



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JULY 2010 SEMESTER

SUBJECT CODE : FTD 22202
SUBJECT TITLE : WELDING METALLURGY 1
LEVEL : DIPLOMA
TIME / DURATION : 9.00am – 11.30am
(2.5 HOURS)
DATE : 08 NOVEMBER 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 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. Appendix 1 and 2 is provided in this paper.
7. Answer all questions in English.

THERE ARE 3 PAGES OF QUESTIONS AND 2 PAGE OF APPENDIX, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

INSTRUCTION: Answer ALL questions.

Please use the answer booklet provided.

Question 1

- a) Define what is hardness in metallurgical terms? (2 Marks)
- b) Define what is hardenability in metallurgical terms? (2 Marks)
- c) Give **THREE (3)** factors that influence the welding heat cycle. (3 Marks)
- d) Give **FIVE (5)** factors that influence the hardenability of steels. (5 Marks)
- e) Explain what is initial temperature in welding heat cycle? (8 Marks)

Question 2

Tempering often involved in Heat Treatment Process. Answer the following questions.

- a) Define what is tempering? (2 Marks)
- b) Give **FOUR (4)** Types of Tempering. (4 Marks)
- c) Explain **TWO (2)** of tempering types in question (b) (8 Marks)
- d) What are the purposes of tempering? (6 Marks)

Question 3

Welded joint consist of Fusion zone, Heat affected zone (HAZ) and parent metal. Answer the following questions.

- (a) What is Heat Affected Zone (HAZ)? (4 Marks)
- (b) Sketch and explain the **HAZ** regions fro Fillet weld. (10 Marks)
- (c) Name what is microstructure in HAZ (2 Marks)
- (d) Give **Four (4)** main problems associated with HAZ. (4Marks)

SECTION B (Total: 40 marks)

INSTRUCTION: Answer TWO (2) questions only.

Please use the answer booklet provided.

Question 1

Answer the followed questions by referring to **Appendix 1**.

a) Determine the microstructure of the following labels.

- A₁ and A₂
- B₁ and B₂
- C₁ and C₂
- D₁ and D₂

(8 marks)

b) Determine the hardness of the following labels.

- A₁
- B₁
- C₁
- D₁

(4Marks)

c) Explain briefly the purpose of Time Temperature Diagram (TTT).

(8 marks)

Question 2

The metallurgy of the welded joint can be categorized into two major regions, the fusion zone and the heat-affected zone. Answer the following questions.

a) Explain what is fusion zone in a welded joint?

(6 Marks)

b) Explain briefly the effects of hydrogen contamination in the fusion metal due to improper protection during welding.

(10 Marks)

c) Give **FOUR (4)** characteristic of Super Critical Zone in welded joint

(4Marks)

Question 3

- a) Give the equation of **Carbon Equivalent (CE)** according to American Welding Society (AWS).

(2 Marks)

- b) Calculate the **Carbon Equivalent (CE)** for base metal SA 1010 and determine whether this steel needs preheating.

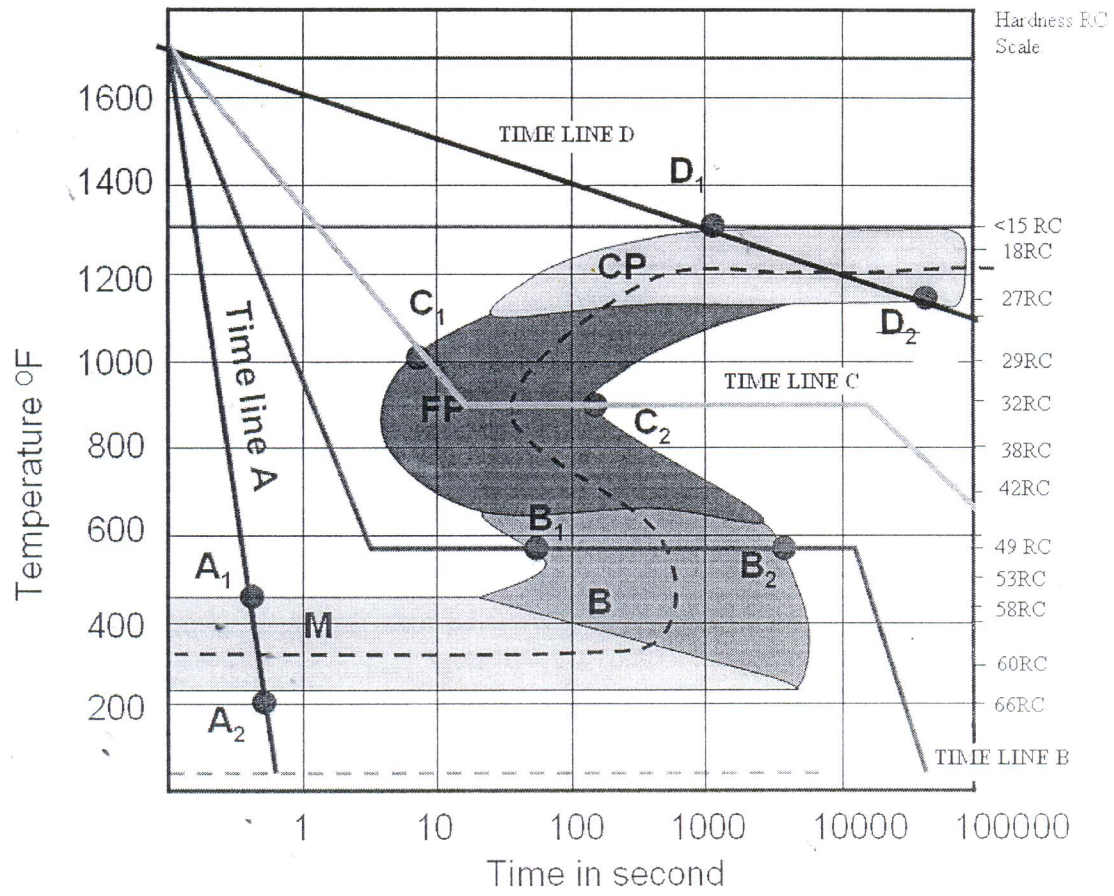
(8 Marks)

- c) Explain briefly why preheat is required for welding of mild steel plate thickness above 25 mm?

(10 Marks)

END OF QUESTION

Appendix 1



Appendix 2

Table 2: Material Composition for carbon steels

| Type | Composition (%) | | | | |
|--------|-----------------|-----------|---------|------------|--------|
| | Carbon | Manganese | Silicon | Phosphorus | Sulfur |
| SA1008 | 0.08 | 0.50 | 0.30 | 0.04 | 0.045 |
| SA1010 | 0.10 | 0.60 | 0.30 | 0.04 | 0.045 |
| SA1015 | 0.15 | 0.60 | 0.30 | 0.04 | 0.045 |
| SA1018 | 0.18 | 0.90 | 0.30 | 0.04 | 0.045 |
| SA1020 | 0.20 | 0.90 | 0.40 | 0.04 | 0.045 |
| SA1022 | 0.22 | 1.00 | 0.40 | 0.04 | 0.045 |
| SA1025 | 0.25 | 0.60 | 0.40 | 0.04 | 0.045 |
| SA1030 | 0.30 | 0.90 | 0.40 | 0.04 | 0.045 |
| SA1035 | 0.35 | 0.90 | 0.45 | 0.04 | 0.045 |