



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 3 Examination in Engineering: March 2026

Module Number: MN3201

Module Name: Fundamentals of Naval Architecture (C 23)

[Three Hours]

[Answer All Questions, Total 70 Marks]

Instructions:

- This question paper has Six questions on 03 pages.
- Maximum marks allocated for each section of questions are shown.
- Non-programmable calculators may be used.
- Drawings and sketches should be clear, neat and in approximate proportion.
- Do not use Red ink.

Data and Information:

- Sea water (SW) Density = 1025 kg/m^3

- Q1**
- a) With aid of diagrams explain the followings:
- i) Forward perpendicular (01 Mark)
 - ii) Stem rake (01 Mark)
 - iii) Entrance (01 Mark)
 - iv) Tumblehome (01 Mark)
 - v) Extreme breadth (01 Mark)
- b)
- i) Define "Relative Density (RD)" (02 Marks)
 - ii) A vessel arrived at the river mouth in water of RD 1.027 with a free board of 2.50m. She proceeded up river consuming 56 tonnes of fuel oil and fresh water and is again at a free board of 2.50 m in water of RD 1.020. Calculate its displacement in salt water. (05 Marks)
- Q2**
- a) Describes the effect on a ship's behaviour of a small GM (tender) ship (02 Marks)
- b)
- i) Define 'block coefficient of fineness of displacement'. (02 Marks)

- ii) A ship's length at the waterline is 120m when floating on an even keel at a draft of 4.5m. The maximum beam is 20m. If the ship's block coefficient is 0.75, find the displacement in tonnes at this draft in salt water.

(06 Marks)

Q3 a) With aid of diagrams explain the following,

- i) Unstable equilibrium

(02 Marks)

- ii) Moment of statical stability

(02 Marks)

b) A ship of 12 000 tonnes displacement has an initial metacentric height of 1.4m. What is the moment of statical stability when the ship is heeled by,

- i) 10 degrees

(03 Marks)

- ii) 25 degrees.

(03 Marks)

Q4 a) Define followings with aid of diagrams;

- i) Tonnes Per Centimetre (TPC)

(02 Marks)

- ii) Centre of flotation.

(02 Marks)

b) A ship's water-plane is 80 metres long. The breadths commencing from forward are as follows: 0, 3.05, 7.1, 9.4, 10.2, 10.36, 10.3, 10.0, 8.84, 5.75 and 0m, respectively. The space between the first three and the last three ordinates is half of that between the other ordinates. Calculate the area of the water-plane, and the position of the centre of flotation.

(08 Marks)

Q5 a) i) Explains the purpose of load lines.

(02 Marks)

- ii) Draws to scale the load line mark and the load lines for a ship.

(04 Marks)

b) i) Write down four (04) conditions to be observed before and while performing an inclining experiment.

(02 Marks)

- ii) A vessel of Displacement 4950 tonnes carried out the inclining experiment. A weight of 25 tonnes already on board was shifted transversely across the deck by 10m. If the length of the plumb line was 4 m and deflection was 0.300 m along the batten. Find the Initial GM of the lightship.

(06 Marks)

- Q6** a) Define the following,
- i) Water pressure
 - ii) Thrust.
- (04 Marks)
- b) A lock gate 12 m wide has water of density 1010 kg per cu. m to a depth of 10 m on one side and water of density 1015 kg per cu. m to a depth of 6m on the other side. Find the following,
- i) Resultant thrust on the lock gate.
- (07 Marks)
- ii) State on which side of the lock gate the resultant thrust acts.
- (01 Mark)