UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION
FEBRUARY 2025 SEMESTER SESSION

SUBJECT CODE	:	**LMB11503**
SUBJECT TITLE	:	**SHIP MATERIALS**
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	:	**BACHELOR OF MARINE ENGINEERING TECHNOLOGY**
TIME / DURATION	:	**9.00 PM - 12.00 PM (3 HOURS)**
DATE	:	**24 JUNE 2025**

INSTRUCTIONS TO CANDIDATES

1. Please read **CAREFULLY** the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of **ONE (1)** sections only (section A).
4. Answer **FOUR (4)** questions in Section A.
5. Please write your answers on this answer booklet provided.
6. Answer **ALL** questions in English language **ONLY**.
7. Answer should be written in black or blue ink except for sketches, graphics and illustrations.
8. Appendices have been appended for your reference.

THERE ARE 5 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

SECTION A (Total: 100 marks)

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

Question 1

With reference to steel heat treatment and phase diagram.

(a) Explain about the full-annealing process in plain-carbon steel for both eutectoid and hypoeutectoid steel.

(10 marks)

(b) Metal alloys can be divided into ferrous and nonferrous alloys. With the help of an iron-carbon phase diagram, discuss steel and cast iron in the shipbuilding industry.

(15 marks)

Question 2

With reference to steel heat treatment and phase diagram.

(a) Calculate the mass fractions of α ferrite and cementite in pearlite. Schematically sketch and label the pearlite microstructure.

(10 marks)

(b) Austenitic stainless steel is one of the important stainless steels that have an austenitic microstructure. Discuss the austenitic stainless steel in relation to its structure, properties and application in marine industries.

(15 marks)

Question 3

With reference to material properties.

(a) Figure 1 shows fatigue behavior of metal A and metal B. Compare the fatigue behavior for both metals and suggest the relevant examples.

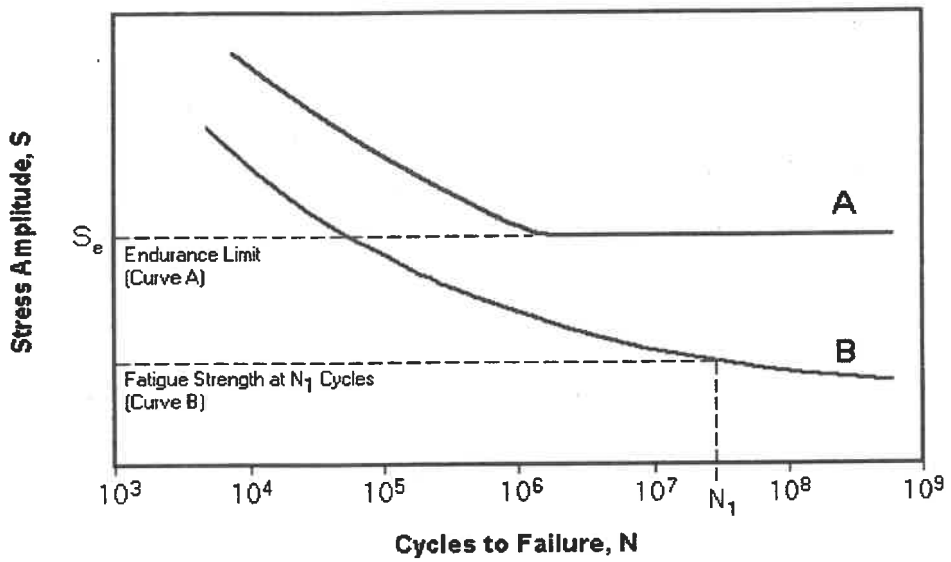

Figure 1

(10 marks)

(b) As a local fiberglass boat manufacturer, your company is well known for small fiberglass boat manufacturing and maintenance. Discuss the fabrication process of structural composite used in your company, choose one (1) method only. The information includes the types of polymers, reinforcement material and the advantages of the mechanism you choose.

(15 marks)

Question 4

With reference to material properties.

(a) Differentiate between destructive and non-destructive testing and discuss the importance of materials testing in marine engineering.

(10 marks)

(b) Table 1 is the Engineering Stress-Strain data that was obtained at the beginning of a tensile test for 0.2% C plain carbon steel.

i. Plot the engineering stress-strain curve for these data.

ii. Determine the 0.2 percent offset yield stress for this steel.

iii. Determine the tensile elastic modulus of this steel.

Table 1: Stress-Strain Engineering Data of Plain Carbon Steel

Engineering stress (MPa)	Engineering strain (mm/mm)
0	0
103.4	0.0005
206.7	0.0010
275.6	0.0015
344.5	0.0020
413.4	0.0035
454.7	0.0040
482.3	0.0060
496.1	0.0080

(15 marks)

Question 5

With reference to material properties.

(a) Reinforcement materials used in composite systems usually are classified as particulate, fiber, structural and nano. However, fiber reinforcement polymer matrix composite is well known for its strength and easy manufacturing. Discuss the types of fiber reinforcement materials in polymer matrix composite.

(10 marks)

(b) Eddy current testing is an inspection method that can be used for a variety of purposes including the detection of cracks, corrosion, material identification, heat treatment condition and coating thickness measurement. By referring to Figure 2, analyze the relation between the depth of penetration, frequencies and material properties (permeability and conductivity) in order to increase the efficiency of defect detection.

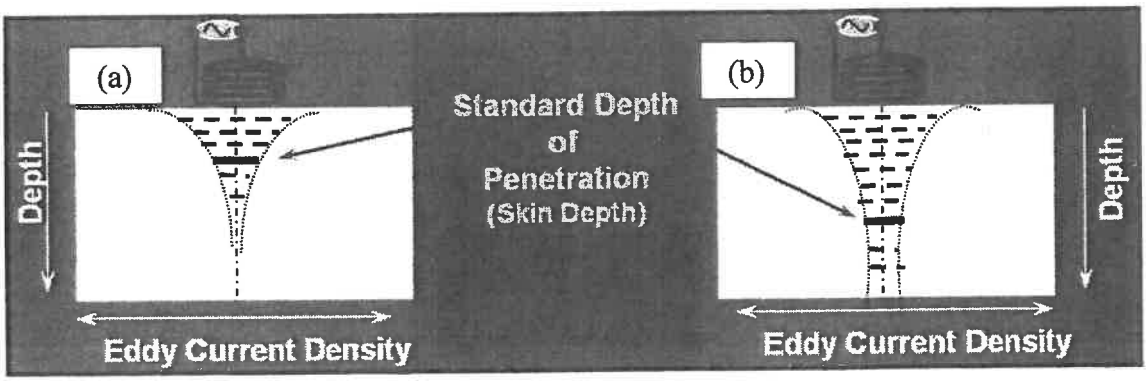

Figure 2: Standard depth of penetration for Eddy current testing (a) High frequency probe; (b) low frequency probe.

(15 marks)

END OF EXAMINATION PAPER