



**UNIVERSITI KUALA LUMPUR**  
**Malaysian Institute of Marine Engineering Technology**

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**FINAL EXAMINATION**  
**MARCH 2025 SEMESTER SESSION**

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**SUBJECT CODE** : LKB40103

**SUBJECT TITLE** : **FATIGUE AND FRACTURE MECHANICS OF OFFSHORE STRUCTURE**

**PROGRAMME NAME** : **BACHELOR OF ENGINEERING TECHNOLOGY (OFFSHORE) WITH HONOURS**  
(FOR MPU: PROGRAMME LEVEL)

**TIME / DURATION** : **2.00 PM - 5.00 PM (3 HOURS)**

**DATE** : **25 JUNE 2025**

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**INSTRUCTIONS TO CANDIDATES**

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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)** Section.
4. Answer **FOUR (4)** questions **ONLY**.
5. Please write your answers on this answer booklet provided.
6. Answer **ALL** questions in English language **ONLY**.
7. Answer should be written in blue or black ink except for sketching, graphic and illustration.

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**THERE ARE 3 PAGES OF QUESTIONS, INCLUDING THIS PAGE.**

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**SECTION A (Total: 100 marks)****INSTRUCTION: Answer FOUR (4) questions ONLY.****Please use the answer booklet provided.****Question 1**

Fracture mechanics can be simply defined as study of the propagation of cracks in materials.

- (a) Briefly elaborate further based on the abovementioned sentence (13 Marks)
- (b) From your opinion, why is Fracture Mechanics vital in engineering field as apart of Strength of the Material? (4 Marks)
- (c) Discuss about the tangentially and perpendicular cracks (6 Marks)
- (d) Compare Fracture Toughness and Fracture Strength (2 Marks)

**Question 2**

The mechanical properties of the metals are those which are associated with the ability of the material to resist mechanical forces and load.

- (a) In your own words, please discuss material properties as below
  - i. Strength
  - ii. Elasticity
  - iii. Plasticity
  - iv. Ductility
  - v. Brittleness
  - vi. Stiffness

(18 Marks)

- (b) With the aid of an atomic structure diagram, explain the shear in the plastic region (7 Marks)

**Question 3**

Design errors is a critical in an engineering field to it can lead to a catastrophe events.

- (a) What can be categorised as Design Errors? (10 Marks)
- (b) Briefly discuss the general cases of failures other than Design Errors with an example (15 Marks)

**Question 4**

Overload can happen in many ways

- (a) Elaborate the reason why bending occurs and discuss what can cause bending overload (10 Marks)
- (b) How can Torsional Overload or Failure can be prevented? (15 Marks)

### Question 5

Fatigue testing is used to determine how many load cycles a material can sustain or the failure load level for a given number of cycles.

- (a) Briefly discuss what is the different of High Cycles and Low Cycles fatigue test (9 Marks)
- (b) Fatigue can fail at any given stress level. What is the factors of fatigue failure can be extracted from the Figure 1 (6 Marks)
- (c) Describe the material A and B based on its fatigue test results shown in the Figure 1 below (10 Marks)

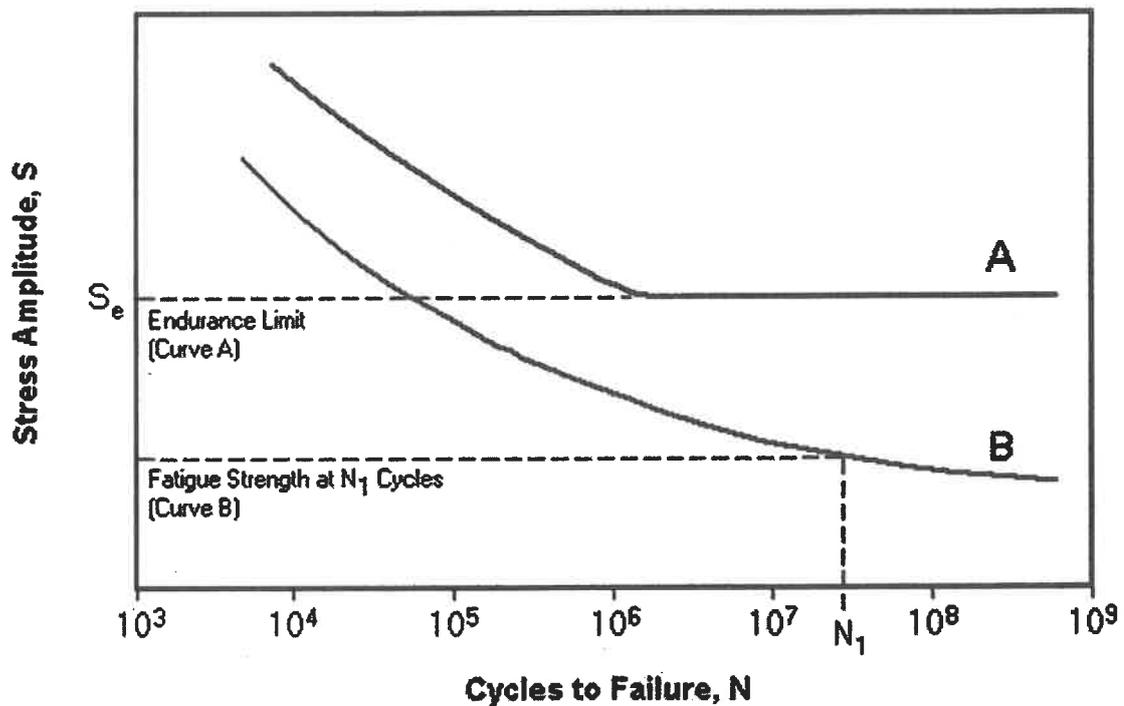


Figure 1

END OF QUESTION PAPER