



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
SEPTEMBER 2013 SESSION

SUBJECT CODE : FTD 32303
SUBJECT TITLE : WELDING METALLURGY
LEVEL : DIPLOMA
TIME DURATION : 2.5 Hours
DATE :

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 and **TWO (2)** questions in section B.
 6. Appendix A, B, and C is provided in this paper. Attach Appendix B and C together with the answer booklet.
 7. Answer all questions in **English**.
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THERE ARE FOUR (4) PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

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

Answer the following questions.

- a) List **FOUR (4)** types of corrosion in Stainless Steels. (4 Marks)
- b) Compare the characteristics of Ferritic and Martensitic Stainless Steels. (6 Marks)
- c) List **FOUR (4)** factors influence the weldability of Aluminium. (4 Marks)
- d) State and classify the group of Aluminium Alloys. (6 Marks)

Question 2

Answer the following questions.

- a) What is welding Preheating? (4 Marks)
- b) Explain the differences between Post Heating and Post Weld Heat Treatment (PWHT). (6 Marks)
- c) What are the side effects of Post Weld Heat Treatment (PWHT)? (4 Marks)
- d) Define the Tempering process and list **Four (4)** types of that process. (6 Marks)

Question 3

Answer the following questions.

- a) Define the Heat Affected Zone (**HAZ**) (4 Marks)

- b) Discuss the most significant problems commonly occur in the **HAZ** area.
(6 Marks)
- c) The common weld cracking that occurred in **HAZ** area is cold cracking. Explain how to avoid this type of cracking.
(4 Marks)
- d) Discuss the factors contributed to cold cracking.
(6 marks)

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

Answer the following questions.

- a) Identify **FOUR** (4) factors that able to induce the internal stress in weldment. (4 marks)
- b) Differentiate between hot cracking and cold cracking (6 marks)
- c) Sketch the weld decay region for butt weld joint. (4 marks)
- d) Explain briefly how weld decay can occurred. (6 marks)

Question 2

Answer the following questions. (Refer to Appendix A, B and C for questions below and attach the Schaeffler diagram into answer booklet).

- a) Explain briefly the purposes of Schaeffler diagram? (4 Marks)
- b) Plate SA36 steel is welded to plate SS304 stainless steel. The dilution ratio is 10%. Select the suitable filler metal either E308L or E310 by using graphical method for welding SA 36 and SS 304. (Note: Base and Filler metal compositions are as in Table 1 in Appendix A). (12 Marks)
- c) Give your reasons for your selection. (4 Marks)

Question 3

Answer the following questions.

- a) Discuss the classification of weld cracking. (4 marks)
- b) Explain the mechanism of solidification cracking. (6 marks)
- c) List **TWO (2)** main problems in welding Austenitic Stainless Steel. (4 marks)
- d) Explain **THREE (3)** methods to avoid weld decay. (6 marks)

END OF QUESTIONS

Appendix A

Table 1: Chemical Composition of Stainless steel

Type	302	303	304	304L	305	308	308L	309	310	314
Carbon (C)	0.15	0.15	0.08	0.03	0.12	0.08	0.03	0.2	0.25	0.25
Chromium (Cr)	17	17	18	18	17	19	19	22	24	23
Nickel (Ni)	8	8	8	8	10	10	10	12	19	19
Manganese (Mn)	2	2	2	2	2	2	2	2	2	2
Silicon (Si)	1	1	1	1	1	1	1	1	1.5	3
Phosphorus (P)	0.045	0.2	0.04	0.045	0.045	0.045	0.045	0.045	0.04	0.045
Sulphur (S)	0.03	0.15	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Molydenum (Mo)	0	0.6	0	0	0	0	0	0	0	0

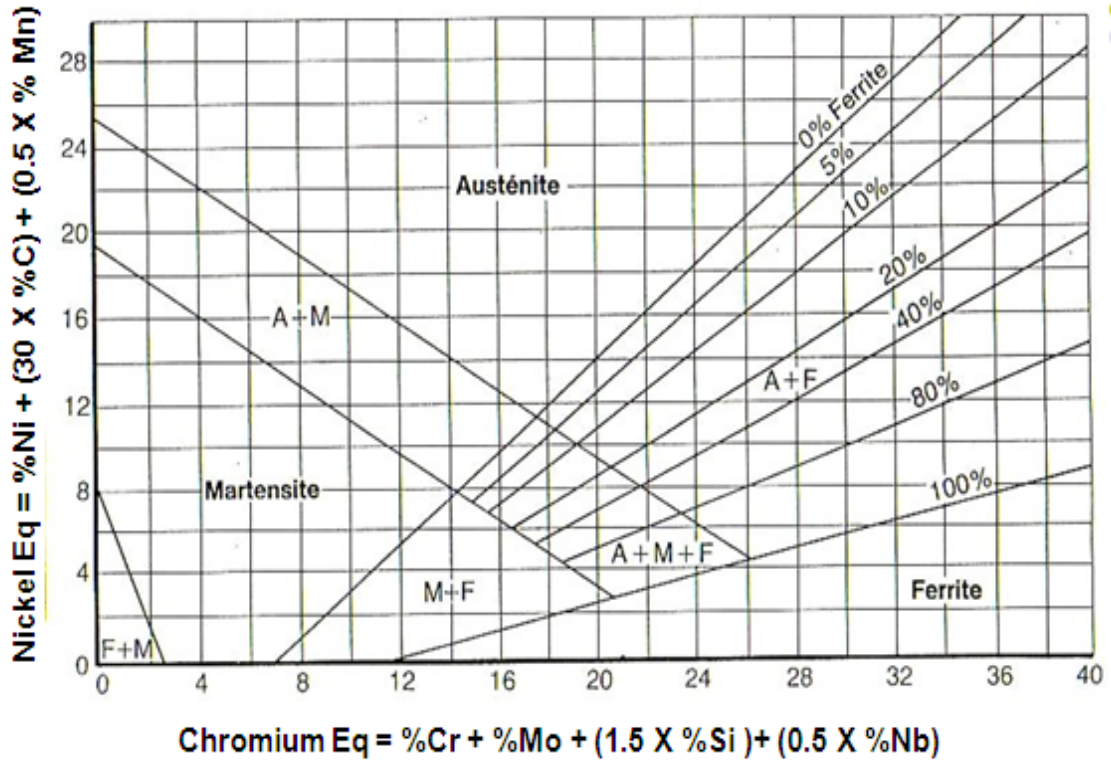
Table 2: Material Composition for Carbon Steel

Type	C	Mn	Si	P	S
SA36	0.25	1.8	0.35	0.04	0.025
SA1008	0.08	0.5	0.30	0.04	0.045
SA1010	0.10	0.6	0.30	0.04	0.045
SA1015	0.15	0.6	0.30	0.04	0.045
SA1018	0.18	0.9	0.30	0.04	0.045
SA1020	0.20	0.9	0.40	0.04	0.045
SA1022	0.22	1.0	0.40	0.04	0.045
SA1025	0.25	0.6	0.40	0.04	0.045
SA1030	0.30	0.9	0.40	0.04	0.045

Note - Balance is Fe

Appendix B

Schaeffler Diagram



Appendix C

Schaeffler Diagram

