CONFIDENTIAL

UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION

JULY 2025 SEMESTER SESSION (7-WEEK)

SUBJECT CODE	:	**LKB40103**
SUBJECT TITLE	:	**FATIGUE AND FRACTURE MECHANICS OF OFFSHORE STRUCTURE**
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	:	**BET (OFFSHORE) WITH HONOURS**
TIME / DURATION	:	**09.00 AM - 12.00 PM (3 HOURS)**
DATE	:	**18 SEPTEMBER 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)** Section with FIVE (5) questions.
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.

THERE ARE 2 PAGES OF QUESTIONS, EXCLUDING THIS COVER PAGE.

SECTION A (Total: 100 marks)

INSTRUCTION: Answer FOUR (4) questions ONLY.

Please use the answer booklet provided.

Question 1

Faliures can be categorised into two categories which are Mechanical Faliure and Environmental Failure. As the designers cannot predict the environmental conditions, mechanical failures are understandable can be analysed. With the aid of diagram, briefly explain the type of failures below

(a) Yielding (5 Marks)
(b) Buckling (5 Marks)
(c) Fracture (5 Marks)
(d) Fatigue (5 Marks)
(e) Elactic Deformation (5 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. Elastictiy
   iii. Plastictiy
   iv. Ductility
   v. Brittleness
   vi. Stiffness

(18 Marks)

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

Question 3

Torsion Overload usually occur in a shaft that is inside a hub or coupling. Torsional fatigue failure prevention can be grouped into three categories. In your words, discuss how can it be prevented in term of

(a) Correct machining (10 Marks)
(b) Identifying torque characteristic (6 Marks)
(c) Identifying torque resonance (9 Marks)

Question 4

Fatigue is associated with stresses that vary with time often in a repeated manner. Hence, it is vital to understand fatigue and its design criterias to avoid its failures. Discuss your understanding about

(a) Fail-safe design (7 Marks)
(b) Infinite Design (6 Marks)
(c) Safe-Life Design (6 Marks)
(d) Damage Tolerant Design (6 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 resuls shown in the Figure 1 below (10 Marks)

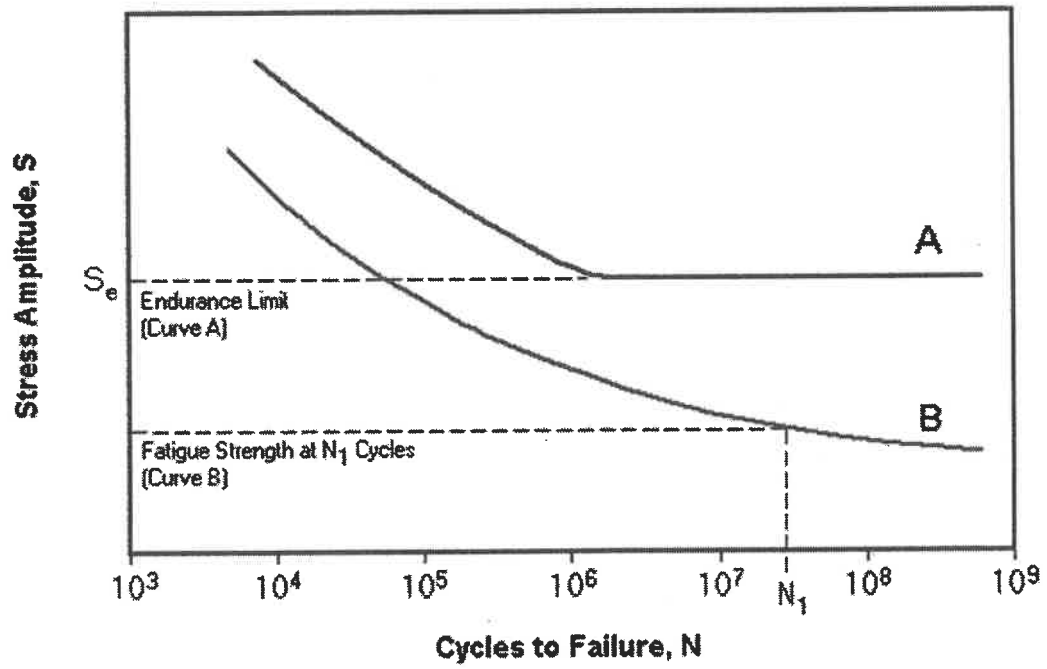

Figure 1

END OF QUESTION PAPER