



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 6 Examination in Engineering: November 2017

Module Number: ME 6215

Module Name: Naval Architecture and Hull
Engineering

[Three Hour]

[Answer all questions, fifty marks for all questions]

All assumptions must be stated clearly. Sketches and diagrams are to be provided where required. Symbols stated herein denote standard parameters.

- Q1 a) When consider the ship responses, what are the 6 basic motions of a ship? Describe them with the aid of suitable sketches. [2.0 Marks]
- b) "Added mass and damping will affect the motions of a ship and also their periods." Explain this briefly. [2.0 Marks]
- c) A study of "Rolling effect" of a ship is very important to prevent catastrophes. Explain this briefly. [2.0 Marks]
- d) What are the main causes of vibration in a ship? How can the levels of vibration be reduced? [2.0 Marks]
- e) "A ship's rolling motion can be reduced by fitting a stabilization system and that systems may be active or passive". What are the systems, which can be utilized for "rolling stabilization" of a ship? Explain two of them. [2.0 Marks]
- Q2 a) Discuss how "ship motion data" can be represented. [2.0 Marks]
- b) What are the "Seakeeping criteria" affecting for limiting the performance of a ship? Discuss them briefly. [2.0 Marks]
- c) What are the Hazards due to the "Wave Resonance Effect"? Explain 3 of them. [2.0 Marks]
- d) Describe the three ways of assessing the motion? [2.0 Marks]
- e) What are the parameters of "ship form" that can be beneficial in different wave conditions? [2.0 Marks]
- Q3 a) Describe the term "Manoeuvring". [1.0 Mark]
- b) What is meant by "Directional Stability and Control" of a ship? [2.0 Marks]

Q3 is continued to the next page...

- c) What is meant by "Turning Circle"? What are the parameters to define the turning performances (List seven of them)?

[3.0 Marks]

- d) A rudder with an area of 30 m^2 , when turned by 40° has the center of pressure 1.5 from the stock centerline. If the ship speed is 20 knots and the rudder is located behind the single propeller, calculate the diameter of the stock, which is able to take this torque.

Given: Allowable stress is 70 MN/m^2 and the factor for velocity is 1.3 for a rudder closely behind the propeller.

[4.0 Marks]

- Q4 a) What are the types of underwater vehicles?

[2.0 Marks]

- b) How can you modify a ship's manoeuvring performances, describe this with the aid of the knowledge in Naval Architecture and Hull Engineering?

[3.0 Marks]

- c) What are the types of rudders used in ships?

[2.0 Marks]

- d) What are the factors to be considered while designing a Submarine?

[3.0 Marks]

- Q5 a) What are the two modes of vibration a ship can under go? Explain them briefly

[2.0 Marks]

- b) What do you mean by tuning factor and magnification factor?

[2.0 Marks]

- c) Explain the following terms with related to the Ship Dynamics

- i) Dead Beat
- ii) Isochronous rolling
- iii) Coupling
- iv) Simple harmonic motion

[4.0 Marks]

- d) What are the methods, which can be used to calculate the vibration of a ship?

[2.0 Marks]