Indian Maritime University

(A Central Univ4ersity, Govt of India)

End Semester Examinations – June 2025

Programme Name: B Sc (NS)

Semester: IV

Subject Code: UG21T5402

Subject Name: Ship Stability Paper - II

Date: 02.06.2025	Max Marks: 70
Duration: 03 Hrs	Pass Marks: 35

General Instructions

(i) All Sections (A, B & C) are to be attempted.
(ii) Non Programmable Scientific Calculator is permitted.
(iii) MV Hindship Trim & Stability Particulars is permitted.
(iv) Graph paper for solving Q 18 may be used.

Section A

1. Given intial drafts: F 8.5 m, A 9.1 m, LBP: 175 m, W: 28000 t, MCTC 275 tm. How much distance a weight of 250 t has to be shifted to make the ship Even Keel.

a. 66 m (Aft)
b. 66 m (Fwd)
c. 42m (Aft)
d. 42 m (Fwd)

2. When the ship is going from SW to FW and it causes the COB shifting to forward. The vessel will trim by ----------
a. stern,
b. head,
c. no change in trim
d. bodily rise

3. This rule is used to get area between any two successive ordinates when at least 3 successive ordinates are known.

a. Simpson's 1st rule
b. Simpson's 2nd rule
c. Simpson's 3rd rule
d. None of the above

4. The initial metacentric height (GM) is found by drawing a tangent to the curve through the origin and then erecting a perpendicular through an angle of heel of ---------- degrees.

5. Atwood's formula is used to find

a. GM
b. KB
c. GZ
d. BM

6. KN curves are used to calculate ----------
a. KB,
b. BM,
c. GM,
d. GZ

7.State the formula for calculating Angle of loll.

8. While ballasting to correct a vessel with Angle of Loll, always start with the same side of the angle of loll. (True or False)

9. In order to correct the angle of loll (vessel heeled to port), ---------- DB tank is ballasted first.
a. Port,
b. Starboard,
c. Centre
d. None of the above

10. The angle of heel due to the shift of grain shall not be greater than -------- .

Section B

Answer all 5 questions of 2 Marks each. (2 x 5 = 10 Marks)

11.Define Angle of loll.

12. Calculate Cb & Cw of M.V.Hindship when floating in SW at a draft of 8 m.

13. State the two formulae for obtaining loss of GM during dry docking clearly mentioning the meaning of each alphabet.

14. A ship of 6000 tonnes displacement has KB 3 m, KM 6 m and KG 5.5 m. Find the moment of statical stability at 25 degrees heel.

15. Define angle of repose and volumetric heeling moment.

Section C

Answer all 5 questions. (10 Marks each)

16.A ship has to load 1000 t of cargo. The drafts are 8.5 m fwd & 9.7 m aft. Space is available 57 m fwd of amidships & 43 m aft of amidships. LBP: 140m, MCTC is 250 tm, COF 3 m abaft amidships & TPC is 25 t. Find how to distribute this 1000 t of cargo, if the ship is to finish loading trimmed 0.5 m by the stern. Calculate also the final drafts fwd and aft. (10 Marks)

17.a) A ship's water-plane is 180 metres long. The breadths commencing from forward are as follows:

0, 6.05, 14.1, 18.4, 20.2, 20.36, 20.36, 20.36, 20.3, 20.0, 16.84, 10.75 and 0 m, 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. (6 Marks)

17.b) M.V. Hindship in condition No. 7 is listed 3 deg to starboard. 350 t cargo is discharged from No. 1 TD, 2 m off centre line (Starboard). Calculate resultant list. (4 Marks)

18. Construct the curve of statical stability for the M.V. 'Cargo-Carrier' when the displacement is 25 000 tonnes and KG is 8.5 metres. From the curve you have constructed find the following:
(a) The range of stability,
(b) The angle of vanishing stability,
(c) The maximum righting lever and the angle of the heel at which it occurs,
(d) The approximate initial metacentric height.
KN value is given below; -

Heel deg	5	10	15	20	30	45	60	75	90
KN	1.1	2.3	3.7	4.9	7.2	9.4	10.2	9.9	8.7

(10 Marks)

19. a) With the help of a neat diagram, derive the formula for MCTC. (5 Marks)

19. b) With the help of a neat diagram enumerate the intact stability criteria of any ship carrying bulk grain. (5 Marks)

20. a) M.V.Hindship is floating at a hydrostatic draft of 8.6 m in SW. She then proceeds to another port consuming 40 t of bunkers. At this port she discharges 206 t of cargo and once again comes to hydrostatic draft of 8.6 m. What is the RD of water at the 2nd port? (5 Marks)

20.b) M.V.Hindship is floating in SW at a draft of F: 6.7 m, A 7.8m. Calculate position of COG forward of Aft perpendicular. If 577.6 t is now loaded, what will be her final hydrostatic draft? (5 Marks)