Document No : UniKL MFI_SD_AC41
Revision No: 02
Effective Date: 01 December 2008

CONFIDENTIAL

SET B

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

JAN 2011 SEMESTER

SUBJECT CODE	:	FTD 22202
SUBJECT TITLE	:	WELDING METALLURGY 1
LEVEL	:	DIPLOMA
TIME / DURATION	:	3.30pm – 6.00pm (2.5 HOURS)
DATE	:	10 MAY 2011

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. Answer all questions inEnglish.

THERE ARE 4 PAGES OF QUESTIONS AND 2 PAGES OF APPENDIX, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

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

(a) Define **Heat Affected Zone (HAZ)**

(4 marks)

(b) Explain briefly **THREE (3)** main problems associated with **HAZ**.

(6 marks)

(c) Sketch the **HAZ** regions for Fillet Weld.

(10 marks)

Question 2

Preheating is important process before welding steel. Answer the following questions.

a) Define the preheating process.

(4 marks)

b) State **FOUR (4)** purposes of preheating.

(4 marks)

c) Give **FOUR (4)** factors to be considered in preheating the steel.

(4 marks)

d) Explain the differences between post heating and preheating.

(8 marks)

Question 3

a) Define hardenability in terms of metallurgical point of view.

(4 marks)

b) State **THREE (3)** factors that influence the welding heat cycle.

(3 marks)

c) Give **FIVE (5)** factors that influence the hardenability of steels.

(5 marks)

d) Explain what is initial temperature in welding heat cycle?

(8 marks)

SECTION B (Total: 40 marks)

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

Question 1

Time Temperature Transformation (TTT) Diagram is plots of temperature versus time and generated from percentage transformation-versus logarithm of time measurements. Answer the following questions by referring to **Appendix 1.**

a) Determine the microstructure of the following labels.
   i. A1 and A2
   ii. B1 and B2
   iii. C1 and C2
   iv. D1 and D2

(8 marks)

b) Determine the hardness of the following labels.
   i. A1
   ii. B1
   iii. C2
   iv. D2

(8 marks)

c) Describe briefly the purposes of Time Transformation (TTT) Diagram.

(4 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) What is fusion zone in a welded joint?

(4 marks)

a) Give **FOUR (4)** characteristics of Super Critical Zone in welded joint.

(8 marks)

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

(8 marks)

Question 3

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

(4 Marks)

b) Calculate the **Carbon Equivalent (CE)** for base metal SA 1018 and determine whether this steel needs preheating.

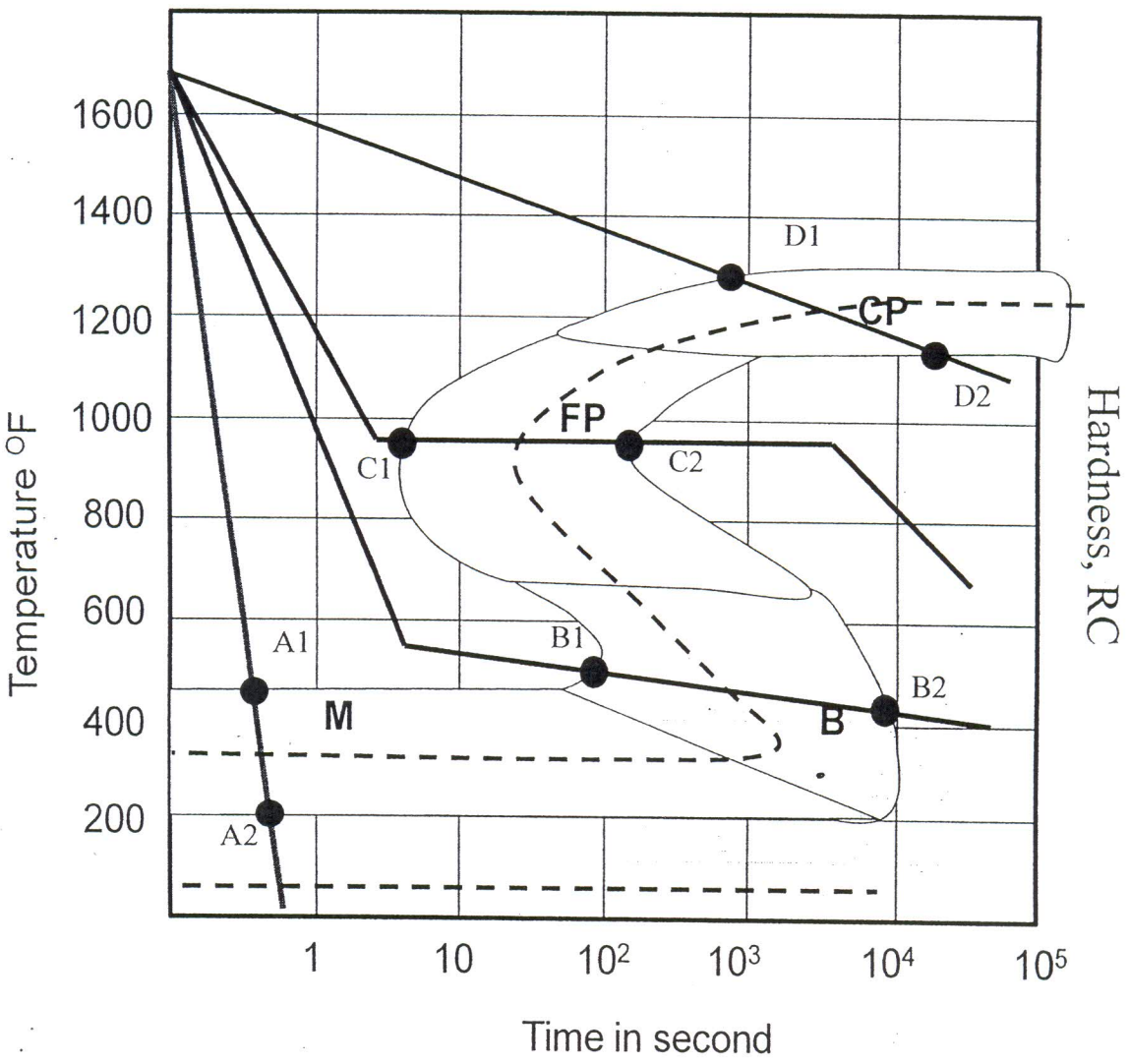
(8 Marks)

c) Explain briefly why preheating is required in welding of mild steel plate with thickness above 25 mm?

(8 Marks)

END OF QUESTION

Appendix 1 : Typical Time Temperature Transformation (TTT) Diagram



Appendix 2 : Material Composition for carbon steels

	Composition (%)				
Type	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