



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

**UNIVERSITY EXAMINATIONS FOR THE DIPLOMA IN MARINE ENGINEERING
(TVET)**

1ST YEAR 2ND SEMESTER 2023/2024 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TDM 2127

COURSE TITLE: SHIP STABILITY

EXAM VENUE: STREAM: Dip Marine Eng

DATE: ../04/2024 EXAM SESSION:

DURATION: 3 HOURS

Instructions

- 1. Answer question 1 (Compulsory) and ANY other three questions**
- 2. Candidates are advised not to write on question paper**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room**

QUESTION ONE (40 MARKS)

- a) What is the importance of understanding ship stability principles as a maritime professional? (5 Marks)
- b) Define Archimedes principle and its applications in ship stability calculations. (5 Marks)
- c) For a floating body in equilibrium, an external force causes a small change in its position. Using diagrams discuss the three situations that can occur when the external force ceases to act. (15 Marks)
- d) Illustrate the various coefficients of form below; (8 Marks)
- i) Block coefficient
 - ii) Mid-ship coefficient
 - iii) Prismatic coefficient
 - iv) Water-plane coefficient
- e) Define the following ship motions; (7 Marks)
- i) Heel
 - ii) Trim
 - iii) List
 - iv) Yawing
 - v) Rolling
 - vi) Heaving
 - vii) Pitching

QUESTION TWO (20 MARKS)

- a) Outline the assumptions made in ship hydrostatic calculations. (4 Marks)
- b) Define the following: Keel K, Centre of gravity G, Centre of buoyancy b, metacenter M, metacentric height, Righting lever GZ. (6 Marks)
- c) For a ship floating, describe using the mid-ship cross-section the **initial stability condition**. (5 Marks)
- d) For (b) above, illustrate the condition when an external force causes a change by a small angle. (5 Marks)

QUESTION THREE (20 MARKS)

- a) Define the following terms; (6 Marks)
- i) Tons per Centimeter immersion (TPC)
 - ii) Fresh Water Allowance (FWA)
 - iii) Dock Water Allowance (DWA)
- b) What is relative density, and derive the relative density of seawater. (4 Marks)
- c) For a vessel floating from Seawater to Fresh water, derive the relationship between TPC and FWA. (10 marks)

QUESTION FOUR (20 MARKS)

- a) A ship has displacement of 2400 tonnes and KG 10.8 metres. Find the new KG if a weight of 50 tonnes mass already on board is raised 12 metres vertically.
(10 Marks)
- b) A ship being dry-docked has a displacement of 1500 tonnes. TPC 5 tonnes, KM 3.5 m, GM 0.5 m, and has taken the blocks fore and aft at 3 m draft. Find the GM when the water level has fallen another 0.6 m.
(10 Marks)

QUESTION FIVE (20 MARKS)

- a) Outline the damage control principles. (5 Marks)
- b) What are the duties of the following damage control parties; (10 Marks)
- i) Shoring party
 - ii) Leak stop party
 - iii) Flooding and counter flooding party
 - iv) Containment party
 - v) First Aid party
- c) Discuss the damage control plan including the damage control tools and equipment.
(5 Marks)