistance and good strength per weight ratio. However aluminum alloys have lower weldability than steels.

- (a) State **TWO (2)** physical properties that causes aluminum alloys is difficult to weld compare to steels. (4 Marks)
- (b) Discuss the properties of aluminum silicon alloy that make it commonly used a weld filler metal. (6 Marks)
- (c) Porosity is a common defect in welding aluminum and the biggest diameter size of porosity can be up to 4mm. Explain the causes of porosity and how to prevent it. (10 Marks)

END OF QUESTIONS

Appendix 1

