

Indian Maritime University
(A Central University, Govt of India)

End Semester Examinations – December 2025

Programme Name: B Tech (ME)

Semester: V

Subject Code: UG11T4505

Subject Name: NAVAL ARCHITECTURE- I

Date: 15.12.2025

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

General Instructions

- (i) All Sections (A, B & C) are to be attempted.
- (ii) Options, if any, are specified in respective section.
- (iii) Note: cu.m = m³

Section A

Answer all 10 MCQs/Fill in the Blanks of 01 Mark each and choose the correct answer as applicable. (Marks 10 × 1 = 10)

1. According to the IMO Code of Intact Stability, what is the primary objective of intact stability requirements?

- a) To ensure a ship can maintain stability under normal loading conditions
- b) To ensure a ship can resist flooding and remain afloat
- c) To ensure stability under various operational conditions, including rough seas
- d) To prevent ships from capsizing under any circumstances

2. Condition of applicability for Simpson's 2nd rule:

- a) No. of ordinates should be multiple of 3
- b) No. of common intervals should be multiple of 3
- c) No. of ordinates should be odd
- d) No. of common intervals should be odd

3. The weight of the ship when built in shipyard including all framing, machinery, decking etc. is:

- a) Deadweight
- b) Lightweight
- c) Displacement
- d) Tonnage

4. Relationship between C_b, C_p, & C_m:

- a) $C_b = C_p \times C_m$
- b) $C_b \times C_p \times C_m = 1$

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- c) $C_b = C_p + C_m$
 - d) $C_b = C_p / C_m$

5. **When flooding occurs in a damaged vessel, reserve buoyancy:**

- a) Shifts to the low side
- b) Remains the same
- c) Increases
- d) Decreases

6. **The existence of liquids in partially full tanks or compartments of a ship causes a virtual rise in the height of the:**

- a) Metacenter
- b) Center of buoyancy
- c) Center of gravity
- d) Center of flotation

7. **When the bending moment is parabolic curve between two points, it indicates that there is:**

- a) No loading between the two points
- b) Point loads between the two points
- c) U.D.L. between the two points
- d) Uniformly varying load between the two points

8. **GM cannot be used as an indicator of stability at all angles of inclination because:**

- a) M is not fixed at large angles
- b) G is not fixed at large angles
- c) There is no M at large angles
- d) There is no G at large angles

9. **Maximum Bending Moment occurs:**

- a) Where SF is zero
- b) Where SF is maximum
- c) At AFT Perpendicular
- d) At midship Perpendicular

10. **Longitudinal stability means:**

- a) Stability about pitching axis
- b) Stability about yawing axis
- c) Stability about lateral axis
- d) Stability about negative yawing axis

(P.T.O)

Section B

Answer all 5 questions of 02 Marks each.

(Marks 5 × 2 = 10)

- 11. What is a stiff ship and a tender ship.
- 12. What is angle of Loll?
- 13. What is TPC and how it is calculated?
- 14. How a Floodable length curve is used?
- 15. How force acting on a bulkhead and center of pressure are related.

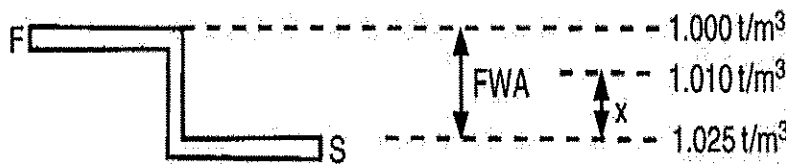
Section C

Answer any 5 questions out of 7 Questions of 10 marks each

(Marks 5 × 10 = 50)

16. a. A ship is loading in dock water of density 1010 kg per cu. m. FWA=150 mm. Find the change in draft on entering salt water.

(3 marks)

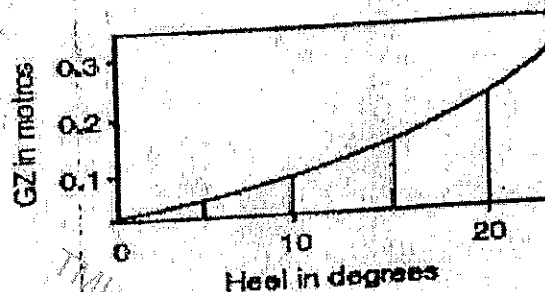


16 b. A ship 135 m long, 18m beam and 7.6m draught has a displacement of 14,000 tonnes. The area of the load water plane is 1925 m² and the area of the immersed midship section is 130 m². Find horizontal and vertical Prismatic coefficients.

(7 marks)

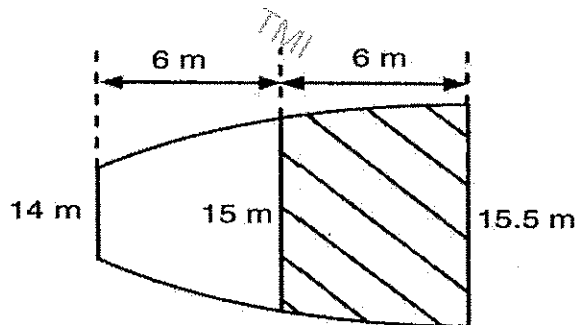
17. A box-shaped vessel 45m x 10m x 6 m is floating in salt water at a draft of 4 m Forward and Aft. GM is 0.6 m. Calculate the dynamical stability to 20 -degree heel.

(10 Marks)



(P.T.O)

18. a Three consecutive ordinates in a ship's water-plane, spaced 6 metres apart, are $c=14$, $b=15$ and $a=15.5$ m, respectively. Find the area between the last two ordinates. **(3 marks)**



18. b A ship 120 meters long at the waterline has equidistantly spaced half-ordinates commencing from forward as follows: 0, 3.7, 5.9, 7.6, 7.5, 4.6, and 0.1 meters, respectively. Find the area of the water-plane and the TPC at this draft. Note: There is an odd number of ordinates in the water-plane, so Simpson's First Rule can be used. **(7 marks)**

19. For a box-shaped barge of 16 m beam floating at an even keel draught of 6m in water of density 1025 kg/m^3 , the tonne per centimetre immersion (TPC) is 17. A full-depth midship compartment 20 m in length and 16 m breadth has a permeability of 0.80.

If the compartment is bilged, determine:

- the draught
- the position of the metacentre above the keel, if the second moment of area of the intact waterplane about the centreline is 75000 m^4 **(5 + 5 = 10 marks)**

20. A ship 126 m long is floating at drafts of 5.5 m F and 6.5 m A. The centre of flotation is 3 m aft of amidships. $\text{MCT } 1 \text{ cm} = 240 \text{ tonnes m}$. Displacement = 6000 tonnes. Find the new drafts if a weight of 120 tonnes already on board is shifted forward a distance of 45 metres. **(10 marks)**

21. a. Define the Angle of Heel and the Angle of List. Explain the difference between the two. **(4 marks)**

21. b. Procedure and importance to conduct inclination experiment. **(6marks)**

(P.T.O)

22. (a) Briefly describe the latest IMO probabilistic method for assessing damage stability. **(4 marks)**

(b) A ship 125 m long and 17.5 m beam floats in sea water of 1.025 t/m³ at a draught of 8 m. The waterplane area coefficient is 0.83, block coefficient 0.759 and midship section area coefficient 0.98. Calculate:

a) prismatic coefficient

b) TPC

c) change in mean draught if the vessel moves into river water of 1.016 t/m³

(1+2+3= 6 marks)

TMI

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