



UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF MARINE ENGINEERING TECHNOLOGY

FINAL EXAMINATION
JANUARY 2016 SEMESTER

COURSE CODE : LCD 10403
COURSE NAME : SHIP MATERIALS
PROGRAMME NAME : DIPLOMA OF SHIP DESIGN
(FOR MPU: PROGRAMME LEVEL) : DIPLOMA OF SHIP CONSTRUCTION
DATE : 23 MAY 2016
TIME : 09.00 AM – 12.00 PM
DURATION : 3 HOURS

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 Section 'B'. Answer all questions in Section 'A' and TWO (2) questions ONLY from Section 'B'.
 6. Answer all questions in English.
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THERE ARE 7 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

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

Question 1

- (a) Explain the purpose of understanding Iron-Iron Carbide phase diagram. (4 marks)
- (b) Sketch an iron carbon phase diagram and describe the relation between phase diagram and heat treatment. (10 marks)
- (c) Differentiate between hardening and cast hardening. (6 marks)

Question 2

- (a) Name **TWO (2)** main groups of metal alloys that are most widely used in marine industry together with its example. State the differences between the two groups.

(7 marks)

- (b) i. Describe about polymer.

(4 marks)

- ii. Lists **THREE (3)** types of polymer.

(3 marks)

- iii. Discuss and give relevant examples for each types of polymer lists in (b) ii.

(6 marks)

Question 3

(a) Discuss the types of mechanical testing that important for material selection in shipbuilding.

(4 marks)

(b) Sketch a typical graph of creep test. Describe the THREE (3) stages of creep.

(8 marks)

(c) By referring to Figure 1, explain about the fatigue behavior of ferrous and nonferrous metal.

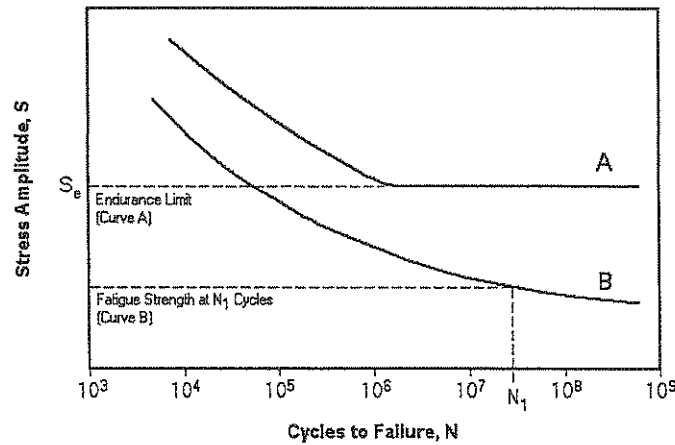


Figure 1

(8 marks)

Question 4

- (a) Differentiate between Destructive testing & Non-destructive testing.
(6 marks)
- (b) State **THREE (3)** possible reasons why we need to demagnetized our component or specimen at the end of the magnetic particle testing.
(6 marks)
- (c) Eddy current is created through a process called electromagnetic inductions. Identify **FOUR (4)** advantages and **FOUR (4)** disadvantages of using eddy current in non-destructive testing.
(8 marks)

Question 5

(a) Define corrosion and describe about the types of corrosion that may occur in shipbuilding industry.

(8 marks)

(b) For the following pairs of alloys that are coupled in seawater, predict the possibility of corrosion by referring to the galvanic series (Table 1).

- i. Aluminum and magnesium.
- ii. Zinc and low alloy carbon steel.
- iii. Cast iron and 316 stainless steel.
- iv. Titanium and 304 stainless steel.

(8 marks)

(c) From your perspective, why it is important to reduce or minimize corrosion in shipbuilding.

(4 marks)

Table 1: The Galvanic Series

Table 17.2 The Galvanic Series	
	Platinum
	Gold
	Graphite
	Titanium
	Silver
	316 Stainless steel (passive)
	304 Stainless steel (passive)
	Inconel (80Ni-13Cr-7Fe) (passive)
	Nickel (passive)
	Monel (70Ni-30Cu)
	Copper-nickel alloys
	Bronzes (Cu-Sn alloys)
	Copper
	Brasses (Cu-Zn alloys)
	Inconel (active)
	Nickel (active)
	Tin
	Lead
	316 Stainless steel (active)
	304 Stainless steel (active)
	Cast iron
	Iron and steel
	Aluminum alloys
	Cadmium
	Commercially pure aluminum
	Zinc
	Magnesium and magnesium alloys

Increasingly inert (cathodic) ↑

↓ Increasingly active (anodic)

Source: M. G. Fontana, *Corrosion Engineering*, 3rd edition. Copyright 1986 by McGraw-Hill Book Company. Reprinted with permission.

Question 6

- (a) Discuss the important of understanding the materials engineering in shipbuilding industry.
(4 marks)
- (b) Define a crystal structure and lists the three (3) common metal crystal structures.
(6 marks)
- (c) Iron at 20 °C is having a BCC crystal structure.
- i. Draw the iron crystal structure.
(3 marks)
 - ii. Show the relation between a and r .
(4 marks)
 - iii. Calculate the volume of Iron unit cell if atomic radius r is 0.124nm.
(3 marks)

END OF EXAMINATION PAPER