



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 3 Examination in Engineering: February 2023

Module Number: MN 3201

Module Name: Fundamentals of Naval Architecture

[Three Hours]

[Answer Five Questions only, each question carries 20 marks]

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- Q1 (a) What are the structural stresses experienced by a ship? Explain two types of stresses in brief. [07 Marks]
- (b) Explain the importance of water tight subdivisions of a vessel. [05 Marks]
- (c) A ship 150 m long and 20.5 m beam floats at a draught of 8 m and displaces 19,500 tonne. The TPC is 26.5 and midship section area coefficient is 0.94. Calculate the block, prismatic and water-plane area coefficients. [08Marks]
- Q2 (a) Define the term Reserve Buoyancy. [05 Marks]
- (b) A box shaped vessel 105 m, 30 m beam and 20 m deep, is floating upright in fresh water. If the displacement is 19,500 tonnes, Find the volume of reserve buoyancy. [07 Marks]
- (c) Write short notes on following;
- Free Surface Effect
 - Trim
 - Seakeeping
 - Table of offsets
- [08 Marks]
- Q3 (a) What are the three basic views/ plans of Lines Plan? Explain them in brief [07 Marks]
- (b) Explain the infrastructure fitted on board ships and craft for limiting the Ships

motions?

[05 Marks]

(c) What are the means of maneuvering vessels?

[03 Marks]

(d) Indicate the types of conventional rudders?

[05 Marks]

Q4 (a) With the help of suitable sketches explain the states of equilibrium.

[10 Marks]

(b) When a ship is unstable or neutral equilibrium is to be made stable, the effective centre of gravity is lowered. Indicate three methods employed in correcting unstable and Neutral equilibrium.

[05 Marks]

(c) Using the provided hydrostatic curves in Fig 1 (Refer Page 3) for M.V. 'Pearl', find out following information when the mean draft is 7.6 metres,

- i. TPC
- ii. MCT 1 cm
- iii. Displacement
- iv. Longitudinal centre of flotation
- v. Longitudinal centre of buoyancy

[05 Marks]

Q5 (a) What is the importance of maritime transportation? Explain.

[08 Marks]

(b) An inclining experiment was carried out on a ship of 8000 tonne displacement. A mass of 10 tonne was moved 14 m across the deck causing a pendulum 8.5 m long to deflect 110 mm. The transverse metacenter was 7.15 m above the keel. Calculate the metacentric height and the height of the centre of gravity above the keel.

[08 Marks]

(c) List out factors on which the Frictional Resistance (viscous resistance) of a ship depends upon.

[04 Marks]

Q6 (a) Illustrate the ship motion data with the help of a sketch.

[06 Marks]

(b) Explain the effect of shifting weights horizontally and vertically on ships stability.

[06 Marks]

(c) A ship 126 m long is floating at drafts of 5.5 m Fwd and 6.5 m Aft. The centre of flotation is 3 m aft of amidships. MCT 1 cm 240 tonnes m. Displacement 6000 tonnes. Find the new drafts if a weight of 120 tonnes already on board is shifted forward a distance of 45 meters.

[08 Marks]

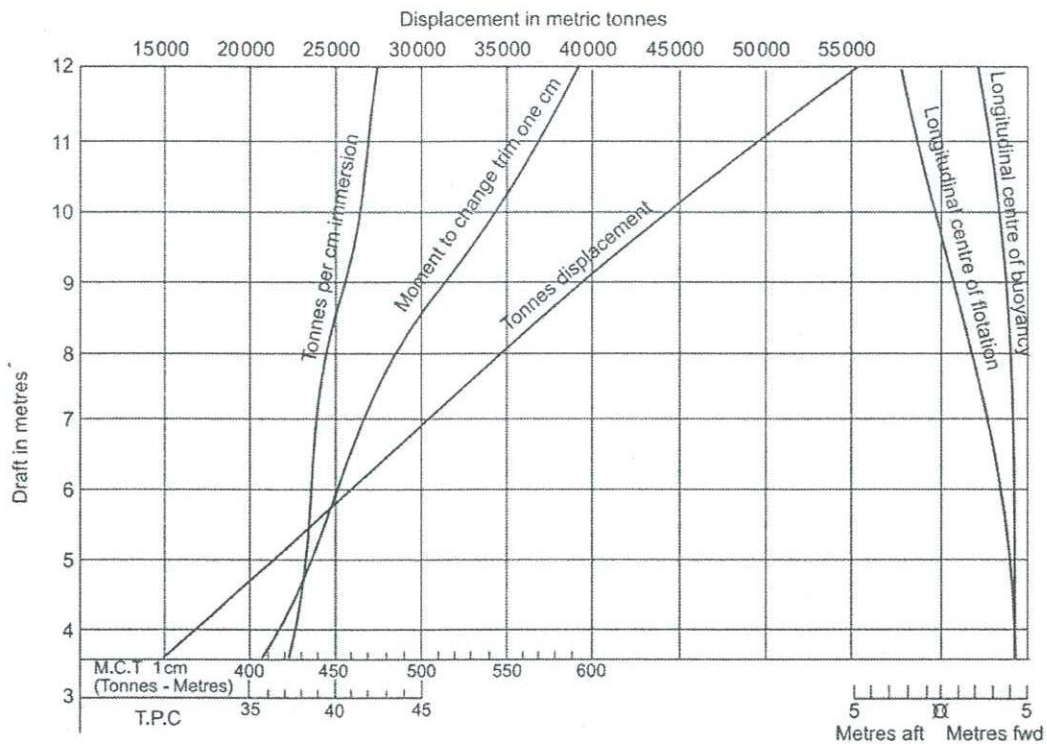


Fig 1 - Hydrostatic curves of M.V. 'Pearl'